Sowing the Seeds for Our Future

Report of the Second Asian Development Forum

"Sustainable Agriculture Towards Food Security and Enhanced Quality of Life"

22-26 February 1993
Cagayan de Oro, Philippines
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Report of the
SECOND ASIAN DEVELOPMENT FORUM

"Sustainable Agriculture Towards Food Security and Enhanced Quality of Life"

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Asian NGO Coalition for Agrarian Reform and Rural Development (ANGOC)
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FOREWORD

In the quest for food security, Asian governments have increasingly come to adopt high-yield, high-input agriculture, similar to that practiced in the West. Caught in a technologico-scientific fix—economists, bureaucrats and multinational corporations promoted widespread use of hybrid seeds, heavily dependent on chemical inputs and pesticides. Hopes ran high on this new scientific wonder.

Yet, over recent decades, mounting evidence points to the fact that Third World confidence in HYV-based agriculture may have been cruelly misplaced. After experiencing a dramatic rise in yields, Asian farmers soon realized that they needed ever-increasing doses of chemicals to maintain the same harvest levels. This is because chemicals reduce the soil's nutritive capacity. The introduction of highly-toxic pesticides brought collateral damage—killing beneficial organisms, polluting vital drinking water supplies, and impairing human health.

Asian farmers were affected in other ways. The Western model of high-yield agriculture necessitated large-scale farming. The lure of fast-track economic gain enticed entrepreneurs to replace household food crops with high-value cash crops for export. These actions only served to drive away growing numbers of rural poor populations away from their lands, and to reduce the meager food on their tables.

Consumers, meanwhile, were not spared, as chemicals found their way up the food chain. Fast-foods replaced traditional food; cultures and nutrition were sacrificed for commerce.

Instead of enhancing food security, the Green Revolution clearly accomplished only the opposite—aggravating food insecurity. There is thus a need to seek new agricultural methods, to search for alternative paradigms.

Sustainable agriculture is the model counterposed to the Green Revolution. There may be subtle differences in interpretation among its growing number of advocates, but it is possible to define sustainable agriculture loosely as agriculture that relies on the regenerative and productive properties of nature, based on equitable social relations, rather than on artificial substances and ecologically-destructive practices framed by unjust structures.

Throughout Asia, countless communities and individuals are now working on agricultural alternatives—and from their efforts springs new hope for our future food security.

This publication is about sustainable agriculture and its role in enhancing food security. It compiles papers and discussions at the Second Asian Development Forum organized by ANGOC on the theme: "Sustainable Agriculture Towards Food Security and Enhanced Quality of Life" held on 22-26 February 1993 in Cagayan de Oro City, Philippines. The Asian Development Forum is a five-year annual Conference which gathers key development thinkers and practitioners to discuss key issues critical to the Asian Region.

This publication presents NGO overviews of the agricultural situation in nine Asian countries. Furthermore, it includes regional theme papers which expound on three core themes—Nicanor Perlas' overview paper presents what is possibly the most comprehensive set of standards for evaluating the sustainability of agricultural systems. The paper by AVARD expounds on the effects and challenges of the global political economy to sustainable agriculture. And Vandana Shiva's critique of the Green Revolution outlines the emerg-
ing threats of biotechnologies to future food security in the Third World.

This publication itself is the combined product of numerous hands and minds. We thank in particular Rachel Polestico for drafting the initial report of the proceedings; Tess Lingan, our expert writer-editor, who crafted the synthesis from all the different sources into readable form through excellent overall publications editing and design; and Faina Lucero, who coordinated all the publications work, constantly reminding everyone of past deadlines due.

We wish to sincerely thank all the speakers, presenters, participants, guests and secretariat support staff of the Second Asian Development Forum. Through their efforts, they may all be considered as co-authors of this publication. We thank especially the SEARSOFLIN staff and students — for hosting the Conference, and for making the participants' stay truly enjoyable and productive. We acknowledge the months of preparatory work, the unfailing commitment and constant coordination work of the ADF Regional Steering Committee: the Association of Development Agencies in Bangladesh (ADAB), Association of Voluntary Agencies in Rural Development (AVARD, India), Management Institute for Social Change (MINSOC, Malaysia), National NGO Council (NNGOC, Sri Lanka), NGO Coordinating Committee for Rural Development (NGO-CORD, Thailand), NGO Federation of Nepal (NGOF), Philippine Partnership for the Development of Human Resources in Rural Areas (PhilDihrta), Rural Development Foundation of Pakistan (RDFP), and Sekretariat Bina Desa (Indonesia).

Several individuals and groups deserve special mention: Nicanor Perlas, who served as the main consultant for the Forum; Vandana Shiva and P.M. Tripathi who presented regional papers; Rachel Polestico who provided process-documentation; the staff of PhilDihrta-Mindanao, Orlan Ravanera and the staff of the Centre for Alternative Rural Technology (CART) in Cagayan de Oro, for backstopping secretariat support work at the conference; the MASIPAG project staff; and the tireless ANGOC Secretariat staff — Dave Ingles, Violeta Q. Perez-Corral, Rey Ureta, Roel Ravanera, Manolo Gregorio, Janie-Rose Villaroman, Marivic Mandalihan, Cris Villarca, and Dodong Ellumba.

We acknowledge with thanks the assistance of the Sasakawa Peace Foundation for making the conference and this publication possible. We express our gratitude in particular to Yuji Kondo for his constant encouragement with the Asian Development Forum, and to Koshiro Takada and Shoko Yamada for their unwavering support and appreciation of Asian NGO processes.

Finally, we remain ever-grateful to Dr. Dioscorro L. Umali, former ANGOC Chairman and chief architect of the Asian Development Forum. For it is from his cherished memory that we all draw our continual inspiration, vision and guidance.

FR. ANTONIO J. LEDESMA, SJ
Chairman

ANTONIO B. QUIZON
Executive Director
 MESSAGE

It is indeed a great honor and privilege for the Sasakawa Peace Foundation (SPF) to support the Second Asian Development Forum on "Sustainable Agriculture: Towards Food Security and Enhanced Quality of Life".

At the outset, SPF would like to take this opportunity to express our deepest appreciation to the Asian NGO Coalition for Agrarian Reform and Rural Development. Our special thanks also go to all the distinguished experts and leaders for sharing their expertise and experience.

The Foundation offers an alternative approach to government assistance by channelling resources directly to NGOs in the developing countries. This approach will strengthen these NGOs whose activities are essential to sustainable development. SPF has accumulated valuable experiences in its more than five years of work with development NGOs in Indonesia, the Philippines, Thailand and Sri Lanka.

In particular, three basic principles have become clear. First, the development activities of NGOs are too diverse and complex for a simplistic approach to be effective. Second, local NGOs have a number of management problems. This would suggest the need for staff training.

Third, NGOs have become very active throughout the developing world. And with radical changes taking place everywhere, NGOs will be getting more opportunities to make their opinions known.

To provide one such opportunity, the First Asian Development Forum was held in February 1992, and it established dialogue among the participants.

This Forum is the second in the series. Compared to last year, SPF feels certain that this Forum will have a greater influence on development policy formulation, as well as produce highly constructive and practical discussions. SPF is confident that the participants' collective wisdom and experience will be mutually beneficial to each of them as their respective countries work toward successful development.

Koshiro Takada
Program Officer
The Sasakawa Peace Foundation

[W]ith radical changes taking place everywhere, NGOs will be getting more opportunities to make their opinions known.
Introduction

Food used to be a simple affair: what you needed, you grew; what was left over, you bartered for something else. Later, when food began to be seriously traded, the matter became less straightforward: what you didn’t need, you grew anyway, and what you really needed, you bought. Today, food has become far more complex: in many developed countries, tons of food are grown — but not to be eaten. For example, in 1987 the EEC (now European Union) spent 15.9 billion pounds so that it could buy and store food in warehouses where the stocks are either left to rot or burned. In the US and Europe, farmers grow enormous amounts of fruits, cereals, and vegetables, then burn most of it to keep prices from falling. For the same reason, US ranchers have been known to slaughter hundreds of heads of livestock, only to bury the carcass in huge pits, their meat untouched. Food has become not only a commodity to be hoarded, but a weapon to be stockpiled. This has contributed to the current worldwide crisis in agriculture. What NGOs in the movement for sustainable agriculture are working to do is to reaffirm a basic, but little recognized, truth about food. The late Dr. Dioscoro L. Umali, who had fought for the poor all his life, understood this truth so well. He said, “Man has a right to adequate food. This right is the bedrock for other human freedoms. Therefore what we are experiencing is a massive infraction of this human right.” “The Right to Food is the Right to Life” has — for many years — been a rallying cry for members of the ANGOC network. It is also a vital component of the framework for sustainable agriculture. In the Second Asian Development Forum, many strategies to mainstream sustainable agriculture were explored, but at the heart of every one of these seemingly divergent approaches is a recognition of this basic right—and a commitment to preserve it.
Summary

In 1798 a British sage named Thomas Robert Malthus issued a dire warning to future generations. Modern man, he prophesied, is doomed to misery by the twin scourges of unabated population growth and a perpetually deficient food supply. Swarms of people — mostly poor — will descend on the earth like a plague, and the burden to feed them all will be eased only by a cyclical ebbing — brought about by famine, war, and disease — in the endless flood of humanity.

It has been close to three centuries since our economist sage made this prediction — in a published treatise known today as the Malthusian theory on population — and for almost as long his pessimism has been shown to be famously wrong. In stark contrast to the Malthusian scenario, the world currently produces huge surpluses of food. Harvests have been increasing at an annual rate of 2.6%, well ahead of population’s 2% growth rate. At present levels of production, there should be more than enough to feed the six billion people anticipated by the year 2050.

On the other hand, the persistence of hunger among the majority of the world’s people would tend to show that Malthus had reason to despair. At a time when technological and scientific advancement has made it possible to produce enormous quantities of food — indeed, so much food that tons of it are burned or left to rot — millions of people all over the world suffer from hunger: 14 to 18 M of them die each year; 35,000 each day; 24 each minute, 18 of whom are children under five years old. Jon Bennett, in The Hunger Machine, likens the toll this killer exacts in human lives to “dropping a Hiroshima bomb every three days.”

Malthus erred when he failed to consider man’s ability to find a solution to what would have been — in Malthus’ thinking — his inescapable lot. But his bigger mistake lay in incorrectly identifying the cause of the coming food crisis. What was “missing” in Malthus’ analysis, however, needs no theory to explain nor complicated extrapolations to arrive at. Indeed, one need not be an economist to recognize it. Any thoughtful observer of the human condition knows it exists.

Old-fashioned greed is what it is, greed, and the injustice that unfailingly attends it.

“Nothing Personal,...”
While exploring the validity of moral claims in international disputes, Fred Halliday, professor of international relations at the London School of Economics, points to a difficulty which any such attempt is bound to run into: “International affairs,” he says, “are, notoriously, the area where moral considerations apply least, and we have come to accept different moral criteria for states than for individuals.”

For this reason the morally charged reality of greed is hardly mentioned, if at all, in most assessments of international affairs. Indeed, to use the g-word to characterize the self-interested acts and motives of certain countries is considered bad form.

Hence, in the preferred jargon for international relations, the present world system — where food is a weapon wielded by a few, and where whole nations, held hostage to poverty and debt, pay the ransom with their people’s livelihood, tradition, and independence — is said merely to proceed from the logic of expediency. (“No offense intended.”) This tempts a comparison with the moral indifference evinced by the gangster who — quite matter-of-factly — tells the soon-to-be-shot-between-the-eyes target of a mob hit: “It’s nothing personal. Just business.”

The record of the last few hundred years is littered with the casualties of “hits” done in the name of “expediency”. This paper will examine three waves of events which have led us down the road to the current crisis in agriculture.

THE FIRST WAVE: The Price of Assimilation
The First Wave began with the “discovery” of the “New World”. In a classic display of expediency, the imperialists came, saw, and conquered. Wide stretches of land in the colonies, planted
previously to food crops, were cleared and turned into private estates. The subjugated peoples were put to work in these lands and forced to grow crops which they had little or no need for but which their taskmasters coveted for their value in trade. Thus, the island country of Sri Lanka was converted by the British into one big tea plantation, while the Portuguese decided that Brazil would grow only sugar. More capriciously, an entirely new crop would sometimes be ordered grown in the overseas plantations simply because the king or queen had developed a fetish for it.

The imperialists then embarked on a frenzied extraction of resources in the colonies to launch and bolster industries at home. However, their domestic markets were soon saturated and could no longer absorb the volume of goods being produced. Here, the colonies again proved useful. For instance, Lancashire cloth was exported to India even though this then-British colony had a thriving textile industry. By the middle of the 19th century, India was importing a quarter of all British cotton exports, its indigenous textile industry all but completely destroyed. Similarly, in Bangladesh a fledgling industry based on the production of silk and muslin was nipped in the bud so that British manufacturers could unload some more of their surplus.

This started a process which to this day moves inexorably on in the form of a vicious cycle. Euphemistically called specialization and international division of labor, this process rests on the assumption that it is more beneficial for some Third World countries to produce 1 or 2 primary crops for export, while the developed countries produce the bulk of the world’s industrial goods.

The colonies became so closely integrated into this process that at the time of their independence most of them found they had little choice but to continue exporting primary commodities. It was also business-as-usual for their former-masters who continued to churn out industrial, high-value products using Third World raw material exports: chocolate from cocoa, aluminum from bauxite, tyres from rubber, soap from palm or coconut oil.

This situation has had serious and enduring consequences on the food-producing capacity of the Third World. In recent years, cash crops have accounted for an ever-rising share of total cultivable land in these countries. Traditional food crops have been neglected and are now being grown mostly in a few rows of vegetable plots. The threatened extinction of a traditional Indian staple, the millets, is a case in point. In 1954, 5 to 6 M ha. were planted to many varieties of this crop; 30 years later, the area was down to 3.6 M ha.; today, only a few millet varieties remain and they can be found only in isolated pockets of the country where NGOs are working to preserve them. Malaysia, the world’s leading exporter of natural rubber and palm oil, is a net importer of food: 40% of the rice, and much of the vegetables, consumed in this country is imported.

The experience of two African countries in the mid-1980s further demonstrates the extent to which the most basic food needs can be sacrificed in the drive to increase cash crop earnings. In the 1984 drought Zimbabwe and Kenya imported 26,000 and 39,000 tons of maize, respectively, for their hungry populations. At the same time, Zimbabwe announced a record harvest of tobacco, soya beans and cotton for export, while Kenya was exporting strawberries and asparagus to Europe.

Unfortunately for the cash-crop dependent Third World, the prices of their exports have been plummeting since the 1970s, due in part to cut-throat competition among the developing countries for the same shrinking markets, and partly as a result of un-free trade policies adopted by the United States and European Community (now European Union) member countries. Hard-hit by falling export earnings, Third World governments could have opted to break away from their dependence on primary commodities and developed their manufacturing sectors. However, such a move requires huge capital investments, something which the cash-strapped, debt-ridden countries could not afford.

On the other hand, the stunning — and loudly eulogized — transformation of Malaysia, Indonesia, and Thailand (and very soon, India) into Asia’s emerging tigers has been held up as proof that Asia’s laggards, too, can successfully industrialize. However, what is largely obscured in all the panegyric offered to progress in these countries is the fact that income disparities among their people have worsened: the rich have become fabulously richer, true, but the poor have also grown more destitute. Farmers driven to bankruptcy — and off their lands — are migrating to the cities in search of work. In ever growing pockets of desperation, hunger reigns, giving the lie to the promise of economic growth.

THE SECOND WAVE: Mirage in a Man-Made Desert
The Second Wave came in the guise of a
The Second Wave came in the guise of a miracle and was trumpeted throughout Asia as the Green Revolution.

In the 1960s a global effort to stave off hunger in the Third World was launched. It was founded on the use of special seeds called HYVs (high-yielding varieties) which produced exceptionally high yields. Of course, the seeds had to be bought (read: imported), and they came with a package of pricey chemicals (imported, too) plus lots of water (care of the customer). Another thing, the carabao had to go; a tractor (imported as well) was the thing to have.

Anyone who still harbors illusions about the motives for introducing this technology to the Third World should be able to take the hint from Arthur Moses, president of the Agricultural Development Council founded by John D. Rockefeller III, who “argued early in the Green Revolution that the cooperative social structure evident in many agrarian communities needed to be dismantled in order to encourage ‘aggressive interest in the marketplace.’”

The spread of the Green Revolution in Asia was broad and swift. Self-reliant economies were broken up. Farmers were encouraged, oftentimes coerced into producing goods primarily for the market. Asia witnessed an erosion of indigenous, traditional agricultural practices and knowledge developed over countless generations. Taking their place was the quick technological fix provided by HYV agriculture with its heavy use of chemicals and pesticides on monocultured farms.

The first few years of HYV cultivation rewarded Asian farmers with bumper harvests, and for a while they thought that they had finally struck it rich. The price paid for such gains, however, was enormous. After years of heavy use of chemical fertilizers, the soil’s fertility declined. Progressively more fertilizers had to be applied to obtain the same farm yields.

In Bangladesh, yield per acre has suffered a 10% decline over a 15-year period despite a three-fold increase in fertilizer consumption. Pakistan has nearly doubled its own consumption: from 1,000 tons in 1952 to 1,892.9 tons in 1990. Over in Thailand, farmers are using 10% more fertilizers to attain yields which have been declining since 1969.

The effects of pesticides were even more sinister. Beneficial insects and organisms, which help control the proliferation of destructive pests, were needlessly exterminated. On the other hand, the offending insects soon became immune to the toxic chemicals, and with the monocropped fields providing an ideal breeding ground for the pesticide-resistant insects, crops became more vulnerable to infestation despite increasing applications of pesticides.

Thailand’s pesticide consumption has increased by almost 45,000 tons in the last 10 years, yet in the same period it suffered some of the worst recorded outbreaks of brown plant hopper (BPH) infestation. The first major outbreak took place in 1975, just six years after the introduction of HYVs in the country and at which time less than 5% of paddy land was using pesticides. An estimated 666,796 rai of riceland were reportedly destroyed. The second major outbreak was even more catastrophic, striking 13 provinces and damaging 937,846 rai. By the 1990-1991 season, the hopper had spread to 39 provinces, bringing the total affected area to over 2,500,000 rai. This has cost the country no less than 2.5 M tons of rice with an estimated value of 10B baht (US$400M). Pakistan, in the meantime, is plagued by another kind of pest. Weed infestation accounts for 15 to 20% of its losses in wheat yield; this is equivalent to about 2 to 3 M tons of wheat lost per year. In the Philippines, close to 500 species of mites and insects, 100 plant pathogens, 55 kinds of weeds, two kinds of nematodes, and five kinds of rodents have developed a resistance to pesticides. The BPH has also paid a lethal visit here: in its first major outbreak in the country 30,000 ha. of riceland were destroyed.

Intensive use of agrochemicals has also caused varying degrees of soil erosion. About 8.1 M ha. of cropland in the Philippines are eroded, of this only 5.8 M ha. are still considered suitable for cultivation. In Thailand, 39 M rai, or over a quarter, of total agricultural land suffer from "severe" to "very severe" erosion. India’s problem in this area is just as serious: 6,000 tons of precious topsoil are lost every year to erosion, and with it, an estimated 5.37 M tons of chemical fertilizers.

Meanwhile, the new seeds’ huge demand for water has resulted in waterlogging, increased soil salinity, and in extreme cases, desertification. In India, groundwater sources are being tapped beyond their existing capacity to irrigate roughly 35 M ha. of farmland. Since the 1950s, but more markedly in the last 20 years, diesel and electric pumpsets have proliferated all over the country: from just 87,000 in 1950 their number increased to a staggering 12,581 M in 1990. Water tables have dropped as a result, especially in areas underlain by hard rocks or with low recharge levels. South Asia has had to cope with an assortment of problems — falling water
level, salinity, desertification and deteriorating water quality, among others — ever since HYVs were introduced into the country. In the northern part of Bangladesh, ground water has dropped 50 to 40 ft. below original levels, while in certain districts some 50,000 ponds and ditches have already dried up. Over in drought-prone Thailand, the government, which prefers to invest on huge reservoirs rather than improve the water storage capacity of the soil, now proposes to siphon water from the Mekong River to refill two of its dams whose reserves have been exhausted by increased demand for irrigation water. This move, however, is expected to have serious downstream consequences for neighboring Cambodia and Vietnam.

Given the pernicious effects of the Green Revolution, prospecting for a sustainable future based on it is a little like holding a time bomb and wishing, as it ticks away, that it won’t hurt too much when the bomb goes boom. Nature goes by simple rules, and torturing it to make it yield its fruits is not one of them.

The sustainability of agriculture as a means of livelihood for thousands of small farmers is also seriously in doubt under the HIV regime. After almost three decades of Green Revolution, Asian farmers have become poorer than ever. When HYVs were introduced in Bangladesh majority of its farmers were only “moderately poor”; 10 years later, more of them have become extremely so.

With yields falling and production costs rising, the “miracle seeds” have become a millstone around the neck of small farmers and tenants struggling to keep afloat in a sea of debt. Just a few years after HYVs were cultivated in Thailand, 4.3 M farming families were already “caught in the debt cycle”; in 1990 there were 5 M such families. In Isan or Northeast Thailand, the poorest region in the country, up to 85% of the population earn less than they need to survive; hence, an average 2 M of them (mostly under 30 years old) leave their homes each year (i.e. during the dry season) to find work elsewhere, returning just before the rainy season. In the Philippines, half of the rural families earn incomes below the poverty level; at least 2/3 of them suffer from undernourishment. In Sri Lanka, a country believed to have a large small holder sector, majority of the rural population are now having to work as wage earners in plantations and export crop farms, or as laborers in public works and house construction projects.

Their wages have fallen so low while their numbers have grown so high that poverty in this sector has been cited to explain poverty in the country as a whole.

The Local Connection

International capital, working alone, could not have accomplished such a sweeping impoverishment of the countryside. The highly uneven distribution of land in most Third World countries is as much to blame for this.

A common feature of former agrarian societies in Asia that have since become models for industrialization is the implementation of a comprehensive agrarian reform. Japan, the original dragon, as well as South Korea and Taiwan, the dragons of the '80s, had all embarked on a state-mandated, state-enforced land redistribution program which enabled them to transform their economies — after decades of consistently high GNP growth — into economic powerhouses. Unfortunately, their industrial success has been achieved at great cost to their agricultural sector.

In pursuit of rapid economic development governments in these countries have subordinated agriculture to industrial growth and have encouraged the expansion of industries into rural areas. As developers moved in to put up buildings and lay down roads, land values in the countryside skyrocketed. Given the general decline in farm incomes and ever-rising production costs, the temptation to trade their land for cash proved irresistible for most of the farmers. Not long after, thousands of otherwise productive farms began to disappear under kilometers of concrete. "Today, instead of supplying fruit and vegetables to [urban consumers], many farmers [in Japan, South Korea, and Taiwan] provide an even more vital commodity — housing," Awash with cash, they've traded in their simple rural abodes for townhouses, and exchanged their tractors for cars.

No wonder that farming has become a distinctly unattractive prospect for the young. More and more of them are abandoning the farm for glamorous high-paying jobs in the cities. The few who remain belong mostly to an ageing generation of farmers, and when this generation dies off, farming as a way of life in these countries will probably die with them.

Among Asia's aspirants for "NIC-ness" (Newly Industrialized Country status), a similar situation exists, except for two important differences: one, their governments are unable — and unwilling — to implement genuine agrarian reform; and two, majority of farmers here have no land to sell.

In Thailand, successive land reform efforts of the government have come to naught because of a failure in implementation. The Fair Land Lease for Rent Act, for instance, was issued by the government purportedly to ease the suffering of over 500,000 landless farmers (1985 estimate). However, powerful landlords have been allowed — at times,
The loss of genetic diversity limits the evolution and development of agricultural crops. It narrows and eliminates options for the future.

Barley, rice, tomatoes, sugarcane, and tobacco are just a few examples of crops which have been saved from extinction by using genes from their more resistant relatives, usually found in the wild. US plant pathologists are considering this same approach to control the resurgence of Phytophthora infestans, the fungus which causes the deadly late blight disease, and which was responsible for the potato famine in Ireland in the mid-19th century.

For many years, the late blight fungus had been kept under control by fungicides and better farming methods. However, the accidental mating of the
Ninety-five per cent of human food comes from just 30 kinds of plants, an extremely narrow dietary basis for the species. If a major epidemic struck any of the cereal crops — such as wheat, rice, and maize — there would be death by famine on a cataclysmic scale.

fungus with a more resistant relative has bred a virulent strain. Over the past decade, it has spread to the Middle East, Asia, Africa and South America. Fungicides no longer work; neither, it seems, does engineering blight resistant genes into potato crops.

Thus, plant pathologists at Cornell University are set to try a proven strategy: they are currently "looking for genes in the potatoes that have withstood the disease on their own for centuries, despite the presence of both mating types of the fungus — the wild species of central Mexico." 16

This should serve as a warning against paring down the world’s genetic stocks to a few plant varieties. Already, "95% of human food comes from just 30 kinds of plants, an extremely narrow dietary basis for the species. If a major epidemic struck any of the cereal crops — such as wheat, rice, and maize — there would be death by famine on a cataclysmic scale." 10

Scientists in developed countries have long been aware of this danger; they’ve known - for far longer than Third World governments have - that preserving crop diversity is a matter of national security. Hence, in recent years, hundreds of "missions" have been dispatched to Asia, Africa, and Latin America to collect plant germplasm. Today, these collections can be found in gene banks in the United States, the former Soviet Union, Japan, Italy, and other countries.

However, these collections are not being maintained for the collective benefit of humanity. In the same way that developed country governments use food aid to gain political and economic leverage in recipient countries, they are stockpiling seeds "as part of the arsenal of international power diplomacy." 11

Multinational seed and chemical companies are just as interested in making proprietary claims on genetic resources taken from the Third World. They know, from experience, that the type of seed sold determines to a large extent the farmer’s need for fertilizers and pesticides. It influences the need for machinery and often dictates the market for the crop, as well as the ultimate consumer. Hence, they couldn’t care less about a genetic wipe-out happening in the Third World as long as they, through their governments, have monopoly control over the seeds that remain.

These companies take seeds (usually of the major staple crops) from the Third World, tinker with their genes, then slap a patent on them. Like the Green Revolution HYVs, the new seeds are bio-engineered to withstand the application of highly toxic chemicals manufactured and marketed by the same seed-chemical companies.

In her critique of biotechnology, Vandana Shiva has this to say about the other implications of the emerging "gene revolution": "While the Green Revolution focused on chemical input, with public breeding programs aimed at producing seeds that need more chemicals, the biotech focus is on the seed itself as a market[.]...patented seed cannot be reused by farmers..." 12

This explains why the demand for intellectual property protection, especially for agricultural patents, has been so stringent in the last few years. Through national patent legislation and the inclusion of IPR safeguards in the recently concluded Uruguay Round of the General Agreement on Trade and Tariffs (GATT), developed country governments and seed-chemical companies are working towards a vertical integration of the agriculture industry.

When this happens, seed and chemical companies will perfect what they started to do under the Green Revolution: make thousands of farmers a truly captive market, dependent on their products year after year. Self-reliance in agricultural production will be further undermined, if not forever lost. Genetic diversity, and the wondrous evolution and adaptation that makes it possible, will be reduced to a few genetically altered plant species, chosen for their trade value. Toxic chemicals will flood into farms as never before, and kill everything that has not been genetically tinkered to resist them.

The ecological time bomb set off by the Green Revolution will tick on, this time faster; and unless a radical reorientation is made of current agricultural policy, we may need the peddlers of such technology to "bio-engineer" us for resistance in order to survive the explosion.

Which Way To Sustainable Agriculture?
The symptoms of an ailing agricultural system are rife in all of the countries represented in this Second Asian Development Forum. Yet, among them the perception of the cause and, therefore,
the appropriate treatment, is varied. Three of them — the Philippines, Thailand, and India — attribute the unsustainability of agriculture to the growth-centered development orientation of their governments, in particular, and the world economic system, in general. The prevailing macroeconomic and trade policies, inequitable resource distribution, especially of land, the lack of a sustainable national policy on agricultural development, and the dominance of chemical-based agricultural systems, among others, are mere offshoots of the fundamental problem. Notwithstanding this common feature, the sustainable agriculture movement* in the three countries varies in scope and operation, and in the way it has evolved.

The movement in Thailand began quite recently (i.e. in the mid-1980s) as a search among farmers and local NGOs for alternatives to mainstream agriculture, which has trapped Thai farmers in a vicious circle of debt and disease. Others opted for organic farming methods to reduce chemical use on their farms. Central to the advocates’ definition of sustainable agriculture are self-reliance and restoration of the farmer’s control of the production process. It also reflects two important beliefs prevalent in the Thai NGO community. One is confidence in farmers’ contribution to ecological enhancement; the other is the conviction that farmers’ economic autonomy is necessary to overcome market domination and exploitation. From this it is clear that the alternative agriculture promoted by Thai NGOs is not simply a set of environmentally sound production techniques, but rather a distinct philosophical concept and political platform derived from the concern for social justice and ecological enhancement.

The sustainable agriculture movement in Thailand has been conducted primarily through model-building and policy advocacy. These strategies, however, have not been too successful as yet. Out of 5 M farming households, only 200,000, or 0.4%, have adopted sustainable farming systems.

In contrast, the movement in the Philippines has gained wide acceptability and popularity among NGOs and people’s organizations in the past four years. From just 120 organizations in 1989, it has grown to 600 groups, representing about 2 M upland and lowland farmers as well as fisherfolk. Today, over 2,500 ha. of land in the Philippines are planted to rice, corn, and vegetables without the use of chemicals.

Policy advocacy is an important tool employed by NGOs involved in sustainable agriculture promotion. They have used it successfully to get the government to ban the use of hazardous pesticides.

Aside from this, Philippine NGOs have made great strides in developing alternative agricultural systems and methods. Seed banks, demonstration farms, and experimental stations have sprouted all over the country. There have also been successful attempts to demonstrate the economic viability of sustainable farming ventures.

But central to all these is the campaign for a genuine and comprehensive reform of the countryside. Philippine NGOs believe that without land tenure security, agriculture will never be sustainable.

NGOs in India share this conviction. Working primarily with landless laborers and marginal and small farmers, these NGOs have made a major issue out of the inequitable distribution of resources, especially land and water.

The most active advocates for sustainable agriculture among Indian NGOs are the environment-oriented groups. There are 2,000 such NGOs in the country; 200 of them are quite active and about 50 are highly visible and effective. The movement in India started as an initiative to let the communities manage and share their water resources equitably. It then moved on to eco-system based planning and development, with the village as the basic unit. Experiments with high-yielding, but non-chemical-dependent, seeds have also been conducted with remarkable success.

Meanwhile, the movement for sustainable agriculture in Malaysia, Bangladesh, and Sri Lanka is primarily a rejection of the pernicious effects of chemical agriculture. Hence, as their country reports will show, their initiatives and recommendations have focused — though not entirely — on finding or developing organic substitutes for toxic agricultural input.

The movement in Malaysia began with the setting up of an organic farm; NGOs have followed this lead by starting similar farms. And if the National Consultation (on Sustainable Agriculture) held in January 1993 is an indication of the general approach to sustainable agriculture promotion, then it can be said that the movement in this country is focused on encouraging broadscale adoption of organic farming. Over in Bangladesh, the primary objective of sustainable agriculture advocates is to help peasants meet their food needs and improve their standard of living, and to maintain a balanced agro-ecosystem. Organic farming is widely endorsed. In fact, Proshika, one of Bangladesh’s better-known NGOs, is implementing an agricultural program in which a non-chemical regimen consist-

The ecological time bomb set off by the Green Revolution will tick on, this time faster; and unless a radical reorientation is made of current agricultural policy, we may need the peddlers of such technology to “bio-engineer” us for resistance in order to survive the explosion.
ing of experimental land preparation and irrigation techniques, as well as organic input like dried potato and hyacinth leaves, has been able to coax high yields from even the chemical-dependent rice HYVs.

Sri Lankan NGO advocates for sustainable agriculture are as much enamored with alternative farming techniques although their special interest is in putting up small integrated farms (i.e. which combine animal husbandry, the home garden concept, biomass-powered light-
in a cycle of debt, they can hardly afford to invest in physical improvements on the land which most sustainable agriculture systems require (e.g. pond digging, drainage), much less wait until the new technique pays off in terms of better yields. Loans have to be paid, and needs met.

It is generally believed, Panyakul writes, that (in the case of fruit tree raising), farmers would need at least three to five years before trees begin to bear and soil is rehabilitated to the extent practice but in preference, is considerably simpler. Therefore, together with the necessary revitalization of the traditional farming culture, Thai farmers need to be helped to re-learn agriculture.

The third factor is CULTURE-bound. What the change to sustainable agriculture requires goes beyond the transfer of technique to a reorientation of the country's rural way of life. The Green Revolution did more than just make HYV converts of Thai farmers; it changed their self-image. After many years of successful conditioning, Thai farmers, especially this generation which has never known any other way to farm, cannot conceive of controlling weeds and pests without chemicals. Indigenous methods are now considered alien, if not stupid, and certainly backward. Hence, as Panyakul says,

Changes in farming patterns will never succeed and be sustained unless cultural battles are won.

The lack of an ALTERNATIVE TRADING SYSTEM FOR AGRICULTURAL PRODUCTS poses the fourth obstacle to sustainable agriculture adoption. A necessary feature of sustainable agriculture practice is that it be economically viable. In the present trading structure, in Thailand as in most Third World countries, farmers are at the mercy of the vagaries of free trade which artificially depress the valuation of their crop in the world market. In the domestic scene, the middleman dominates and sets the price of agricultural produce. Farmers crops are undervalued and farmers often earn too little to pay off their debts, and much less to subsist on. Unless farmers can be guaranteed at least a fair price for their produce, they will be reluctant to make the change to sustainable farming which would initially require some capital investment and much more labor.

Still another factor has been cited to account for the slow rate of adoption of sustainable agriculture systems in Thailand: the lack of a basic, common definition of sustainable agriculture is one. Thai NGOs recognize several orientations within their own movement, with various groups using different—and often mixed—philosophies and approaches. Some see sustainable agriculture as a package of appropriate tech-

Issues and Constraints

The experience of two countries, Thailand and the Philippines, is illustrative of the factors which hinder sustainable agriculture promotion.

Thailand

In "Framework for the Promotion of Alternative Agriculture Markets, Vitoon Panyakul cites at least four factors to account for this low rate of adoption in Thailand. The first has to do with ECONOMIC FACTORS. The vast majority of Thai farmers live below the poverty line. Perpetually strapped for cash and caught that adequate fruit is produced... Furthermore, the lack of land tenure security discourages farmers from making sacrifices to preserve and improve on the productivity of land which they have no hope of owning.

The vastly more complicated PRODUCTION TECHNIQUES involved in sustainable agriculture systems is another disincentive to their adoption.

Understanding and making the complex cycles of the environment work for the farm is a complex process, explains Panyakul.

Sustainable farming requires serious attention and determination from the farm owners who have to put abstract principles (to work). The difficulty is further compounded by the need to adapt general techniques to varying farming environments and the farmers own socio-economic constraints. In contrast, chemical farming, which has long supplanted traditional methods not only in
nologies, tools, seeds, and processes. For others, it is a manifestation of the democratization happening in the countryside, an indication of a conscientized and politicized peasantry seeking self-determination. Sustainable agriculture is also thought to incorporate an entire lifestyle. For many, it fits well with Buddhist theology and the search by many people in present day society for something which is missing in their lives—connectedness with the environment. For this last group, sustainable agriculture begins with a thought process and evolves into practice.

Philippines

On the other hand, in the Philippines, where sustainable agriculture is now widely accepted, a number of factors still stand in the way of broadscale adoption.

Nicanor Perlas, forerunner of bio-dynamic farming in the country, cites, for instance, the prevailing attitude of resignation among the population as a major stumbling block. Most people, producer and consumer alike, are aware of the hazards posed by chemical agriculture to their health and the nations environment. Yet, they credit it for effectively answering the food needs of the country's growing population, a feat which they doubt any alternative farming method can match.

Such pessimism is ingrained, with even more formidable consequences for sustainable agriculture promotion, in the thinking of government bureaucrats. Former environment and natural resources secretary Fulgencio Factoran Jr. has said, for instance, that alternative technologies still need to be perfected before they can be transferred to the country's tradition-bound farming communities. According to him, the transformation to soft agriculture could take a generation so that meanwhile we have almost no choice but to live dangerously with our Faustian agriculture.

But perhaps the biggest stumbling block to successful NGO promotion of sustainable agriculture in the Philippines is the enduring problem of inequitable resource distribution, especially of land. The Philippine landholding pattern is basically skewed with only a few landowners having control of large part of the total agricultural area. This situation has changed only slightly through several generations despite the implementation of different agrarian reform programs by the various administrations as the political power of feudal families has enabled them to circumvent, if not totally evade, agrarian reform.

Of 10 million Filipinos comprising the agricultural labor force, only 15 per cent are owner cultivators while 85 per cent have no control over the lands they till. With the double cost-price squeeze, the lack of credit facilities, perpetual indebtedness, and runaway inflation, poverty has become endemic to farming. Thirty per cent of the poorest Filipinos are from the rural areas, and the vast majority (62 to 68 per cent) of the rural poor are farmers.

Under these conditions, concerns of land resource sustainability pale beside the more compelling demands of survival. To ask farmers to sink money, time, and extra labor into land which belongs to oftentimes resented landlords is really asking too much unless the farmers are convinced that they, too, will benefit.

Philippine NGOs advocating for the implementation of comprehensive and genuine agrarian reforms are many and their work covers not just lobbying but also land tenure improvement. However, landed interests which are deeply entrenched in positions of power continue to hold back the movement for reform.

Another institutional constraint to sustainable agriculture promotion is the governments development framework which prioritizes industrial growth and neglects agricultural development. Massive conversion of prime agricultural land for industrial use has attended this national policy, resulting in the displacement of farmers and undermining local food production capacity.

Sustainable Agriculture Lessons and Future Directions

- Sustainable Agriculture (SA) presupposes a holistic, systems approach to agriculture. Success in sustainable agriculture depends on reliably accounting for and effectively responding to all factors relevant to the farming system.
- SA entails a deep understanding of biological cycles. Traditional agricultural practices are an enormous storehouse of knowledge of these cycles accumulated through thousands of years of experience. SA practitioners ought to develop these indigenous knowledge systems, adapting them to existing conditions, and supplementing them with the findings of modern science. There is no inconsistency in drawing upon the discoveries of both traditions.
- The adoption of indigenous knowledge systems likewise demonstrates the cultural sensitivity of SA. Using the indigenous people’s knowhow accords renewed value to their cultural identity, and helps arrest the degeneration of their societies in the face of modernization.
- SA is not limited to alternative regenerative agricultural techniques. It is equally concerned with social justice issues, and recognizes the need for economic and political restructuring. SA practitioners must acknowledge the indissoluble link between agricultural sustainability and equity. SA should form part of efforts to build a people-centered economy. It advocates a bottom-up, participatory approach to development, instead of a top-down centralized growth-centered system.
- SA advocates ought to recognize the crucial role of women in agricultural production, and must make their liberation from gender oppression a prime concern.
- The transition from conventional HYV agriculture to SA is not a painless, worry-free undertaking. Because of the damage inflicted on the soil and the ecosystem as a whole, it may take time for farmers newly converted to regenerative farming techniques to achieve sufficiently large farm yields in the short transition period. In case this happens, NGOs and sympathetic government units must be prepared to help supply adequate social safety nets to ease the transition and prevent farmers from being discouraged by the move.
- SA is a highly knowledge-intensive system. Unlike conventional agriculture, where research is very highly concentrated in well-endowed research centers in government extension units, the universities and in laboratories of corporate
manufacturers of agricultural inputs, SA relies greatly on local, site specific research. SA requires that a farmer be a research scientist of sorts, to enable him or her to tailor the appropriate SA techniques to particular farm conditions. There is no universally applicable package of SA techniques. Since conditions in each farm are unique, the SA regimen for each farm will likewise vary.

- The knowledge-intensive character of SA, means that a premium is placed on informing and educating farmers. SA's success in a particular area is correlated with the extent to which farmers have been able to understand the myriad issues related to sustainable agriculture: biological cycles, social systems, political economy, ecology, plant and animal life cycles, etc. along with specific agricultural techniques: composting, multi-cropping, etc.

- Powerful vested interests—landlords, manufacturers of chemical pesticides and fertilizers, etc.—stand behind conventional agriculture. SA advocates ought to be able to understand the workings of these groups to be able to better deal with them.

- The more highly distributed character of sustainable agriculture research does not preclude the need for "centers of research excellence" that can stand up to the best that conventional-agriculture-oriented institutions such as IRRI can offer. NGOs ought to lobby governments to create such centers, while setting up their own research institutions.

- In their work, SA practitioners feel the need for quick and ready access to technical, market, and statistical information. While NGOs and certain government institutions have begun building up knowledge bases on sustainable agriculture, these are at present woefully inadequate. Moreover, NGOs lack the means to quickly disseminate needed information. In this regard, traditional media—i.e. newsletters, books, magazines, radio—and modern systems—i.e. microcomputers and public telecommunication networks—can be of invaluable help. In this regard, the training of committed and knowledgeable SA extensionists is likewise urgently demanded.

- Participatory management of SA programs denotes that farmers assume active roles at all stages of project implementation. Farmers are not passive receivers of knowhow from experts, who possess a monopoly of advanced expertise. Furthermore, farmers ought not occupy inferior positions in highly hierarchically management structures. Farmers are co-creators of knowledge, and lead implementors of SA programs.

- Local people's organizations are of critical importance to the success of SA. These organizations ought to serve as the leading force in SA's spread. Farmers must unite to be able to share common costs, exchange information and knowhow, provide mutual help, and build a political force capable of defending the people's welfare and standing up to vested interests inimical to their interests.

- To ensure the permanency of SA's success, meaningful local autonomy must be vested in the most basic political unit: the small village. Farmers must have a greater say on how their lives are run to make sure policies redound to their benefit; they can only happen if their local government units—i.e. directly elected officials as well as people's councils, comprising local organizations and individuals—have the power to decide on crucial local issues, e.g. watershed and forest management, education, irrigation, public works, agricultural extension, and healthcare.

- Networking between groups and individuals involved with SA has been of invaluable help not only in knowledge sharing; equally important, it is role in reducing efforts, and in building up a politically and economically potent force to push for the adoption of SA. Networking can be done at the local, regional, national, and international levels. Apart from farmers groups and NGOs, it is important to secure the support of professionals, unions, the academic community, and government officials.

- Cooperation between people's organization, NGOs and government holds huge potentials, for the latter's resource capability remains unmatched. Such cooperation has yet to be fully exploited. Working with the government need not mean cooperation by the highly influential elite. While working with the government, NGOs strive to make the state more responsive to the people's needs, and more representative of its interests.

- SA practitioners recognize the need for improved information dissemination and awareness-building among the general public using their own channels, and especially the mass media, which reaches a much broader audience.

- SA practitioners have to deal with the paucity of affordable credit in the rural areas. Accordingly, the establishment of accessible rural credit facilities stands as a major SA undertaking. SA advocates must work to entice government and private banks to offer more loan programs to benefit the rural poor. At the same time, they ought to develop their own rural credit cooperatives, which can enter into collaborative ventures with established financial institutions.

Notes
2 Ibid., 12.
3 Ibid.
8 "Agricultural Heritage," People and Planet.
9 The Economist, November 1993.
10 "Agricultural Heritage," People and Planet.
11 Ibid.
PROCEEDINGS

Pre-Conference Preparations/Activities
NGO focal points were selected in each of the eight countries represented in the Forum. These were: ADAB - Bangladesh, AVARD - India, BINA DESA SEKRETARIAT - Indonesia, MINSOC - Malaysia, NGOCORD - Thailand, NNGOC - Sri Lanka, PhilDHIRA - Philippines, and RDFP - Pakistan. These national NGO networks were responsible for the preparation of country papers and selection of Forum participants.

Country papers were written in consultation with various NGOs. Forum participants included men and women who are either actual practitioners of sustainable agriculture (SA) or have known track records in SA advocacy.

Regional or issue papers were prepared by experts on critical issues which are integral to the theme of the Forum: "Sustainable Agriculture: Towards Food Security and Enhanced Quality of Life". Mr. Nicanor Perlas of CADI, an authority on SA having worked in this field for the last 25 years and set up the commercially successful biodynamic IKAPATI Farm in the Philippines, wrote a treatise on the "Seven Dimensions of Agricultural Sustainability". Ms. Vandana Shiva, author of several books on the ill effects of the Green Revolution, prepared a "Scientific Critique of the Green Revolution and the Emerging Agricultural Biotechnologies". AVARD, with the assistance of Mr. Laxmi Jain, an expert on global political economy, focused on the implications of policies of the Asian Development Bank (ADB), World Bank (WB) and General Agreement on Tariffs and Trade (GATT) on SA in the South. ANGOC prepared an outline of NGO initiatives on SA in the region.

Conference Highlights
Informal Dinner. On the eve of the five-day conference, an informal dinner and cultural presentation was held at a local beach resort where the participants had the chance to establish vital initial contacts among themselves.

Welcome ceremonies. The opening ceremonies provided an opportunity for the local hosts to welcome the participants to their city and express their solidarity with the concerns of the Forum. In their welcome remarks, they raised such issues as pollution, food insufficiency, rapid degradation of agricultural lands, etc.

Issue paper presentation. Three issue papers were presented on the first day and these provided a critical framework on SA and set the theme for the next day's discussion. The speakers were Mr. Perlas, Ms. Shiva and Mr. Tripathi, in behalf of AVARD.

An open forum followed each presentation. This allowed the participants to ask clarificatory questions and share relevant information. A facilitator chosen from among the participants chaired each session and synthesized major points which emerged from the discussion.
The ANGOC regional report, presented on the third day, was a panel discussion where participants from the Pesticide Action Network (PAN), the Southeast Asia Sustainable Agriculture Network (SEASAN), and the Southeast Asia Regional Institute for Community Education (SEARICE), and ANGOC shared their programs of action for SA and alerted the Forum participants to significant regional and international events where NGO advocacy is crucial towards creating a stronger and more favorable policy climate for SA.

Country paper presentation. Country papers were presented on the second and third day of the Forum. The sessions included the 15-minute country report, followed by an open forum and synthesis.

Reflection for the day. Before the start of each day’s session, a participant gave a short reflection on the previous day’s proceedings, recalling the main points covered and the insights gained.

Sharing on the second day, Mr. Krishnaswamy of India said that the previous day’s session reaffirmed to him that life is a unity in and NGO work, one should constantly go back to and learn from the people. In SA, one should be willing to learn from the animals and plants because they seem to know nature much more intimately.

On the third day, Fr. Francis Lucas of the Philippines lamented the fact that even as the Forum was raising the issues of agricultural unsustainability, millions of people are being victimized by the problems and solutions given by so-called “experts”. SA demands that each and everyone make up for these illusions, see and feel with the farmers, be more concrete and practical, and look beyond the economic blindfold.

On the fourth day, Mr. Bishan Singh of Malaysia focused on the current imperative to view SA as a serious alternative that is community-centered, ecologically sound, and respectful of indigenous knowledge, bearing in mind the urgent need to settle the issue of land ownership because for SA to succeed, the farmer has to have control of his land.

Field/Exposure Trip. Midway through the Conference, the participants took a break to visit two exposure sites. One group went to the Del Monte Philippines, Inc. (DMPI) pineapple plantation in nearby Bukidnon, while another group visited the Masipag Rice Trial Farm in Balinsasag. Both groups stopped by at the DMPI cannery where the participants toured the plant premises and saw the processing of pineapples, done mostly by women employees, into products sold in supermarket counters all over the world.

At the DMPI plantation site, a 33,000-ha. monoculture planted solely to pineapples, the participants got a glimpse of how a multinational corporation operates in a developing country, how its policies result, among others, in token benefits for a privileged few and further marginalization of the majority of peasants due to highly skewed tenurial patterns.

At the Masipag Farm, the participants were briefed on the farmer-based approach to seed selection and natural breeding, where the farmers themselves participate in field experiments and varietal selection. They also met the farmers and exchanged notes.

Workshop. On the fourth day, the participants were divided into five groups of about 10 members each, such that a diversity of thinking and experience was represented within each group. The workshops had three tasks: (1) identify key issues which reflect the SA framework, (2) set targets and objectives, and (3) formulate action plans.

Each group elected its own chairperson/facilitator and rapporteur. The body decided to re-convene during plenary on the fifth and last day, giving ample time for each group to discuss and strategize future actions.

Regional and Country Level Commitments. After the presentation of the action plans on the fifth day, the different regional networks already represented in the forum (ANGOC, IRR, PAN, SEARICE, SEASAN, SARRA, APPROTECH ASIA) grouped together to strategize how the action plans can be incorporated into their respective agenda. (This region-wide grouping later evolved into an informal network with the understanding that it will sponsor joint regional activities on SA.) The other participants also regrouped by country to operationalize the SA action agenda at the country level.

Closing ceremonies. The Asian Development Forum concluded in a joint closing ceremony with the 29th batch of the Southeast Asian Rural Social Leadership Institute (SEARSOLIN) graduates.

As a fitting end to the Forum, a representative from each country stated a
commitment to support SA activities and efforts in their respective countries.

Towards an SA Framework
In as much as the Forum was not able to forge a consensus on the framework of SA, Mr. Antonio Quizon of ANGOC suggested that the Forum formally adopt the Seven Dimensions of Agricultural Sustainability expounded earlier by Mr. Perlas. This could serve as the criteria for distinguishing the real SA practitioners from those who would merely jump on the bandwagon. Mr. Rene Salazar of SEASAN seconded the idea but suggested that perhaps it could be adopted as a working framework in progress. Mr. Tripathi of India, however, recommended that the Forum already adopt Mr. Perlas' framework as a basis for unity, making room for diversity as the movement gains momentum. Mr. Ong Boon Keong of Malaysia and Ms. Penny Levin of Thailand, suggested that an eighth dimension on gender be included. Dr. Hadij Hussain of Pakistan, however, stressed that this dimension is already subsumed in the requirement for social equity.

SA Action Plans
The action plans arrived at by consensus on the plenary were the following:

1. Research. NGOs should strengthen their capacity in this area specifically to:
   - pilot sustainable agriculture;
   - set up ethical standards for SA practitioners;
   - develop research methodologies on SA for NGOs;
   - produce resource maps of particular areas;
   - conduct research on different ecosystems.

2. Training. This is needed by both practitioners and the general public and may be done by:
   - setting up an SA Adult Education Institute;
   - developing and conducting consumer education seminars.

3. Policy Advocacy. NGOs and national research institutes should try to influence the policies of governments and international bodies by:
   - initiating a review of the UN system, the Consultative Group in International Agricultural Research (CGIAR), the Asian Development Bank (ADB), World Bank (WB), and the General Agreement on Trade and Tariffs (GATT);
   - campaigning for a ban on hazardous pesticides;
   - careful study and close monitoring of SA-related policies;
   - undertaking follow-up action on developments concerning intellectual property rights (IPR) and biotechnology.

4. Information Base and Documentation. This should include such projects as:
   - developing certification standards for SA products;
   - preparing a directory of SA practitioners and practices;
   - using ANGOC newsletters and those of other organizations to disseminate SA-related information.

5. Regional Strategy for SA. NGOs should work synergistically towards:
   - a common SA agenda;
   - consensus on an SA framework;
   - region-wide networking;
   - a regional action plan for biotechnology;
   - an NGO position on botanical pesticides and organic and rapid composting;
   - alternative marketing schemes (e.g. international, regional, and national SA Fairs).

6. Mainstreaming SA. Some effort should be made along the following lines:
   - giving recognition and awards to SA innovators;
   - initiating a review of the UN system, e.g. by making this the theme for the Third Asian Development Forum;
   - lobbying for a "UN Decade for Sustainable Agriculture";
   - deepening the discussion on food security, women, energy and lifestyle transformation as they affect SA.

Country Commitments

Bangladesh: Strengthen NGO capacity in SA and work for policy changes in government related to SA.

India: Increase NGO involvement in SA through fora, newsletters, media and other modes of exchange; work with government at various levels to effect major policy changes in SA.

Indonesia: Commit both financial and institutional capability to educate the people, mobilize different sectors, advocate policy reforms, and pilot SA.

Japan: Share experiences with other countries and also with Japanese organizations and farmers through the Asian Rural Institute and JANIC.

Malaysia: Translate articulations to concrete action; make a commitment to lifetime practice of SA and strengthen the newly formed Malaysian Organic Farm Network.

Nepal: Gather data on SA developments; promote networking among research and development institutions; represent the NGO position in dialogues with government; initiate steps to solve border problems between Nepal and Northern India in the interest of saving the environment; and influence SA policies.

Pakistan: Strengthen the government's commitment to support SA.

Philippines: Implement the Forum's commitments in the hope that someday the Philippines need no longer import rice (as expressed by Ka Kiko, the only farmer representative).

Sri Lanka: Make a total commitment to SA objectives.

Thailand: Present SA action plans to the Alternative Agriculture Network for subsequent translation and circulation to members, other practitioners and farmers.

Vietnam: Pursue development models based on SA principles.
Country Reports
Bangladesh

Profile of Agricultural Sector

LAND USE

Trends in Land Use

Changes in land use patterns and the environment since independence have adversely affected wetlands, fishery and horticultural grounds. In the last two decades, land use patterns have also been markedly modified by the adoption of the new agricultural technology, structural solutions to floods, the impact of human activity on land and nature, narrow sectoral policies of the government, and the lack of land use control and management planning. The salient features of the current trends in land and water resources use are:

- In 1973-74, the net cropped area (NCA) was 20.977 M acres; this increased by 684,000 acres in 1985-86. This change was mainly at the expense of forest land, current fallow, low lying and wetland areas brought under rice cultivation. Non-cropped areas are rapidly disappearing as they are converted to other uses.

- The area not available for cultivation increased by 0.645 M acres in 12 years (1973-74/1985-86). Of this, it is estimated that as much as 150,000 acres previously under agricultural use are now encroached on by urban settlement, infrastructure development, and industries.

- Total land area increased by 00.429 M acres from 1974-76 due largely to land accretion in the coastal areas and within river channels.

- The area planted to Aush* fell nearly 13% and the Broadcast Aman** acreage by nearly 90%. (Rashid 1989).

- Fallow land decreased from 1.550 M acres in 1973 to 0.997 M acres in 1986.

- The number of farms with less than one acre increased from under 1 M in 1977 to over 4 M in 1984; the average farm size declined from 3.5 acres to 2.5 acres over the same period. Fragmentation gives rise to more intensive cropping.

- An estimated 100,000 ha. of mono-cultured Transplanted Aman land have been converted to seasonal or annual shrimp cultivation over the last decade. The practice of flooding shrimp ponds with brackish water has affected agricultural production in the coastal belt (particularly Khulna, Satkhira, Bagerhat) and in mangrove forest areas like Chokoria in Chattagong.

- According to the Statistical Year Book of BBS, since 1971 the forest area has never fallen below 5 M acres until 1988 when

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Aush: A local kind of paddy sown in April and harvested in June-July.
Aman: Two categories of Aman: One sown and the other planted. The first one sown in April along with Aush and the second one planted in July-August harvested in November-December.

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Dominant Bio - Physical Endowments

Rainfall

- The westerly depression causes from 1-4 cm of rain to fall between January 20-February 25.

Different types of thunderstorms (and mildly cyclonic storms) are heralded by large thunderheads. These are usually of short duration, but are intense with windspeeds of up to 100 Kmph and heavy rainfall.

- The main rainy period begins with the monsoon rains—of primary importance to agriculture—and lasts for five months (end of May to mid-October).

Temperature

- Climate is characterized by high temperatures, heavy rainfall, often excessive humidity and fairly marked seasonal variations.

- Mean maximum temperature in summer (mid April-mid June) ranges from 30.4°C-36°C. The heavy rainfall throughout the rainy season (mid June-mid August) marks a season of sharp variations with mean maximum of 31°C and mean minimum below 2°C temperatures. Temperature falls gradually in Hemanta (Nov.-Dec.) when the northern part of the country records a minimum of 2°C in January. In February - March (Spring or Basanta) the temperatures start to rise again.

Topography

- Bangladesh, one of the largest deltas in the world, is crisscrossed by about 230 rivers and sits at the confluence of three great Asian rivers—the Ganges, Brahmaputra, and Meghna.

- Land is classified into five different patterns in accordance to flood depth and land use pattern: i) high lands; ii) medium high land; iii) medium low lands; iv) low lands; and v) very low

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it dropped to 4.749 M acres. Actual tree cover is even less: not more than 6% of the total land area.

- 58% of the NCA was single cropped, 34.7% double cropped and 6.9% triple cropped in the period 1975-1976. After a decade, little had changed; in 1985-86, 53.2% of the NCA was single cropped, 39.2% was double cropped, and 7.6% was triple cropped. This indicates that efforts in increasing cropping intensity have hardly borne fruit.
- The average intensity of cultivation was estimated as 1.6 in 1986. Given intense population pressure, such intensity is not optimal. More than half of the land is cultivated just once, and a mere 7.6% is cultivated thrice.
- Average crop productivity (output per acre) of land is low compared to many other developing countries. Land productivity has also increased at a rather slow rate: only 1.95% per annum per acre of cultivated land between 1949 and 1983.

Land Types and Land Use

From an agronomic point of view, the height of land from the normal flood level is of primary importance in determining land use patterns, since the availability of water as well as soil texture are determined by it. Land which is normally not vulnerable to flooding in the peak monsoon period is classified as high level, while land which is often flooded is low level; medium level land can be found in such places as the shohori (Northern region) and at Aman-Ura and Aus-Ura (Sylhet District).

Homestead and settlement lands cover 15% of all land which remains above the flood level. High land accounts for 29%, hills and valleys, 11.6%, and the Barind Tract, 2.6%. Only 13.2% of high lands are available for intensive agriculture; these are located in flood plains and piedmont plains (Rashid 1989, p. 117).

The Master Plan Organization shows that 77.6% of high lands are available for cultivation (Technical Report 1, MPO 1985) but much of this area, particularly in the hills, is forested and should not be put under any form of cultivation, as recommended by the Reconnaissance Soil Survey (RSS).

Crop Distribution

T. Aman covers the highest acreage (8,685,000 acres in 1983-84) followed by Aus (7,705,000 acres), B. Aman (3,509,000 acres) and boro (3,199,000 acres), according to the agricultural census of 1983-84. However, in the last few years dramatic changes have occurred in boro acreage. It has now overtaken Aus in acreage and production. This has been made possible by improvements in irrigation (mostly minor) coverage and better input delivery systems, as well as a decrease in Aus acreage, particularly in areas prone to floods.

AGRICULTURE SECTOR

Sectoral Policy

The main aim of the Government is to increase the production of food grains to attain food self-sufficiency. This is being done through intensification of cropping patterns, supported by increased ground water and surface water irrigation, intensive use of agrochemicals, the introduction of improved crop varieties (HYVs), policy adjustments aimed at improving supplies of agricultural input, and by improvements in the efficiency and outreach capabilities of the extension service.

Government policy documents attribute low agricultural productivity to technical factors, citing the following as major constraints: frequent natural disasters, shortage of land, high population densities, unstable markets, lack of appropriate and sustainable technology, inadequate investments (partly due to uncertain land tenure and tenancy arrangements), and insufficient extension support.

Five Year Plans

All the Five Plans drawn up since 1973 have one major theme: increased food production, specifically the achievement of self-sufficiency in food by adopting modern agricultural technology. Until recently, environmental concerns associated with the use of modern agriculture technology have not been seriously considered.

An analysis of the agricultural policies reflected in the Plan documents indicates that they were formulated from the viewpoint of aggregate production. In reality, however, the utility of any agricultural policy aimed at sustainable agricultural development must be judged not only by its aggregate production efforts, but also by its impact on the different rural socioeconomic classes, especially the vast majority of small farmers and agricultural laborers struggling at the edge of subsistence. Numerous micro studies have established, with a reasonable degree of certainty, that large farmers have appropriated a much larger share of all the ingredients of modern technol-

<table>
<thead>
<tr>
<th>Soil Types</th>
<th>Biophysical... from previous page</th>
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</thead>
<tbody>
<tr>
<td><strong>Soil Types</strong></td>
<td>The low lying active floodplain region comprising Bangladesh once known as the granary of Asia, mainly due to its alluvial soil character. The three main types of soil are:</td>
</tr>
<tr>
<td>- Hills soils: They lie mainly in the hill district of Chittagong and covers 18079.0 sq. km. (12.6%). They range from brown sandy loams to clay loam tracts.</td>
<td></td>
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<tr>
<td>- Floodplain soils: occupy the largest area (79.1% or 113,895.0 sq. km. out of a total 143,999.0 sq. km.) and are patchily distributed in all the four divisions—Chittagong, Dhaka, Khulna, Rajshahi.</td>
<td></td>
</tr>
<tr>
<td>- Terrace soils: Forming only 8.3% of the total area (120,250 sq. km.), they are characterized by brown to deep grey acidic tracts.</td>
<td></td>
</tr>
</tbody>
</table>
ogy—fertilizer, irrigation, and credit.

Bangladesh’s economy is heavily dependent on grants and aid from foreign bilateral (countries) and multilateral (agencies) sources. It is through commodity aid that most agricultural inputs are imported. Most commodity aid, however, is tied to source restrictions and other conditions which often raise the cost of imports.

Donors, both multilateral and bilateral, have shown great interest in the growth and development of Bangladesh agriculture. Among the areas of special interest to them are the privatization of the input delivery system, agrarian reform, rural employment, crop diversification, agricultural pricing policy, and the distributive implications of agricultural development policy.

Fertilizer use started in the country on a modest scale; in recent years, it has assumed such proportions that the International Fertilizer Development Corporation (IFDC) has established a full-fledged office in Dhaka in order to promote the use of fertilizers. Between 1980-81 and 1989-90, the use of urea increased by 244%, TSP by 223%, MOP by 262%, while zinc and gypsum use increased phenomenally.

All the government plans have encouraged the increased use of chemical fertilizers mainly through the use of subsidies. Lately, however, subsidies have been removed from all but two types of fertilizer types, and distribution has been transferred to private hands.

In addition to chemical or inorganic fertilizers, organic manures are also used in Bangladesh, though in small amounts. Moreover, organic manures are used largely to supplement chemical fertilizers.

Irrigation is necessary in the country during the dry season (October - March). Most irrigation in this period comes from ground water, using shallow and deep tube wells. Since all the government irrigation plans have fallen short of their targets, special emphasis has been put in the latest national (fourth) plan on subsidy rationalization, standardization of irrigation equipment, water legislation and administration, inter-agency cooperation, and environmental protection.

Undoubtedly, the expansion in irrigated acreage has allowed the cultivation of crops which otherwise could not have been done, especially during the dry season. Thus, irrigation has not only helped increase land productivity but has also generated indirect positive effects on employment and income. However, irrigation is not an unmixed blessing. Already, there is evidence of environmental hazards associated with the use of ground water irrigation.

Emerging Sustainability Issues

BIOLOGICAL LIMITS

Land Degradation

Soil Erosion

Soil erosion affects both cultivable and forest lands. In Bangladesh, river bank erosion has resulted in the dislocation of settlements, changes in land use, landlessness and loss of livelihood.

Ground Water Loss and Desertification

Ground water is generally regarded as a renewable natural resource; thus, when a water well is drilled, people presume that its supply of water is inexhaustible. This presumption will hold only if there is a balance between water pumped from the aquifer by wells and water returned to the aquifer from surface sources. The introduction of HYVs put increased pressure on the aquifers. In 1977, only 30% of farm holdings were irrigated; this figure almost doubled in 1983. "Out of nearly 69,000 farm households over 33,000 (52%) have reported irrigation" (BBS: 1983: 23). Extensive ground water extraction has had a number of undesirable results: decline in ground water level, increased salinity, deteriorating water quality, reduction of flow in the connected rivers, and land subsidence.

Ground water levels have sunk 5 m below the surface in the North, and as low as 8 m in areas of extensive ground water abstractions (MPO: 1985: 56). In several areas, e.g. Rajshahi, Bogra, Pabna, Comilla, Mymensingh and Dhaka, ground water extraction is causing a serious lowering of ground water levels in the dry season. The Northern districts are the most severely affected due to hydrological droughts and the extensive use of ground water. There, water levels have dropped 30-40 ft. from their original levels. Most of the shallow and hand tube-wells which were fielded to supply drinking water in the area, have failed. Around 50,000 ponds and ditches in the Barind areas in the Northern districts have already dried up (Bhumik: 1986: 08). This particular region is facing an acute shortage of water for surface irrigation, drinking water and fish culture. Mango cultivation in the Rajshahi division has dropped about 50%. The desertification process is already evident in the Northwest part of the country (GOB: 1991: 58).

Salinization

In Bangladesh, more than 3 M ha. of land are affected by salinity. The backflow of salt water into the river systems has adversely affected 38% of the land, and 33% of the population (ESCAP 1985). This backflow extends further inland during the dry season when the water flow is greatly reduced. Since the Farakka barrage reduced the water flow in the Ganges during the dry season, salination in the Southwestern part of Bangladesh has increased.

At the same time, 1.2 M ha. of land suffer from sulphur deficit while 1.6 M ha. are zinc deficient, due to water logging and intensive use of fertilizers and pesticides.

Destruction of Aquatic Ecosystem

Aquatic pollution in Bangladesh can be traced to the use of pesticides and chemical fertilizers, as well as the extraction of irrigation water from deep tube wells. Some of the pesticides used, e.g. DDT 2,4-D, aldrin, dieldirn, lindane, etc., are highly poisonous to fish and other aquatic organisms. Agricultural run-off containing fertilizer and pesticide residues create nutrient loading in the aquatic environment, which in turn cause eutrophication and land algal growth. Irrigation through the use of deep tube wells damages the top soil in the long run.
because of mineral build-up in ground water.

Mangrove areas cover 0.41 M ha. in Bangladesh. The mangroves are valued for their hardwood, firewood, broad leaves, tanin, and other minor forest products. However, in recent years they have been subjected to certain threats: exploitation, unplanned shrimp cultivation, channelization, drainage and siltation, land reclamation, natural calamities such as cyclones and tidal bore, and withdrawal of upstream water.

There has been a steady deterioration in the quality of the coral reefs. The major causes of coral reef degradation are both natural and man-induced. The natural factors are climatic, tectonic and biological, and they take the form of cyclones, earthquakes, and negative interactions of coral reef organisms with other plants and animals. The man induced causes consist of shell and coral collection, destructive fishing methods, sedimentation from fresh water run-off and the impact of tourism and settlement.

Deforestation
The country's forests cover 14% of the land, although the actual area under forest cover is far less. This dwindling share is constantly threatened by shifting cultivation, overgrazing, and commercial logging. (The intensity and extent of forest degradation from logging in Bangladesh is shown in Fig. 1.) As far back as 1989, the government imposed a total ban on all forest felling until the year 2000. In spite of this, illicit felling continues unabated.

Shifting cultivation contributes to extensive deforestation in the Chittagong Hill Tracts area. In the past, shifting cultivation was not destructive as it allowed the land, once cultivated, to remain fallow for a number of years. This enabled the forest to regenerate in cultivated areas. The rapid increase in the population now dependent on shifting cultivation has resulted in short-term exploitation, which restricts the regeneration of soil fertility and forest cover.

Wetland Destruction
Almost 80% of Bangladesh's made up of floodplain areas (GON: 1987: 05). The Southwestern regions consist of an older delta which harbors the single largest stand of mangrove forest in the world, the Sunderbans. (FAO: 1988: 03). The upper portion of the Meghna river includes many wetlands. These support a rich diversity of species, including an estimated minimum of 330 species of plants, 270 species of birds, 257 species of fish, 20 species of mammal, and eight species of amphibians (World Bank: 1991: 52 & Sadeque: 1992: 54). The Sunderbans is home to the Royal Bengal tiger and the endangered estuarine crocodile. The haor and beel wetland of the Northeast are an important wintering and roosting site for many indigenous and migratory birds, as are the intertidal mud flats along the coast of Bangladesh. The Ata Danga Baor, in the Ganges floodplain reportedly support a number of endangered species, including gharials, which is almost extinct. This wetland is also being used as the reservoir and breeding ground of indigenous fish.

Not enough is known about the impact of flood control, drainage, and irrigation for HYVs on these wetlands, but it is widely believed that the area that dries up for at least part of the year is growing in size.

Increased water extraction can also, by reducing dry season river levels, destroy the character of wetlands. Fish, birds and other species are diminishing in number (Repetto: 1989: 76). In 1983-84, total open water fisheries were estimated at 471.6 M tons; in 1987-88, the figure was down to 426.1 M tons (Sadeque: 1992: 54).

Infrastructural Activities
The construction of many roads, embankments, and canals in villages all over the country has caused adverse environmental effects, including floods and obstruction of the free movement of water (Ahmad, Q.K: 1991: 21). These infrastructure are often built in an unplanned manner and so result in the loss of top soil.

Large-scale dams also cause adverse effects on the land. Many environmental problems, for instance, have arisen because of the diversion of the Ganges water due to the Farrakka Barrage. These infrastructure have also accelerated desertification in the Northern part of the country.

Narrowing of crop genetic resources
One of the most serious side effects of the “Green Revolution” monocropping is the loss of plant genetic diversity of plants needed in the continual development of new ‘strains’. Once the old varieties are lost, “mankind will have lost them for good and ever” (Frankel in FAO in Ehrlich: 1973: 86). The narrowing of the genetic basis of agriculture increases risks because crops become more vulnerable to pests or disease” (Altiere: 1987: 18).

HYVs of rice have displaced traditional varieties. Only eight types of Aush and 12 types of Aman are being cultivated in selected villages, while 14 types of HYV rice are being planted.

Table 1 chronicles the decline of traditional varieties, and the rise of HYVs in four selected areas.
A comparative study of selected villages in four districts has produced an interesting finding. It is the interrelation between the duration of HYV cultivation and the number of varieties. Since HYVs were introduced in the early ’60s, HYV varieties have replaced all those of Aush and almost all of Aman. In Bogra, Aush varieties have been almost completely eliminated.

The longer the period of cultivation in an area, the greater the number of varieties of HYV rice. The villages of Comilla are an example. Another thing to be noted is that a change in varieties took place frequently in Comilla.

Food Imbalance
The single-minded pursuit of increasing rice production through the HYV technology has succeeded to a certain extent (Table 3), but at the expense of other food crops, like pulses; the production of oilseeds has likewise stagnated and decreased.

Table 2. Trend in Production of Crops other than Cereals

<table>
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</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>1415</td>
<td>1416</td>
<td>1486</td>
<td>1444</td>
<td>1366</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1958</td>
<td>1877</td>
<td>1882</td>
<td>2127</td>
<td>1910</td>
</tr>
<tr>
<td>Oil seeds</td>
<td>392</td>
<td>378</td>
<td>348</td>
<td>355</td>
<td>338</td>
</tr>
<tr>
<td>Pulses</td>
<td>538</td>
<td>512</td>
<td>502</td>
<td>531</td>
<td>487</td>
</tr>
</tbody>
</table>

Source: Statistical Year Book of Bangladesh: 1990

The displacement of traditionally grown pulses and oilseeds by cereals like rice and wheat, once irrigation was available, has also caused a major shift in the nutritional balance: from protein and fats/oils to carbohydrates (GOB: 1991: 49). This has created a nutritional imbalance, as well.

Table 3. Index of Selected Agricultural Crop Production
(Base 1972-73=100)

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Rice srl</td>
<td>124</td>
<td>142</td>
<td>148</td>
<td>156</td>
<td>162</td>
</tr>
<tr>
<td>Wheat</td>
<td>129</td>
<td>138</td>
<td>143</td>
<td>147</td>
<td>154</td>
</tr>
<tr>
<td>Pulses</td>
<td>106</td>
<td>97</td>
<td>96</td>
<td>88</td>
<td>78</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>117</td>
<td>108</td>
<td>103</td>
<td>113</td>
<td>101</td>
</tr>
</tbody>
</table>

Source: Agriculture Statistics-BBS 1990. (Computed from Table No. 5.11)

According to Table 2, the production of oilseeds and pulses has declined from 392 tonnes to 338 tonnes, and 538 tonnes to 487 tonnes, respectively, during the period 1984-85 to 1988-89 (BBS: 1990: 184).

Chemical Fertilizer Use and Effect
Extent of Fertilizer Use
Table 5 (next page) shows that all types of peasants in seven selected villages use chemical fertilizers for rice cultivation. The use of chemical fertilizers in HYV farming is significantly higher than in Aush and Aman cultivation. As expected, rich peasants use more fertilizers than poor ones.

Table 5 also shows that the application of chemical fertilizers varies to a substantial degree from one region to another.

The Statistical Pocket Book of Bangladesh 1981 and the Statistical Year Book 1990 show that agricultural crop area in the country was 29,039,000 acres in 1972-73, and 34,883,000 acres in 1986-87—a 20% increase in cropped area over a 15-year period. In the same period, chemical fertilizer use increased by 334%. This means that much of the same acreage received about three times more fertilizers per year in 1986-87 than it got in 1972-73.

Fertilizer Use and Productivity
The threefold increase in chemical fertilizer use per acre has not increased the yield dramatically. On the contrary, the yield per acre has decreased by nearly 10%. (See Graph) In the last few years, yields for all irrigated rice, including HYVs, have been dropping. According to Ahmed, M (1985: 162), “They plummeted from 38.7 maunds (one maund = 37.5 kg.) per acre in the late ’60s to 25 maunds in the mid’70s.”

These statistics corroborate the experience narrated by the farmers in the micro study cited above where production has fallen slightly in all the surveyed villages even as peasants ponder the need to supplement chemical fertilizers. Mr. Kashem, a peasant from a village in Manikgonj district, has this to say:

“For the first two years chemical fertilizers increased production. But then it stabilized and now started to fall. Yet, peasants are applying more and more chemical fertilizer in the hope of raising production.”

In Comilla, where chemical agriculture has been practised for a long time, peasants like Mr. Sattar believe that:

“The intensive use of chemical fertilizers has not substantially raised rice production. On the other hand, it has made the soil hard and less capable of holding water. So the peasants in this locality use manure along with chemical fertilizers. Cow dung and rotten hyscinths are mixed with the soil to do the trick. This has improved the quality of the soil.”

Interestingly enough, the local people are aware of the negative consequences of the use of chemical fertilizers. They have no idea of the scientific cause but they are aware of the outcome. Like peasants in the other selected villages, 72-year-old Mr. Rahim says:

“HYVs have made us victims of a vicious circle. Now, to maintain the present production level, more and more chemical fertilizers are being used. As a result, the plants become greener and soft which
attracts more insects than the plants that use non-chemical fertilizers. Despite this knowledge, we cannot stop the practice because it has become part of our farming habits. In the meantime, however, almost all the local varieties of rice have disappeared. To keep the harmful insects at bay, more and more new types of pesticides are being used."

Data on chemical agriculture input and output from the micro study cited above show that despite the rising quantity of different types of chemical fertilizers used, rice crop output has either declined or stagnated. (Table 4 and 5)

The case of Mr. Faltu from Kamta village in Manikgonj district is representative of this trend:

"I have estimated the quantities of fertilizers during the past five years: 70 kg. in 1987, 80 kg. in 1989, 115 kg. in 1990, and 130 kg. in 1991. My returns were 1875 kg., 1687.5 kg., 1500 kg., 1762.5 kg., and 1800 kg. per acre, respectively, during these five years."

Table 4. Rise In Production (in kg.) by Acre

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kishoregonj</td>
<td>1867.5</td>
<td>2117.3</td>
<td>1856.3</td>
<td>1665.0</td>
<td></td>
</tr>
<tr>
<td>Bogra</td>
<td>1807.5</td>
<td>1830.0</td>
<td>1687.5</td>
<td>1665.0</td>
<td></td>
</tr>
<tr>
<td>Manikgonj</td>
<td>1297.5</td>
<td>1830.0</td>
<td>1863.8</td>
<td>1650.0</td>
<td></td>
</tr>
<tr>
<td>Comilla</td>
<td>2362.5</td>
<td>2175.8</td>
<td>2175.8</td>
<td>1838.3</td>
<td></td>
</tr>
<tr>
<td>Avg. Production</td>
<td>2075.6</td>
<td>1833.8</td>
<td>2071.9</td>
<td>1942.5</td>
<td>1745.6</td>
</tr>
</tbody>
</table>

The Effects of Fertilizers

Bangladesh uses fertilizers more intensively than most low income countries; the 1987-88 consumption level of 770 g.m. of plant nutrients per ha. of arable land was exceeded only by China, Sri Lanka, Indonesia, and Pakistan. "Leaching of nitrogenous fertilizers, which is highly soluble and volatile, may cause nitrogen compounds to accumulate in neighboring surface water or ground water, with possible harm to crops, fish, or domestic water supplies" (World Bank: 1991: 47, GOB: 1991: 45). In addition, water bodies with high nitrate levels encourage the growth of algae which are toxic to fish and cause skin irritations, or may encourage weeds which obstruct waterways and harbor insect pests. Little is known about the actual extent of pollution from fertilizer leaching and run-off in Bangladesh.

Pesticides

Use of Chemical Pesticides

Pesticide use is far more dangerous than chemical fertilizers. In Bangladesh, the use of modern chemical pesticides started in 1957 with the importation and free distribution of three tons of DDT and BHC by the newly established Plant Protection Department. It increased to about 11,000 tons in 1973 (Islam, A: 1990: 122).

Table 6. Use of Pesticides for Local Varieties and HYVs

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Value Added TK/HA</th>
<th>Total Purchased Inputs TK/HA</th>
<th>Pesticide Cost TK/HA</th>
<th>% of VA Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>12.294</td>
<td>3.328</td>
<td>59</td>
<td>0.5</td>
</tr>
<tr>
<td>HYVS</td>
<td>20.871</td>
<td>8.93</td>
<td>314</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Following the withdrawal of price subsidies and the imposition of a government ban on free distribution, their use dropped to only 2,000 tons in 1974. The quantity of insecticides used at present is 6,948 metric tons per year (Ramawamy: 1992), which is not high compared to that in other countries. But Bangladesh's rural area is among the most densely populated in the world, with less than 1,000 sq. m. of arable land per person: 25% of the population relies on ponds and other surface sources for drinking water, and about 80% for domestic use. For these reasons, current levels of agrochemical pollution that might be acceptable elsewhere may not be safe in Bangladesh (World Bank: 1991: 45).

At present about 20 types of insecticide, 18 types of fungicide and two types of rodenticide are being used in Bangladesh (UN: 1987: 19). Published figures
suggest that about 1/3 of pesticide consumption consists of Diazinon, which is not toxic to plants at the recommended dosage but can be toxic to fish and highly toxic to birds. There have, however, been reports in the press of widespread distribution of banned pesticides, especially the “dirty dozen.” About 90% of agricultural use of pesticides is for rice; farmers’ expenditure on pesticide per ha. of paddy is more than five times higher for HYV rice than for traditional varieties (Table 6).

In Bangladesh, there are no effective controls on the sale, packaging, application and disposal of pesticides. The lack of a deposit on pesticide containers often results in their conversion to food and medicine containers (Showler: 1990: 59). Condemned stocks of pesticides are stored in burial plots, posing a threat to ground water supplies. Some chemical and pharmaceutical plants are reportedly storing effluent in tanks or ponds which can overflow during the monsoon.

**Effects of Pesticide Use**

Peasants believe that HYV rice varieties, when grown with chemical input, are more vulnerable to pests than local varieties. Mr. Gokuil Ghandra, from a village of Comilla, relates his experience:

“When the HYV was first introduced in the early ‘60s, pesticides worked well. But today, the pesticides are fake. These pesticides cannot control the pests; different brands are marketed with the promise to destroy pests. However, the promises most often prove to be false. The peasants of this locality have to try them one after another, [hoping to get] the desired results. Pesticides are also used more frequently.”

Due to his lack of knowledge of the cause of the development of pesticide-resistance, he simply blames the businessmen for selling adulterated pesticides. He points out that the rate of pesticide use is growing day by day. The indiscriminate use of pesticides is helping the insects to develop immunity to them. As insects become more pesticide-resistant, the peasants also have to frequently turn to newer brands of pesticides. The higher the economic strata peasants belong to, the greater the use of pesticides. Furthermore, there is a direct relationship between fertilizer and pesticide use.

**Pesticide Effects on Food**

The use of pesticides has adversely affected the fish population. Many species face extinction. Some have become infertile, leading to a sharp decline in fish production in the country. Fish contributes the major share of protein in the peasants’ diet. Now, owing to the effects of pesticides on fish, peasants have to make do with less protein. Mr. Gafur gives a graphic description of this decline:

“In my youth, I used to catch so much fish that the women at home, who were assigned to clean and prepare the fish, were dismayed. The whole area stank of fish and some of the catch was dumped to be used as manure. Nowadays, there is not even enough for our meals.”

**Cropping Systems**

Year-round transplanted rice cultivation and over-intensification, e.g. triple cropping in a year, may reduce overall yields by keeping the land waterlogged for many years. This, in turn, leads to the formation of toxic compounds in the soil, loss of essential nutrients like zinc and sulphur through deep percolation (Jones: 1984: 199), and the spread of soil borne-diseases that thrive in this waterlogged environment. About 3.9 M ha. and 174 M ha. of land area is deficient in sulphur and zinc, respectively. This has caused an average reduction of about 10%; 17% for rice crops (GOB: 1991: 48). Soil degradation is increasing in the different regions of the country. The most acute problems have emerged in the Northern region because of the intensity of cropping systems there.

The low stubble biomass of HYVs likewise contributes to the depletion of the soil since few nutrients return through decomposing crop stub. Due to acute fuelwood demand, even the stubble of local indigenous varieties is removed after harvest; this results not only in decreased land productivity but also in decreased vegetation and heightened soil erosion.

**SOCIAL LIMITS**

**Poverty Profile**

Poverty is overwhelming in both rural and urban areas. At least 60% of the Bangladesh’s population is living below the poverty line (Table 8). Also, the table shows that the households
involved primarily in informal non-farm activities in rural areas are the worst-off among all groups (per day per capita deficit is 640 cal.), worse than even the landless farm workers (whose per capita per day deficit is 603 cal.). Extreme poverty in rural areas, measured in terms of intake of at least 1,800 k. cal. per capita per day, has worsened during 1973-74 and 1983-84 (Figure 3). During the period, there was a fall in "moderate" poverty (poverty line based on 2,122 k.cal.) from 62-68% to 57%, and a corresponding rise in 'extreme' poverty (1,800 k.cal.) from 25-28% to 28%.

There is a high incidence of unemployment and underemployment in the country, especially affecting the female labor force. (Khuda, 1978, 1979, 1980, 1982, 1985, 1986 and 1988). It is hard to conceive of any major improvement in employment conditions in the country in the near future, given Bangladesh's large population, high rate of population and labor force growth, low level of savings and investments, unstable tenure system, and unequal distribution of land.

Real wages in the agricultural sector have been almost stagnant since the mid-1980s, although there was a small increase in 1990. Nevertheless, the real income of the poor has remained largely unchanged since the mid-1980s.

Table 8. Calorie Deficit by Socio-Economic Classes, 1976/77

<table>
<thead>
<tr>
<th>Class</th>
<th>Calorie (day/capita)</th>
<th>Population (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landless farm workers</td>
<td>1519</td>
<td>603</td>
</tr>
<tr>
<td>Small farmers (tenants)</td>
<td>1638</td>
<td>484</td>
</tr>
<tr>
<td>Medium farmers (owners)</td>
<td>1764</td>
<td>358</td>
</tr>
<tr>
<td>Medium farmers (tenants)</td>
<td>1976</td>
<td>166</td>
</tr>
<tr>
<td>Rural informal (non-far)</td>
<td>1482</td>
<td>640</td>
</tr>
<tr>
<td>Urban informal</td>
<td>1708</td>
<td>414</td>
</tr>
<tr>
<td>Average of all classes</td>
<td>1665</td>
<td>456</td>
</tr>
</tbody>
</table>

Note: Calorie deficit was measured by taking 2,122 K. Cal per capita per day as the norm
Source: Ahmed, 1986, and Osmani, 1990

Poverty and environmental degradation affect women disproportionately. Probably no other group is more affected by environmental degradation than those who are both poor and women. They tend to be severely disadvantaged in terms of education, health, nutrition and participation in the labor force. They have also less access to land, credit and extension services. Every dawn brings with it a long march in search of fuel, fodder and water. As the environmental situation worsens, the long march becomes even longer and more tiresome.

Most of the rural poor people in the country get their livelihood from agricultural activities: farming, grazing animals, fishing, collecting wood, fruits and other products from the forest, and VCIs. They live in what are sometimes called "biomass societies," places where practically all human activities use organic materials. Food is unprocessed, fuel comes from a combination of firewood, dung and crop wastes; houses are made of wood, bamboo, mud and thatch; clothing from cotton and wool. Water supplies depend on soil maintenance and tree cover. For biomass societies the environment is not a "luxury," it is the very means of existence.

Problems of Resource Control

Land

Colonial rule of Bangladesh is over, but the hierarchical agrarian relations based on ownership of land and capital still remains. The skewed land ownership pattern is very clear from the 1984-85 Agriculture Census Report—70% of rural households own only 20% of land while 30% of the population own 71% of the land.

Increased Production Costs

In chemical agriculture, annual production cost increases are unavoidable. There are two main reasons. One is the increase in the quantity of external input (chemical fertilizer, pesticide, etc.). When most farmers started HYV rice cultivation in Bangladesh, they used about 50 kg. of chemical fertilizer. Today, they have to use 200 to more than 300 kg. of two or more types of chemical fertilizer per acre, and yet they still cannot get the same yields as before. This is due to soil degradation.

The other factor in increasing costs is the increase in the price of external inputs. The price of chemical fertilizer was only 0.5 taka/kg. in 1972; today, it is 5.0-6.0 taka/kg. — a more than tenfold increase in 20 years. The cost of irrigation has also increased nearly six times. Meanwhile, the price of rice has only doubled in 20 years.

Loss of Biomass Resources

The immediate environmental resources not only meet crucial household needs but provide a range of raw materials for use in traditional occupations and crafts; as such, they are a major source of employment and income. For example, firewood and cow dung are important sources of fuel for pottery; bamboo is a vital raw material for basket weavers; bullock carts and catamarans are made from wood, and so on. Traditional crafts are being threatened not just by the introduction of modern products but also by the acute shortage of biomass.
Based raw materials.

The decline in non-timber forest products adversely affects the income of poor rural households, for whom these are often a significant supplementary source, and sometimes the only source of income. As other sources of livelihood get eroded, selling firewood is becoming increasingly common, especially in the Eastern (Chittagong Division) and the central (Dhaka Division) part of Bangladesh. Deforestation directly impinges on this source of livelihood for the rural poor. HYVs irrigated by modern techniques such as DTW and LLP or STW generate much higher labor requirements compared with indigenous devices such as doon (local irrigation instrument) and swing basket (Hamid: 1988:49). However, when modern technology was introduced into rural areas, the small farmers using doons could no longer get enough water; this affected their income and production.

**Disruption of Social Support Networks**

The considerable displacement of people resulting from the acquisition of land by the state or the submersion of villages by the building of major irrigation and hydroelectric works has another effect: the disruption of social support networks. Social relationships with kin provide economic and social support that is important to all rural households, but especially to poor households and to the women. “The poor people typically depend on such informal support networks, which they also help to build through daily social interaction, marriage alliances that they are frequently instrumental in arranging, and complex shift-exchanges” (Macchialan: 1983, Vatuc:1981, Sharma:1990, in Agarwal, B:1990:24). Apart from the economic and social benefits, the relationship between forest dwellers and forests is also symbolic, “suffused with cultural meanings and nuances, and woven into their songs and legends of origin” (ibid.). Deforestation, dams and embankments destroy a whole way of living and thinking among forest dwellers and tribal people.

**Dependence on the Market for Food**

Table 9 shows that peasants are getting more of their food needs from the market, rather than from the land. This trend is more pronounced among the lower strata of peasants.

**Table 9. Percentage of Source of Food (other than Rice) Obtained Before and After HYV Introduction**

<table>
<thead>
<tr>
<th>Categories of the Peasantry</th>
<th>Before HYV</th>
<th>After HYV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Land</td>
<td>Market</td>
</tr>
<tr>
<td>Landless</td>
<td>40.2</td>
<td>52.8</td>
</tr>
<tr>
<td>N=229</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marginal Peasant</td>
<td>62.5</td>
<td>37.5</td>
</tr>
<tr>
<td>N=168</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Peasant</td>
<td>59.1</td>
<td>40.9</td>
</tr>
<tr>
<td>N=43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rich Peasant</td>
<td>53.5</td>
<td>46.5</td>
</tr>
<tr>
<td>N=43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total N = 533</td>
<td>51.6</td>
<td>48.4</td>
</tr>
</tbody>
</table>

Mr. Salam, a peasant, has this to say:

“In the past, we produced many varieties of produce in small quantities and some items like fish were available from natural sources. Today those sources yield hardly anything and our products have become monocrops aimed at the market. Required food items except rice are now provided by the market. In this locality, only chillies and potatoes are produced besides rice, whereas before pulses and other vegetables were produced.”

**Increasing Dependence on Imports**

Policy-makers and government officials who extolled the virtues of Green Revolution in the early 60s had promised self-sufficiency in food. The complete opposite turned out to be the case. Food imports in the years before 1960 (i.e. before the Green Revolution) were much lower than in the years after 1972 (i.e. after the Green Revolution). Food grain imports per head in 1986-87 were almost twice their size in 1959-60.

**Factors Determining Unsustainability**

**GOVERNMENT POLICIES**

**Agricultural Policy**

In the fourth Five-Year Plan objectives center around facilitating and accelerating technological transformation to achieve self-sufficiency in food production, and thereby improve the nutritional status of the population in the country (FFYP: 1990-V:38). Most of the previous Five-Year Plans have followed the same policy to achieve food self-sufficiency: mechanization of agriculture. Its main thrusts are to:

- grow more food,
- increase irrigation levels in the countryside;
- introduce almost tax free import of HYV technology in the private sector; and
• arrange easy credit facilities to install DTWLP and STW.

It is important to note that the utility of any agricultural policy aimed at sustainable agricultural development must be judged not only by its total production effect, but also by the impact it has on the different rural socio-economic classes in the vast majority of small farmers and agricultural laborers struggling at the edge of subsistence (Khuda, B:1991:17).

The justifiability of agricultural policy in Bangladesh should also be assessed from the viewpoint of its impact on the environment. The government’s agricultural policy hinges on the use of capital-intensive modern technologies (rather than labor intensive ecologically sustainable agricultural systems) which create social inequalities and upset the social and ecological balance.

• Existing land resource assessments define agricultural suitability in terms of the cost required to produce one particular crop (Mackie, C:1990:57). This is a misleading indicator of over-all agricultural potential because land may be ideal for horticulture crops or fisheries, yet rated as “with low suitability”.

• Government makes no provision for experimenting with alternative, ecologically sustainable agriculture. Its policies are based on the knowledge of experts whose assessment of “modern technology” is made solely from an economic point of view and does not consider sustainability in the long run.

• The promotion of a long-term program to tackle crucial problems of environmental degradation requires at least 10-15 years to mature. Successive governments in Bangladesh have neglected this; they have often been unconcerned about the long-term consequences of their policies and have failed to make long-range plans to address the environmental problems of agro-ecosystems.

Subsidies for Agricultural Input and Equipment

• When chemical agriculture was first introduced in the early 1960s, the government subsidized the price of major input like pesticides, fertilizers, and other agro-equipment. The state even distributed the input free of cost. Thus, pesticide imports increased about fivefold (in volume terms) during 1967-80. The subsidized prices led to over-application of these chemicals, which in turn caused pollution and the destruction of beneficial insects.

• Meanwhile, fertilizer subsidies assume at least three forms: production subsidy, procurement subsidy, and transport subsidy. (GOB: 1990 in Khuda:1991:25) Subsidies have contributed to the already inefficient use of fertilizers typical of the country. “Impressive timing and placement, careless use of irrigation water and other contemporary inputs, and careless cultivation practices such as weeding contribute to application efficiency rates that are probably well under 50%” (Repetto, R: 1989:76).

Efficiency can be improved substantially in exchange for somewhat higher labor management costs, but fertilizer subsidies distort these on-farm decisions. The result is the waste of costly input and increased pollution as chemicals run off into bodies of water.

• At the start of the 1960s, irrigation equipment such as machines, fuel and building infrastructure, and other services (mechanical support) were heavily subsidized. Revenues in this sector did not even cover operating and maintenance costs. Charges were also small relative to the value of water to farmers.

Farmers almost always demanded additional water because they carried few of the costs and enjoyed most of the benefits. The ever-rising demand for water destroyed breeding grounds and habitat as well as depleted soil nutrients through water logging and aggravated salinization (Jayal: 1985:180).

Government Credit Policy

• Government credit facilities should have gone to the most disadvantaged people. However, all the evidence shows that those who are already in a better position are the ones who actually benefited (Newaz: 1988:87 and Robinson:1990:280).

The wealthy have better access to government institutions and make full use of their socio-economic and political advantage. Easy credit induces them to excessive use of fertilizers, pesticides, and water.

• To strengthen its HYV-based strategy the government has announced a special Agricultural Credit Program with these features: (This program was discontinued in 1988.)

• The loanable amount is based on crop patterns. The policy promotes commercial input-dependent crops rather than subsistence low-input crops.

• The size of the loan is considerably higher for external input-dependent crops, such as HYVs, sugar cane, etc.

• The farmers do not get the entire loan in cash. Thirty percent of the loan is provided in kind, e.g. chemical fertilizer, which makes it hard for farmers to opt for organic fertilizers.

Mechanization

The government took a large direct role in farming; parastatals use government budgetary resources to create highly mechanized operations and typically run them at a loss. Such direct and indirect mechanization subsidies have severely damaged natural resources. For instance, using heavy equipment instead of traditional methods to plough or clear the land has sometimes devastated the soil. Nutrients in the biomass have been lost, water scarcity created, and top soils scraped off.

Infrastructural Activities

The construction of roads, embankments, railways and other infrastructure has created waterlogging in agricultural lands. This has accelerated the depletion of soil nutrients and created problems of salinity, alkalinity, and toxicity. In the last two decades, the construction of unregulated and unplanned roads has increased due to the "Food for Works" Program in Bangladesh. These and other infrastructure have also caused the drying up of wetlands in Bangladesh.
FOREIGN DEBT BURDEN
- The total debt service payments was US$160 M in 1982-83 and US$293 M in 1988-89 (BBS:1990:235)
- There are two primary mechanisms by which the debt crisis causes environmental degradation.
  § Many so called ‘development’ projects financed by the loans are themselves ecologically damaging. This is most notably true in the case of huge dams and barrages built for “flood control” and to provide irrigation and hydro-electric power. These dams cause immense damage to ecosystems, e.g. forest and arable resource loss, increased salinization and reduced fertility of downstream agricultural land, higher incidence of water-borne diseases, and forced resettlement of hundreds of thousands of people.
  § The means by which debts are repaid are often environmentally damaging. Deforestation is the most obvious example. In Bangladesh, the need to earn foreign exchange to repay debts has led to the clearing of much of the mangrove forest for shrimp culture. Natural forests have given way to huge monoculture (both private and government-owned) plantations, e.g. rubber, eucalyptus etc.

MARGINALIZATION OF INDIGENOUS KNOWLEDGE
- In rural poor families, the selection and procurement of seed is usually done by the women who have the most detailed knowledge of crop varieties. The existing ideology of chemical agricultural development and commercial attitudes towards afforestation has initiated the devaluation and marginalization of indigenous knowledge and skills, impinging especially on the knowledge that poor peasant and tribal women usually possess.
- The present strategy and policies have made little attempt to tap or enhance this knowledge or understanding. At the same time, women have been excluded from the institutions through which modern knowledge is created and transmitted.

RESEARCH BIAS
- Agricultural research in Bangladesh suffers from two major biases:
  § The primary thrust of such research efforts has been the adoption of modern technology in agriculture;
  § The focus has been on the cropping system rather than on the farming system as a whole.
- “Non involvement of farmers in the ... formulation of agricultural research policy is a major reason why research findings are not useful to the large majority of the farmers” (Khuda, B. et al: 1991:40). Pray (1979 in ibid) puts it another way, “The research institution does not know what the farmers are doing and the conditions under which farmers have to operate.”
- The dominant market-oriented research effort of government institutions has had little impact in solving the problem of agro-ecosystem degradation in the country. Due to concern for productivity, even at the expense of sustainability, government approaches and programs have failed to address the problem of agro-ecosystems in the country.

IMPERFECT, INTERLOCKED AND DISTORTED MARKET OPERATIONS
- The market structure in Bangladesh is governed not so much by the interplay of demand and supply, but more by the influence of different social classes.
- There is, however, an appearance of heterogeneity of roles in the market, e.g. notwithstanding their social position, individual peasant households may lease out, or take a lease on, land; borrow or lend money; hire, or hire out, labor. But it is the initial resource position which is crucial in determining relative bargaining strength and, indeed, the level of exploitation.
- The relative bargaining position of the poor is further eroded by systems of interlocked markets where participation in one market reduces the range of feasible options open to the participants in other markets, as the terms of subsequent potential market transactions are contractually imposed by the dominant partner on the dominated one. Several village studies in Bangladesh have found evidence of credit-labor, credit-product, tenancy-credit, tenancy-labor and triple and quadruple interlocked markets.
- The extra-market mediations are the influence exerted by micro-level village socio-political organizations, as well as by macro-level state institutions. Mediation of these institutions not only distorts market operations in favor of the rich and powerful but also alienates the poor socially and culturally. In the village-level factions, kinship, _Somaj_ (social organization for enforcing moral standards and social control), and village courts are dominated by those who are also economically powerful; participation of the poor in these institutions is merely token in nature.
- Mediation by the state constitutes by far the most widespread influence on the socio-economic-political environment of the peasant society. Sadly, these influences most often work for the benefit of those who are already powerful.

One of the principal methods of state mediation is the initiation of development programs which implement infrastructural development projects, provide subsidized input supply for technological modernization, and make available credit line for economic growth. No one can argue against the need for such interventions to lift the peasant economy up from stagnation. But since these interventions are mediated through institutions dominated by the elite, the benefits of development projects disproportionately accrue to them, thus deepening the polarization within the society.
- In recent years, one of the most powerful extra-market mediations is performed by the large-scale permeation of the dowry system. It brings very serious economic and social consequences on the rural poor and more so on poor women. Apart from losing land and other assets to finance dowry, poor women are subject to physical humiliation and even death. There is much empirical evidence that village-level social, economic and political organizations promote and profit from systems of dowry, as these serve patriarchal interests and result in the dispossession of peasants.
Sustainable Agriculture Initiatives

Government Initiatives
The government has undertaken some initiatives to prevent agro-ecosystems degradation. These include the following policies and programs:

Policies:
- establishment of strict protective measures for critical fisheries habitat;
- minimization of risks and costs associated with concentrating investments and natural resources on increasing food grain production; and
- assistance to those who do not benefit directly from expansion of dry season rice cultivation, to help them improve the management of their rain fed lands and homesteads through crop diversification and rural industries. (GOB: 1991:48)

Projects:
- pilot projects to designate and protect inland fisheries habitat from encroachment;
- community-managed fisheries management projects in small target watersheds;
- formation and support of community organizations of farmers for the maintenance of traditional and local cultivars, breeds, species; and
- expansion of genetic resources through pilot projects on balanced crop diversification in each ecological zone, with full community participation in the identification of new crops and planning for cropping patterns (GOB: 1991:47).

Overview of NGDO Involvement in Sustainable Agriculture NGDOs’ Approach to Sustainable Agriculture
Although ecologically sound and sustainable agriculture is still at an experimental stage in Bangladesh, it has already influenced small farmers and policy-makers. The NGDO strategy for sustainable agriculture is directed towards meeting the subsistence needs of peasants (Hirschman: 1984).

The NGDOs’ concept of sustainable agriculture entails an eco-friendly agricultural system whereby people in the community optimize the use of resources through traditional, indigenous, as well as modern science.

Trends in NGDO Action
Only a few NGDOs in Bangladesh, e.g. PROSHIKA-MUK, FIVDB, CARE Intl., HKI, RDRS, etc., have been working to introduce sustainable agriculture practice. Until recently, neither the GOs nor NGDOs were working to disseminate sustainable agricultural practices among the other local NGDOs. Lately, (spell out) BARRA has taken the initiative, in collaboration with the other leading NGDOs (mainly PROSHIKA-MUK, CARE Intl. Bangladesh, FIVDB, HKI and ADAB), to introduce Regenerative Agriculture among NGDOs. BARRA has successfully forged the cooperation of regional and international networks like the South Asian Rural Reconstruction Association (SARRA), the International Institute of Rural Reconstruction (IIRR), and the Developing Countries Farm Radio Network (DCRFN). To spread information on Regenerative/Sustainable Agriculture technologies, BARRA has organized two national level training for 40 trainers/mid-level agricultural managers, and developed FORAM (Forum for Regenerative Agriculture Movement), which comprises 75 NGDOs involved in Regenerative Agriculture.

A detailed listing of BARRA and other NGDOs’ involvement in various aspects of sustainable/regenerative agriculture promotion is provided as follows:

Policy Initiatives
- On September 15, 1989, BARRA organized an idea formulation meeting with NGDOs practicing different types of Regenerative Agriculture in Bangladesh. A technical committee of seven members was formed for guidance and technical support in promoting/introducing Regenerative Agriculture in Bangladesh.
- As per recommendation of the idea formulation meeting, a three-day workshop attended by Agricultural Project Managers, Coordinators, Trainers, Supervisors, etc. from 13 member organizations was held that same year, on December 02-05. Its aim: to flesh out the idea. Both local and foreign resource persons took part.
- BARRA helped initiate the establishment of an NGDO Forum for Regenerative Agriculture Movement (FORAM). So far, 75 NGDOs have joined FORAM.
- A “Memorandum of Understanding” (Constitution) of FORAM has already been formulated and accepted by the FORAM partner NGDOs.
- BARRA helped compile information received from participating organizations.
- BARRA hosted national and international visitors, sharing with them information about the situation of chemical based agriculture in Bangladesh and the urgency of introducing Regenerative Agriculture.
- A follow-up workshop was organized with ICRA (International Course Regenerative Agriculture) participants to review and update the Regenerative Agriculture training curriculum for the next national level training.
- A Regenerative Agriculture Training follow-up workshop was organized to review progress and to introduce low external input technologies.
- BARRA assisted NOVIB (a donor from Netherlands) in conducting a “Study on Environmental and Agricultural Problems in Bangladesh: Perspective for Policies and Implementation”.

Actual Farming Initiatives:
Approximately 385 acres of land are currently covered by NGDO-run regenerative/sustainable agriculture farms. It is notable that apart from the male farmers, a total of 2,448 women farmers are also involved in practising/advocating regenerative/sustainable agriculture technologies at homestead areas. Apart from these PROSHIKA-MUK has been using sustainable agriculture techniques to produce non-chemical dependent but high-yielding crop varieties since 1990. Approximately 2,000 farmers have been growing HYV rice without using any
Research:

- All of the collaborating organizations practising Regenerative Agricultural technologies are conducting action research on different practices/technologies, species, effect on soil, botanical pesticides, yields, pest attacks, etc. Results are monitored and shared with all FORAM members and other interested researchers/organizations.
- Steps have been taken to develop a trial/demonstration farm (in collaboration with CARITAS/MAWTS) at Dhaka for future trainees and visitors.

Educational Activities:

- Following the recommendation of the BARRA Training participants and the Technical committee for Regenerative Agriculture, post-training follow-up support services on regenerative agriculture have been provided to the training participants and their organizations to implement the lessons arrived at in the training.
- Currently being undertaken is the compilation and documentation of available technical information on regenerative agriculture.
- A Bangla Handbook and Flip Chart on Bio-Intensive Gardening and Regenerative Agriculture Techniques was published by the LIFT Project, CARE International - Bangladesh.
- A Bangla newsletter featuring regenerative agriculture experience will be published after completion of some formalities with related organizations.
- BARRA used to offer consultancy services to interested organizations on designing, planning and budgeting regenerative agriculture projects.

Training:

- A four-week long technical training course to introduce/promote regenerative agriculture techniques was conducted; 40 trainers, managers, and coordinators from 33 NGDOs participated in the course.
- Nine senior staff from eight organizations (PROSHIKA-MUK, BNELC-DF, RDRS, CARE Intl. Bangladesh, HKI-Bangladesh, FIVDB, BARRA & ADAB) attended a four-week long International Course on Regenerative Agriculture (ICRA) in the Philippines. The participants conducted national level training in Bangladesh afterwards.
- BARRA/FORAM has provided National level training (TOT) on regenerative agriculture with ensured post training follow-up to 40 Trainers/mid-level agriculture project managers from national and international NGDOs. The aim is to develop the skills of extension workers and to facilitate training of interested neighboring organizations. FORAM member organizations are also pushing local NGOs to test and adapt regenerative/sustainable agriculture in the field.

Commercialization:

Trials/demonstrations and workshops on sustainable agriculture have been eliciting very encouraging responses from the farmers, especially those suffering from the effects of chemical agriculture.

Lessons Learned/Insights

In this study the experiences, views and opinions of the peasants have been considered to evaluate different aspects of chemical agriculture. The macro study, using secondary materials like statistical year books, plan documents and research materials, reveals strikingly similar pictures. At the same time, experimental ecological agriculture has also been studied to find out if it can be an alternative to chemical agriculture.

The findings have mostly gone against chemical agriculture, while experimental ecological agriculture is gaining widespread approval.

- The use of chemical fertilizers and pesticides continues to increase exponentially. The increase, however, has not been matched by a corresponding rise in the production of rice. In fact, production shows a declining trend.
- Chemical agriculture has replaced many of the local varieties of rice and other crops and food items, e.g. fish, pulse etc. Crop diversity essential for sustainable production has been undermined.
- Chemical agriculture has adversely affected the livelihood and lifestyle of villagers, especially the poor. Fuel shortage, scarcity of housing materials, and shortage of fodder in rearing livestock characterize the impact of chemical agriculture on the livelihood of peasants.
- Chemical agriculture has promoted rice monoculture and as a result many nutritionally important crops like vegetables, pulses, and oil seeds have been gradually replaced. This has affected the health of the soil and the health of the people.
- The increasing and indiscriminate application of pesticides has caused irreparable damage to soil, many species of fish, grass and beneficial insects. Water pollution is another major threat to health and life.

The advantages of ecological cultivation have yet to be appreciated by peasants in Bangladesh. The experiments with rice at demonstration plots have at least made the following points clear:

- It has proved capable of high yield.
- Production of organic fertilizers adds new biomass (and will do so every year) to the soil, thus improving the quality and fertility of the land.
- It eliminates dependency of peasants on fertilizers and pesticides, thus cutting down the cost and increasing their autonomy.
- It has a positive effect on the environment. Marginal rate of diminishing return is not expected to be high as it recycles agricultural resources within the peasants' homestead and farm.

The foregoing was excerpted from the Country Report prepared by Dr. Quazi Faruque Ahmed and Md. Sirajul Haque for the Second Asian Development Forum.
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Case Study: Bangladesh

HYVs Minus the Chemicals

Background
Proshika Manobik Unnayam Kendra (Proshika) is a non-government organization (NGO) in Bangladesh. Since 1976 it has been organizing the rural poor through development education and training and by providing various other support services such as credit extension. In 1989 a similar process was initiated by the NGO in the urban areas. From its inception, Proshika has incorporated into its programs a framework for development that is economically viable, ecologically sound, socially just, and culturally appropriate -- in short, sustainable.

Proshika's work priorities are grouped into themes which reflect a number of rural and urban development concerns. These are: (1) organization of the rural poor; (2) development education; (3) employment- and income-generating activities; (4) rural health infrastructure; (5) social forestry; (6) ecological agriculture; (7) urban poor development; (8) disaster management.

The Ecological Agriculture Programme was started in a modest way in 1978; at the time it concentrated on vegetable growing. But from 1990-91, experiments in ecological rice cultivation were conducted.

Objective
Proshika's Ecological Agricultural Programme aimed to demonstrate that an alternative agricultural production system has enough potential to seriously challenge the prevailing chemical-based farming. Using organic fertilizers and a natural pest control mechanism, Proshika's experiments in "ecological agriculture" were designed to show that "organic" farming is capable of producing rice yields comparable with those of chemical farming, prevents disease and pest infestation, and enhances the soil's natural productivity.

Process/Strategy
The experiments were conducted in selected "irrigation command areas" covering the different regions in the country. These were Brahmanbaria, Kalkini, Bhaireb, Kuliarchar, Dhamrai, Doulatpur, Ghior, Gabtoli, Shibganj, and Nagorpur. In each of these areas, demonstration plots for ecological agriculture and conventional chemical agriculture were set up side by side. (In all, there were 92 demonstration plots for ecological agriculture, and 29 for chemical agriculture.) Selected rice varieties - many of which were of the high-yielding type - were planted in the demonstration plots. The "chemical agriculture" plots were tended in the conventional way, that is, with the use of chemical input. On the "ecological agriculture" plots, meanwhile, experimental land preparation and agronomic techniques were utilized, and therein lay the difference.

Although the techniques varied somewhat from area to area, the following general steps were observed:
1. In most cases, the plots had been left fallow prior to the experiment.
2. The plots are ploughed from four

| Table 1. Comparative Economic Performance of Ecological and Chemical Rice Farming |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Names of Area   | No. of Plots   | Total Area (in decimal) | Expenditure/Acre | Income/Acre | Gross Margin/Acre | Net Margin/Acre | Yield/Acre (kg) |
| B. Baria        | 4     | 4     | 85   | 76   | 5,614 | 7,126 | 13,253 | 13,749 | 7,640 | 6,354 | 7,130 | 5,706 | 2,550 | 2,643 |
| Kalkini         | 8     | 4     | 84   | 70   | 8,119 | 6,735 | 19,504 | 16,237 | 11,384 | 7,502 | 10,646 | 6,708 | 2,825 | 2,355 |
| Bhaireb         | 8     | 4     | 192  | 138  | 6,626 | 7,582 | 11,204 | 14,770 | 4,578 | 7,187 | 3,976 | 6,498 | 1,878 | 2,289 |
| Kuliarchar      | 9     | 3     | 223  | 60   | 6,333 | 7,773 | 11,197 | 15,634 | 4,864 | 7,861 | 4,289 | 7,154 | 1,746 | 2,246 |
| Dhamrai         | 9     | 2     | 74   | 32   | 6,081 | 8,484 | 11,836 | 14,881 | 5,755 | 6,597 | 5,181 | 5,548 | 1,903 | 2,383 |
| Doulatpur       | 3     | 2     | 30   | 27   | 10,302| 12,470| 20,284| 19,078| 9,862 | 6,609| 9,046 | 5,672| 2,864 | 2,774 |
| Ghior           | 12    | 2     | 203  | 40   | 6,686 | 9,150| 12,947 | 14,638| 6,261 | 5,488| 5,659 | 4,656| 1,930 | 2,200 |
| Gabtoli         | 12    | 2     | 126  | 24   | 5,333 | 7,315| 11,050 | 9,207 | 5,717 | 1,892| 5,135 | 1,227| 1,746 | 1,445 |
| Shibganj        | 24    | 4     | 60   | 110  | 5,332 | 5,768| 15,147 | 16,120| 9,815 | 10,352| 9,329 | 9,827| 2,283 | 2,430 |
| Nagorpur        | 3     | 2     | 67   | 27   | 8,671 | 9,906| 20,776 | 15,419| 12,105 | 5,513| 11,317 | 7,613| 2,916 | 2,141 |
| Total           | 92    | 29    | 1,684| 604  | 6,910 | 8,431| 14,720 | 14,946| 7,798 | 6,536| 7,171 | 6,061| 2,263 | 2,292 |

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to six times – in what is called "optimum ploughing" – before irrigating them.

3. A "basal dosage" composed variously of decomposed potato leaves and water hyacinth, cow dung, oil cake and poultry droppings are mixed thoroughly with the soil during ploughing.

4. The plots are irrigated. They are then ploughed a second time to make the soil muddy (a desired quality) and to mix the compost thoroughly with the soil.

5. Irrigation water in the plots is kept at a certain depth (usually 1") while the seedlings are transplanted. It is then maintained at depths which range between 1 1/2" to 2 1/2" at the vegetative to the "milky" stage of the crop's growth.

This technique is called "optimum irrigation".

6. A "top dressing" made up of cow dung (in dust form), oil cake and poultry droppings is applied on the plots.

7. No "quick composting" nor green manuring is done. At times, however, azola is used to improve the soil's nitrogen regeneration capacity.

8. Disease and pest infestation was hardly recorded in the plots. However, a number of techniques to control pests were used when necessary:
   - Simultaneous drying and "moisturing" of plots;
   - Application of a mixture of ash and neem powder;
   - Use of light traps.

**Accomplishments**

Table 1 shows the comparative economic performance of ecological and chemical practices for HYV rice cultivation in the 10 irrigation command areas shows that Proshika's ecological Agriculture Programme is on the right track:

The "ecological agriculture" plots required a significantly lower investment per acre while producing yields comparable to those of "chemical agriculture" plots. This has resulted in a higher net margin for ecological agriculture.

It is noteworthy that the experiment lasted only for a year. It is expected that over a period of time, the productivity of the soil will have been restored and enhanced by ecological farming techniques, and thus investment will become even lower and production much higher. And if one were to consider the environment friendliness and sustainability of ecological agriculture, then the benefits from shifting to this alternative farming system would be better appreciated.
About 55% of the total geographical area of India was available for cultivation in 1983-84. Of this, 43% was actually under cultivation, the remaining 12% consists of fallow land and culturable waste. Of the 181 M ha. available for cultivation, 130 M ha. are devoted to foodgrain cultivation, the rest to cash crops, horticultural crops, and plantation crops (Fig. 1). Various cropping patterns are followed in India, depending upon the agro-climatic features of different areas—principally, the amount of rainfall and availability of irrigation. Some of the major cropping patterns include multiple cropping in irrigated areas; farming in semi-arid areas; mixed cropping and inter-cropping, particularly in unirrigated areas; multi-level vertical cropping; forestry and agro-forestry; mixed farming; kitchen gardening, home fish gardening and sea-farming.

Major Crops
Food grains, which include rice, wheat, jowar, bajra, maize and pulses are grown on 130 M ha. (1983-84), while commercial crops, plantation crops and horticultural crops are planted on 12.5 M ha. Commercial crops include cotton, jute, mesta, oilseeds and sugarcane. Other plants, such as cotton, jute and mesta, serve as important raw materials for agro-based industries.

The bulk of the value added in agriculture is accounted for by food grains and cash crops, but horticultural crops play an important role owing to their value in providing income and nutrition to the growers. Among the major horticultural crops are a wide range of fruits, vegetables, coconut and cashewnut.

By far the most important plantation crop in India is tea which is grown widely in the hills of Assam and West Bengal, in the Nilgiris in the South and in certain parts of the Central Himalayas. Also considered major crops are rubber and a variety of spices, such as cardamom, clove and black pepper.

Factors Determining Structure of Land Use
Colonial Influence
The colonial government, which ruled India for nearly two centuries, made the extraction of India's agricultural surplus its primary objective. To achieve this goal, it experimented with many forms of exploitative systems. At the time of independence, there existed three major forms of land revenue systems, namely Zamindari, Mahalwari and Ryotwari. Between the state and the actual tiller of land, there existed a large number of intermediaries, all of whom had to be supported by the labor of the cultivator. Tillers neither had control over land use, nor any incentive to obtain it. Further, because of insecurity of tenure
is received throughout the year. Thus, in theory, anytime is cropping time.

Soil type

India contains a wide variety of soils. Soil characteristics play an important role in determining crop patterns. Red soil, found in the Deccan, is sandy and hence cannot retain water because of its high porosity. Alluvial soil, by virtue of its rich nutrients and water-retaining capacity, is the most fertile type of soil, contributing the largest share of farm output. The black soil found in the Deccan plateau originating from lava is rich in humus and is extremely suitable for growing cotton. Laterite soil formed by the weathering of the laterite rocks which contain calcium is favorable for the cultivation of tea plants.

Alluvial soil: Perhaps agriculturally the most important, this type of soil is found in North India, Bihar West Bengal and parts of Assam, Orissa and Central South India. In North India, this soil is found in Punjab, Haryana and Uttar Pradesh. Being the most fertile among the different types of soil found in India, alluvial soil is used by farmers to grow cereals, pulses and sugarcane. This soil has a low humus and nitrogen content. Calcium and phosphorous are present in large amounts.

Red soil: Peninsular India and some coastal regions are characterized by these soils which are low in humus, nitrogen, phosphoric acid and lime. Their colour is due to iron. Their texture is slight and porous.

Black soil: Their texture varies from loamy to clayey. These soils are found in central India, Maharashtra, Andhra Pradesh and Tamil Nadu. Black soils are deficient in structure, and marketing. Figure show the effect of its activities an average annual growth rate of 2.7%, well above the population growth rate of 2.2%.

Agricultural growth underwent two broad phases, with the mid-60s marking the beginning of a major transition. The period witnessed the adoption of new crop varieties along with

<table>
<thead>
<tr>
<th>Table I. Agricultural Production in India</th>
<th>1970-71</th>
<th>1980-81</th>
<th>1989-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foodgrains</td>
<td>108.4</td>
<td>129.6</td>
<td>171.0†</td>
</tr>
<tr>
<td>Cereals</td>
<td>96.6</td>
<td>119.0</td>
<td>158.2</td>
</tr>
<tr>
<td>Rice</td>
<td>42.2</td>
<td>53.6</td>
<td>73.6</td>
</tr>
<tr>
<td>Wheat</td>
<td>23.8</td>
<td>36.3</td>
<td>49.8</td>
</tr>
<tr>
<td>Jowar</td>
<td>8.1</td>
<td>10.4</td>
<td>12.9</td>
</tr>
<tr>
<td>Bajra</td>
<td>8.0</td>
<td>5.3</td>
<td>6.6</td>
</tr>
<tr>
<td>Maize</td>
<td>7.5</td>
<td>7.0</td>
<td>9.7</td>
</tr>
<tr>
<td>Others</td>
<td>7.0</td>
<td>6.4</td>
<td>5.6</td>
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<tr>
<td>Pulses</td>
<td>11.8</td>
<td>10.6</td>
<td>12.6</td>
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<tr>
<td>Gram</td>
<td>5.2</td>
<td>4.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Tur</td>
<td>1.9</td>
<td>2.0</td>
<td>2.7</td>
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<tr>
<td>Others</td>
<td>4.7</td>
<td>4.3</td>
<td>5.7</td>
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<tr>
<td>Oilseeds†</td>
<td>9.6</td>
<td>9.4</td>
<td>16.9</td>
</tr>
<tr>
<td>Groundnut†</td>
<td>6.1</td>
<td>5.0</td>
<td>8.1</td>
</tr>
<tr>
<td>Rapeseed &amp; mustard</td>
<td>2.0</td>
<td>2.3</td>
<td>4.1</td>
</tr>
<tr>
<td>Others</td>
<td>1.5</td>
<td>2.1</td>
<td>4.7</td>
</tr>
<tr>
<td>Tobacco</td>
<td>0.36</td>
<td>0.46</td>
<td>0.56</td>
</tr>
<tr>
<td>Cotton (lint)‡</td>
<td>4.8</td>
<td>7.0</td>
<td>11.4</td>
</tr>
<tr>
<td>Jute‡</td>
<td>4.9</td>
<td>6.5</td>
<td>7.1</td>
</tr>
<tr>
<td>Sugarcane†</td>
<td>126.4</td>
<td>150.2</td>
<td>225.6</td>
</tr>
<tr>
<td>Tea*</td>
<td>0.42</td>
<td>0.57</td>
<td>0.68</td>
</tr>
<tr>
<td>Coffee</td>
<td>0.11</td>
<td>0.12</td>
<td>0.12</td>
</tr>
</tbody>
</table>

† 1991-92; (172 mn. tonnes)
‡ Comprising groundnut, rapeseed and mustard, sesameum, linseed, castorseed, Nigerseed, safflower, sunflower and soybean.
§ Cotton in mn. bales of 170 kg. and jute in mn. bales of 180 kg. each.
* Calendar years

AGRICULTURAL SECTOR

Agricultural Growth

In the post-independence period, the government achieved much by way of improved irrigation, technology, agrarian

and rack-renting, the cultivator had no incentive or capability to improve the land's productivity.

Policies affecting agricultural production were unfavorable. The colonial government had no explicit price policy. Commercial banks functioned only to serve export trade, and not farm production. The colonial government did make a modest attempt to provide irrigation facilities through the construction of new canals and renovation of some old ones, but politics was often the basis for site selection. Many of these were placed in regions the colonial regime considered vulnerable to external attack or that were among the principal sources of soldiers for the colonial army.

National policy

After independence, the government abolished the zamindari system, eliminated intermediaries, introduced tenancy reforms, put a ceiling on land holdings, and consolidated holdings. Though well-intentioned, these agrarian reform measures failed to eliminate feudal and semifeudal relations. Absentee landlordism persisted, albeit on a smaller scale. A major source of concern was the fragmentation of land holdings caused by population growth pressure. After independence, almost all states except Tamil Nadu, Kerala, Manipur, Nagaland, Tripura and parts of Andhra Pradesh enacted laws to consolidate holdings. The implementation of the laws, however, has been patchy and sporadic. Only in Punjab, Haryana and Western Uttar Pradesh has consolidation work been completed; it is also partially completed in Maharashtra and Madhya Pradesh. So far, only about 36% of the cultivated area has been consolidated. The primary reason for the slow progress is the tenants and small and marginal farmers' fear of eviction. In the process of consolidation, some large land owners have in fact got rid of the tenants and sharecroppers. Another impediment is the law which requires that a holding fall below a minimum size to qualify for consolidation.
increased use of such modern inputs as fertilizers and pesticides—essential ingredients in the so-called "Green Revolution." Two interesting points may be noted in this connection. First, in the phase 1960-65, foodgrains output grew at 2.58% and non-foodgrains at 3.5% a year, while in the second phase of 1965-85, the corresponding growth rates were 2.81% and 1.75%. Secondly, in the first phase, area expansion contributed 1.4% to the growth of foodgrains and 2.3% to the growth of non-foodgrain output. In the second phase, these contributions were 0.44% and 1.19%, respectively.

Food production in India has increased by roughly 350% from the level of 50.5 M tonnes in 1950, reaching a peak at around 176 M tonnes in 1990-91 (Table 1). This means that in 40 odd years, the level of progress achieved paralleled the progress made in the preceding 5000 years. This remarkable growth was achieved through a package of technologies consisting of high-yielding seed varieties, irrigation, fertilizers and pesticides. By no means was the "Green Revolution" an unmixed blessing; as subsequent sections will point out.

It is interesting to note that the regions that experienced the most growth are those that possessed four major requisites to the rapid adoption and diffusion of the new technologies: owner cultivation, land consolidation, rural electrification, and rural communications.

Although traditionally the dominant economic activity in India, and despite having maintained its pre-eminent position, agriculture has been decreasing in economic importance to the country. Its share in the Gross Domestic Product has now come down to about 33% from 60% at the time of independence in 1947. However, the share of agriculture in providing employment is still as high as 65% of the total "main workers".

Policy Support

The government's main emphasis in agriculture is to ensure well-rounded stability, which concretely means self-sufficiency in the production of foodgrains (cereal and pulses) and other essentials like oilseeds and major cash crops, such as tea, coffee, jute, cotton and tobacco.

Agricultural income has so far not been taxed, and taxation as it obtains in the agricultural sector does not serve as a disincentive to production. Whether price differentials and intersectoral terms of trade have any such effects still needs to be determined.

Studies show that farmers respond to price changes by varying cropping patterns accordingly. Findings such as those by Thamarajakshi show that the terms of trade changed in favor of agriculture with the arrival of the new technology. By the 1970s the terms of trade favored industry; in recent years the trend seems to have been reversed in favor of agriculture. Moreover, the emergence of rural pressure groups, primarily the affluent farmers, has led to a change in the method of computing costs and prices of agricultural production, and the fixing of official support prices. This has ensured higher prices for farmers. However, it is richer farmers that have been better fitted than the farming community as a whole. Hence, many farmers have withheld surplus wheat, forcing the government to import about 3 million tonnes of wheat at much higher prices to regulate the foodgrain market.

Substantial subsidies long given on such inputs as chemical fertilizers, electricity charges, etc., are being withdrawn in phases under the current structural adjustment program. To compensate the farmer, support prices are being substantially increased.

The Green Revolution

Nothing has brought into sharper relief the issues pertaining to sustainable agriculture than the new agricultural strategy which produced the "Green Revolution." The government adopted the strategy towards the end of the '60s in response to the need to boost food production, particularly after two successive droughts and after food imports had reached alarming proportions. This strategy was adopted to bring about a science-based transformation in Indian agriculture.

The first program of this nature was the Intensive Agricultural Development Programme (IADP) launched in 1960-61 in selected districts in India. It was on the basis of the recommendation of a team of Ford Foundation experts who visited India in 1950. IADP was the first attempt to bring in a top-down science-based, chemically intensive strategy, which used industrial inputs such as fertilizers and pesticides. The new strategy was extended to a larger area from 1966-67 onwards.

The distinguishing feature of this strategy was the use of new high-yielding varieties (HYV) of seeds developed in such institutions as the International Maize and Wheat Improvement Centre in Mexico and the International Rice Research Institute (IRRI) in the Philippines. The wheat seeds which initially met with success in Mexico were imported by many countries including India. The semi-dwarf HYW wheat seeds were developed in the 1950s by Norman Borlaug. By 1968 almost half of the wheat seeds planted were of these dwarf varieties (Table 2).

The HYV seeds helped in increasing food production in India by more than 30% between 1966 and 1991. The new seeds turned a much larger proportion of the soil nutrients into grain. This increases the yield, particularly with higher inputs of nutrients. Along with higher yields, the seeds have a shorter maturity period and, thus, a

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**nitrogen and phosphoric acid and conducive to the cultivation of cotton.**

**Laterite soils:** These soils have a low organic matter content and a high water absorption capacity. They are found in Karnataka, Kerala, parts of Orissa, parts of Assam and certain areas of Central India. These soils are not rich in plant nutrients and have to be managed efficiently.

**Desert soils:** These are found in arid and semi-arid conditions, largely in Rajasthan and in the Southern parts of Punjab. This soil is poor in organic matter.

**Forest soils:** These soils are formed by the action of organic matter from forest vegetation. Variations in climate cause forest soils to form differently in the plains and in the hills.

**Peaty and Marshy soils:** Peaty soils are a result of the accumulation of large quantities of plant residues which are only partially decomposed in submerged or watery areas. Peaty soils are primarily found in Kerala. Marshy soils are of a similar nature and are found in some parts of Orissa, West Bengal, North Bihar, Uttar Pradesh and the Eastern coast of Tamil Nadu.
Table 2. Area Under High Yielding Varieties of Seeds
(Million Hectares)

<table>
<thead>
<tr>
<th>Crop</th>
<th>1985-86</th>
<th>1987-88</th>
<th>1989-90</th>
<th>Seventh Plan Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>23.5</td>
<td>22.1</td>
<td>26.2</td>
<td>32.0</td>
</tr>
<tr>
<td>Wheat</td>
<td>(57.0)</td>
<td>(57.3)</td>
<td>(62.1)</td>
<td></td>
</tr>
<tr>
<td>Jowar</td>
<td>19.1</td>
<td>19.7</td>
<td>20.3</td>
<td>22.0</td>
</tr>
<tr>
<td>Bajra</td>
<td>(83.0)</td>
<td>(85.4)</td>
<td>(86.4)</td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>6.1</td>
<td>6.1</td>
<td>6.9</td>
<td>6.5</td>
</tr>
<tr>
<td>(37.6)</td>
<td>(38.7)</td>
<td>(46.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(46.8)</td>
<td>(45.4)</td>
<td>(51.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(31.0)</td>
<td>(22.2)</td>
<td>(23.3)</td>
<td>(3.0)</td>
<td></td>
</tr>
<tr>
<td>(38.8)</td>
<td></td>
<td></td>
<td>(39.0)</td>
<td></td>
</tr>
<tr>
<td>Rag</td>
<td>-</td>
<td>-</td>
<td>61.2</td>
<td>70.0</td>
</tr>
<tr>
<td>Total</td>
<td>55.4</td>
<td>54.1</td>
<td>61.2</td>
<td>70.0</td>
</tr>
</tbody>
</table>

Figures in parentheses give the percentage of HYV area to total area under the crop.

Source: Economic Survey - 1991-92, Govt. of India.

Emerging Sustainability Issues

BIOLOGICAL LIMITS

Land Degradation

One of the ironies of Indian agricultural progress has been created by an overwhelming, although understandable, concern to maximize food production to match the population growth rate. The rise in the grain yield has, however, extracted a heavy price by way of land and natural resource degradation.

India’s population, which is nearly four times that of the United States, is supported by the same crop land base of about 350 M acres. And yet, policy support for soil conservation has been miniscule. The government only began to realize the gravity of the problem in the ‘80s, when ecological consciousness started seeping into the bureaucracy. A Ministry of Environment was created but it appears that the government pays greater attention to industry-related environmental matters. Apparently, the process of land degradation goes on apace. There is inadequate documentation of the degree turned resource loss, although B.B. Vohra (New York, 1982) estimates that 61% of India’s agricultural lands are degraded to some extent.

Loss of farming lands is taking place not only through soil erosion and other related causes flowing from the application of new technology, but also through the encroachment of human habitats on farmland. The living space requirements of the 14 M people added to India’s population each year are at least partly met by homes built on crop land surrounding the cities and 6,000,000 villages (Government of India, 1976). This process has not been an unthinking human endeavor. There has been a boom in the real estate business in the 1980s around the metropolitan towns of India, such as New Delhi, Bombay, Bangalore, Calcutta and Madras. As a consequence, thousands of acres of agricultural land are being turned into concrete jungle. Apparently, no government policy has been formulated to regulate urban impingement on farmland.

Soil Erosion

It has been estimated that each year India loses around 6,000 tonnes of top soil. Measured in terms of the loss of major nutrients like nitrogen, potassium, phosphorous, the country loses the equivalent of 5.37 M tonnes of chemical fertilizers every year.

Experts at the Indian Council of Agricultural Research point out that a conversion of thick forests into farmland under the Grow More Food campaign during the 1940s encroachment onto more and more forests and grasslands to meet food, fuel and fodder needs, and the adoption of exploitative intensive cultivation techniques, with disregard to topography, have been at the root of relentless soil erosion in the country. Development activities like mining have also been responsible for soil loss, as well as overgrazing, forest fires, burning of grassland, deforestation and the destruction of organic matter.

In 1985, the Ministry of Agriculture computed that around 175 M ha. of otherwise productive land are subjected to various types
of erosion (Rao, New Delhi 1992). Of this, 111.3 M ha. were subjected to erosion from water, 38.7 M ha. from wind, 8 M ha. from salinity and alkalinity, 0.6 M ha. due to waterlogging, 4 M ha. from rains and gullies, and 4.3 M ha. from torrents and floods.

Studies conducted by the Central Soil and Water Conservation Research and Training Institute at Udhhagamandalam reveal that in the well managed lands four tonnes of soil per ha. a year, while in the ill managed lands from 20 to 120 tonnes are lost through erosion. It has further become apparent that a trade-off exists between the benefits obtained today from large dams and the losses to be incurred tomorrow from the soil erosion that they cause. The debate has extended to such projects as the Narmada Valley Development Project and the Tehri Dam Project.

Water Management
A major sustainability issue that has emerged in the course of the Green Revolution is water management. HYV seeds require more intensive use of water. Farmers are motivated to use ground water in excess, because water is a primary agent in raising output.

In Eastern Uttar Pradesh, private tubewells are now the most important and fastest growing source of irrigation, according to the findings of Kripa Shankar (1992). He estimates that private tubewells now account for 55% of the net irrigated area whereas only two and a half decades ago they were practically non-existent.

By 1984-85, ground water accounted for 42% of India’s irrigation potential and nearly 48% of the net area actually irrigated (Saksera, 1989). At present, roughly 35 M ha. of crop area can be irrigated from ground water. This exceeds the 33 M ha. irrigation potential created through all major and medium irrigation works (Dhawan, 1990).

Since the 1950s, but more pronouncedly in the past two decades, the use of ground water has grown explosively. Nationwide the number of diesel and electrical pumps jumped from 87,000 in 1950 to 12,581 M in 1990, a continuous growth rate of over 12%. As a consequence, water tables are dropping, particularly in areas underlain by hard rocks or with low recharge levels. Saline intrusion has also become a problem in many coastal regions (Moench, 1992).

On a larger scale, dropping water tables increase the pumping energy needed to produce the same irrigation service. Roughly 2% of India’s electricity production is currently devoted to pumping groundwater.

Over-exploitation of ground water resources is increasingly being recognized as a major problem. How to address the problem is, however, not clear. Several states have passed or are considering laws designed to regulate ground water extraction. Where previously attempted, regulations are widely ignored. Compounding the problem is past government encouragement; credit schemes, for instance, are popular, and politically difficult to limit (Moench, 1992).

Adverse Effects of the Green Revolution
It is only now when the Green Revolution has reached a plateau that many experts have begun to realize its baleful effects. Their concerns include reduced genetic diversity of the crops, soil fertility, and soil salinity. The new technology has likewise made the farmer more dependent on purchased inputs, in contrast to traditional farming.

The HYV seeds do increase yields, but do so only in the presence of complementary inputs like fertilizers, pesticides and irrigation. The inputs are obtained primarily through the market. Traditional agriculture, on the other hand, uses indigenous cropping systems with inputs that are family- and farm-based; these inputs are much more friendly towards the soil and environment.

HYV technology has been found to have adverse effects on the ecology. These include the exacerbation of the greenhouse effect, the destruction of soil fertility, rising soil toxicity, waterlogging and increased salinity, and pesticide contamination of food, soil, and water.

Green Revolution technology destroys the genetic diversity of crops. This happens in two ways. First, is through the promotion of monocultures. Secondly, the new technology has also brought about the conversion of forest land as well as land planted to other crops into wheat and rice farms.

HYV seeds are susceptible to such plant (particularly wheat) diseases as leaf Blight, Brown Rust and Loose Slatin. These seeds thus need to be replaced frequently—every three-to-five years. This is true of both wheat and rice. Traditional seeds are more resistant to pests and diseases. The narrow genetic base of the new seeds also contributes to pest vulnerability. It is better to reduce the degree of pest vulnerability by using a variety of eco-friendly seeds, rather than using seeds that necessitate artificial means of pest control.

Fertilizer Use and Effects
Fertilizers are a crucial input in the new technology. In traditional agriculture, fertilizers were merely supplemented organic manures whereas the new technology accorded a direct and crucial role to chemical fertilizers. Heavy fertilizer use leads to soil erosion and soil fertility loss. Much of the area where the Green Revolution has been in operation has alluvial soil which is intrinsically one of the most fertile among India's soils, but the Green Revolution reduces soil fertility by excessive exploitation and disruption of the cyclical movement of nutrients, which traditional agriculture respects.

The heavy use of fertilizers has increased India's dependence on imports. Fertilizer subsidies likewise put considerable pressure on government finances. The Green Revolution chemical inputs have increased soil toxicity by introducing trace elements such as fluoride and other harmful elements in the ecosystem. At the same time, the use of NPK fertilizers causes rapid micro-nutrient deficiency by taking away such elements as zinc, iron, copper, manganese, sulphur and magnesium from the soil.

Pesticides
A related source of risk to human and animal life as well as to the environment are pesticides. It has been estimated that at least 1 M people are poisoned every year by pesticides. Although awareness about this danger came quite early on, little has been done to effectively combat it.
Table 8. Consumption of Chemical Fertilisers

<table>
<thead>
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<th>1980-81</th>
<th>1985-86</th>
<th>1989-90</th>
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<tr>
<td>Million Metric Tonnes</td>
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<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphorous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Economic Survey 1991-92, Gov't of India

SOCIAL LIMITS

Land Tenure
Despite a plethora of legislation and a series of social movements, the distribution of land continues to be highly uneven and "land to the tiller" remains a distant goal. For example, in 1980-81 marginal holdings (of less than 1 ha. each) accounted for as much as 56.4% of the total number of holdings but only 12.1% of the total area of land; whereas medium (four ha. to ten ha. each) and large (10 ha. and above each) holdings and as much as 52.6% of the total area of land. The situation varies widely across the states. In certain areas beset with acute poverty, over 40% of the rural households are landless although their mainstay is agricultural labour. Unless land is equitably shared, sustainability in agriculture will remain greatly handicapped.

Food Security
Increased production offers no guarantee of economic access to food. The increase in per capita per diem availability of foodgrains in the country from 305 gm. in 1950-51 to 510 gm. in 1990-91 has not ensured food security for the poor. As of 1987-88, government statistics show that about 30% of the population lived below the poverty line. About half of the rural population has inadequate access to food.

Subsidized supplies of foodgrains and some other edibles through the public distribution system (PDS) could provide badly needed relief to the poor, but PDS remains defunct in most of the rural areas despite its recent revamping in about 1,700 of over 5,000 blocks in order to better target tribal groups and other rural poor. Generally, it is the urban population which derives the major benefits from the PDS.

Finally, the benefits of the so-called Green Revolution remain confined to a small area, which contributes the bulk of the marketable surplus foodgrains. This entails problems of procurement, transport, storage for distribution to the food-deficit areas, far away from the urban areas. The solution obviously lies in shifting from "mass production" in a small area to "production by masses" and "local production, local consumption" across the country. The Eighth Plan aims at such a shift: the diversification and broadening of the agricultural base of the country. Its success, however, is far from assured.

Factors Contributing to Unsustainability

GOVERNMENT POLICIES
The beneficial impact on agricultural sustainability of a host of well-intentioned government policies has not been as great as originally envisaged. The implementation of two important federal laws—the Insecticides Act, 1968 and the Water (Prevention and Control of Pollution) Act, 1974—helps illustrate the point.

The Insecticide Act failed to strongly encourage the move away from the use of artificial pesticides. Experts have noted with unease inadequacies in the implementation of the Act's provisions for monitoring pesticide residues (Bhargava, 1992). Hence, it is not surprising that ever-increasing traces of pesticides are being found in food stuffs, human fat, and animal tissues.

The impact of the Water (Prevention and Control of Pollution) Act has likewise been minimal owing chiefly to a lack of political will among the state governments charged with enforcing the law. Apart from the considerable political interference and influence-peddling exerted by factory owners, administrators have to contend with the stock Third World argument in defence of environmental laxity. It is argued that it is not in the interest of development to suddenly coax an industry into investing in expensive equipment to treat effluence to the point of ecological harmlessness. Stringent environmental regulations merely serve, therefore, to nip a developing country's nascent industrial sector inadvertently in the bud. The constraints of underdevelopment thus prevent the realization of the original objectives of environmental policy.

Consequently, government officials tend to spare companies from purchasing machinery needed to comply with environmental standards, since obtaining and maintaining such expensive equipment supposedly impairs these companies' economic viability.

Yet another policy issue affecting agricultural sustainability is urban-biased price control. Only a fraction of city dwellers receive part of their food needs from their own farms, which are filled either by other members of the family or by tenants. The overwhelming majority of urban dwellers depend on the market for their food. Since most of them are poor, having just migrated from the countryside, the government feels obligated to subsidize foodgrains and other commodities (such as sugar and edible oils).

The increasing demand for food in the urban areas compels the government agencies to procure ever larger quantities of grains. To ensure the steady flow of foodgrains to the market, the government has to encourage farmers to produce as much as they can without worrying about price fluctuations. This is taken care of through a scheme of support prices. The arrangement makes it highly profitable to go into intensive cultivation and multiple-cropping, using high-yielding seed varieties, fertilizers and pesticides.
MARKETING CARTELS
Marketing cartels exert a deleterious force on agricultural sustainability. Grain traders make excessive profits by purposely withholding grain from the market to create a scarcity of food and a regime of abnormally high prices.

Starting in the mid-1960s, and especially after 1971 when India felt confident enough to discontinue US food aid, trading cartels played a major role in determining the sourcing and distribution of grains in certain areas. From time to time, during difficult years, their operations were restricted. On occasion, private traders were banned from entering the market or were prohibited from moving grains from surplus states to deficit states. At present, traders and cartels are free to operate in the manner they choose. By virtue of their more dynamic approach to the market compared with government grain procuring agencies, the private firms are able to establish closer links with the big farmers, whom they strongly enjoin to go into intensive chemical-dependent farming.

The study also notes that in the new technology era, the pattern of growth in agriculture has created chronic regional imbalances. This can partly be attributed to region-specific structural characteristics, although no one can deny the failure of policies in minimizing the gap between regions. Among the various policy instruments, input subsidies should have been used carefully for this purpose. The series presented by Gulati on the regional spread of subsidies clearly brings out two contrasting conditions. The first applies to such states as Uttar Pradesh, Punjab, Andhra Pradesh, Tamil Nadu and Maharashtra which received the bulk of the subsidies. On the other end are such states as Orissa, Assam, Himachal Pradesh, Kerala and Jammu and Kashmir which received only a small share.

The policy adopted on the suggestion of the World Bank and the IMF has received support from experts who have conditioned their approval on using the funds saved from withdrawing subsidies to help small and marginal farmers. The viability of the small and marginal farmers should be increased through better targeting by credit and other institutional facilities. These facilities should not only help small farmers cope with higher input prices but also complement their farm incomes.

Another, more sustainable, option would be to invest the money obtained from cutting subsidies into the development of rainfed agriculture and in increasing the productivity of these regions through watershed development programmes.

In an excellent study of the ecological and political risks of the biotechnology revolution Vandana Shiva (1992) points out the three principal elements of the new technological fix. These are: First, the substitution of wheat and rice produced for the domestic market with fruits and vegetables produced for export. Secondly, the Green Revolution technologies have been replaced by new biotechnologies, integrated more deeply with farm chemicals, on the one hand, and food processing, on the other. Thirdly, there is a total neglect of staple food production as a primary objective of public policy.

It is interesting to note that the new biotechnology symbolized by the PepsiCo project for Punjab was conceived against the background of the ecological destruction caused by the monocultures of the Green Revolution. The call for agricultural diversification in Punjab was contained in the Johl Committee report of 1985. As Shiva says, “A policy for diversification involves an increase in the genetic diversity in cropping systems. However, the PepsiCo project and the associated new seed policy which was announced in September 1988, threaten to further erode genetic diversity in agriculture by narrowing the crop base, and increasing the ecological vulnerabilities through the introduction of exotic varieties of fruit and vegetable monocultures.”

Improvement in the potato seeds envisaged under the PepsiCo project implies making it more appropriate to its processing plant. Imported machinery will be used to process 30,000 tonnes of potato and 1,600 tonnes of grain annually. The end result is that new potato seeds will replace the indigenous table varieties of potato. To comprehend what this new technology will bring about, it is useful to remember that 40% of the potatoes cultivated in the United States is of the Russet Burbank variety (in the US today, only 12 out of the 2,000 potato species are cultivated). The demand for Russet Burbank grew because the size of this specie of potato is compatible with the specified
The Agricultural Crisis is a Cultural Crisis

V
otaries of the concept of alter native agriculture hold that the agricultural crisis of today is a crisis of culture. Wendell Berry sums up the view thus:

“A healthy farm culture can be based only upon familiarity and can grow only among a people soundly established upon the land; it nourishes and safeguards a human intelligence of the earth that no amount of technology can satisfactorily replace. The growth of such a culture was once a strong possibility in the farm communities of this country (United States). We now have only the sad remnants of those communities. If we allow another generation to pass without doing what is necessary to enhance and embolden the possibility now perishing with them, we will lose it altogether. And then we will not invoke calamity — we will deserve it”.

If this was true of the United States of the 1970s, which it undoubtedly was, it is grimly true of the India of the 1990s and in the decades ahead. The continuing research and extension bias in favour of monocultures and the scientific methodology applied in defence of the new strategy have reduced agriculture to an unhuman activity which is no longer an integral part of community culture.

Today’s agriculture, in an ecological sense, is not sustainable, more so in India with extreme ecological and cultural diversities. Thesy of modern scientific agriculture are those augmented yields are the result of large injections of fossil fuels and minerals into the processes of mechanization, fertilization, irrigation, pest control and transportation.

There certainly is, therefore, a case for looking at sustainable agriculture from a different people-centered as well as ecological perspective. Aldo Leopold (1949) described agricultural sustainability in aesthetic terms: “Examine each question (of land use) in terms of what is ethically and aesthetically right, as well as what is economically expedient. A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise.”

length of McDonald fries.

The reason the PepsiCo project has engaged the attention of the environmentalists so closely is that it symbolizes the new shift in the agricultural policy, particularly on seed. The focus is on seeds of flowers, oilseeds, coarse grains, vegetables and fruits, and not on food staples. The new seed policy thus implies the erosion of indigenous crops and crop varieties, while introducing heavier use of toxic agro-chemicals.

The danger of the new seed policy is this has brought the import of seeds and seed-processing under the purview of the Open General Licence. The free import of genetically engineered seeds and crop varieties will lead to a drastic increase in the demand for chemical herbicides for use on herbicide and pesticide-resistant crops developed by agrochemical companies. India may well follow in the footsteps of the United States where annual sales of herbicides sprayed on herbicide-resistant plants amount to $120 M.

MARGINALIZATION OF INDIGENOUS KNOWLEDGE

A major consequence of the triumph of monocultures would be the gradual marginalization of indigenous farming knowledge and practice, which are extremely rich, diverse and precious in India. There is often a thoughtless rejection of traditional agriculture as “unsound” and “backward”. But anyone familiar with the Indian agricultural scene is aware of the farmer’s tremendous knowledge of the soil, use of water, cropping patterns and selection of crop varieties which are most suitable for his farm land and ecosystem.

An interesting insight is provided into the level of the indigenous knowledge in farming in a study by W. David Hopper: “The economic organization of a village in North-central India”, which is an unpublished doctoral thesis authored by the author presented at the Cornell University in June 1957 (Schultz, New Delhi, 1964). Hopper summarizes an important part of the study thus: “An observer in Senapur (the village concerned) cannot help but be impressed with the way the village uses its physical resources. The age-old techniques have been refined and sharpened by countless years of experience, and each generation seems to have had its experimenters who added a bit here and changed a practice there, and thus improved the community lore. Rotations, tillage and cultivation practices, seed rates, irrigation techniques, and the ability of the blacksmith and potter to work under handicaps of little power and inferior materials, all attest to a cultural heritage that is richly endowed with empirical wisdom”.

Hopper then asks himself, “Are the people of Senapur realizing the full economic potential of their physical resources?”. From the point of view of the villagers the answer must be “yes” for in general each man comes close to doing the best that he can with his knowledge and cultural background.

There is further evidence that the indigenous knowledge of agriculture was comparable to some of the most developed systems in the world. A pioneering study by Raj Krishna (University of Chicago, 1961) of the supply responses of farmers in Punjab during the 1920s and 1930s indicates that the lag in adjustment in producing cotton was about the same as it had been for cotton farmers in the United States.

The large body of information of new technology makes it amply clear that the injection of outside elements in the form of industrially produced seeds, fertilizers and pesticides has not only made the farmer increasingly dependent on borrowed knowledge, but in the process of using it he has been forcing the traditional knowledge into disuse. This has a disastrous cultural dimension. To the extent that the farmer is part of a community which sustains itself on agriculture, this relationship is severely shaken, leading to a strange alienation and upsetting of moorings. It has thus been aptly said that a prosperous agriculture no longer implies a prosperous rural community.
Sustainable Agriculture Initiatives

Beginnings
Way before the late 1970s when Lady Eve Balfour, the British advocate of ecological agriculture coined the phrase “sustainable agriculture”, many government agencies and non-governmental organizations (NGOs) were already engaged, probably unconsciously, in work promoting a similar concept. If they were not aware of the intrinsic nature of their work, it may have been because their idea of what constitutes sustainability had yet to crystallize.

NGOs had long been advocating the basic ingredients of sustainable agriculture. They received enormous help from the academe, and inspiration from a rich and ancient tradition firmly grounded in ecological and cultural diversity. The intellectual and ideological substratum is likewise extensive. Most of India’s political and social leaders led by Mahatma Gandhi realized quite early on in the course of the freedom movement that the uplift of the countryside was essential to the emancipation of the nation, since more than 80% of the country lived in the villages. All the pioneers of Indian emancipation recognized the importance of the agriculture-based villages. Small wonder then that these leaders, and the organizations they created, undertook a kind of missionary work, promoted improved and sustainable farm practices.

It has, for instance, been common practice in India to dig village ponds or build other water harvesting structures both to provide drinking water and irrigation. Organizations, either on their own or helped by the government, constructed bunds to protect farmland from floods or undertook desilting work to renovate canals and reservoirs.

Work of this kind was looked upon by the ruling elite as being essentially marginal—a kind of idealistic function performed by NGOs. Rural values were generally identified with traditionalism and backwardness. This kind of cynical perception was certainly reinforced by the decay and backwardness of Indian agriculture and the primitive quality of rural life.

It may be a little too optimistic to assert that things have changed in essence, except perhaps in regions well exposed to the new agriculture. In the Western model of development that Indian leaders sought to follow, industry was promoted at the expense of agriculture. Fortunately, within a decade of winning freedom, the government realized the full importance of agriculture in the nation’s life. As a result, steps were taken to create infrastructural facilities, such as huge dams, roads to spread communication, and power generation and transmission networks to carry electricity to remote villages.

The basic facilities extended to Indian farmers were backed up by massive extension work to educate and persuade the farming community to adopt modern methods of cultivation and other measures to improve agriculture and village life. This was perhaps the first organized effort of the government agencies in the sphere of agricultural development.

Turning Point
At first, the new agricultural technology that led to the Green Revolution was very positively received, firstly because of its association with Western-inspired modernity, and secondly because of its initial spectacular success. For some time it did not occur to users and policy makers that the new technology could have adverse effects. Serious concerns about the long-term effects of the new technology began to spread only when environmental considerations started to dominate development debates during the ‘70s and ‘80s.

It was suddenly realized that traditional agricultural practices merited serious study and reconsideration. Environmentally-sensitive traditional farming has a lot to offer contemporary sustainable agriculture. Driven by their concern for the emancipation of the villages and the rural poor, NGOs played a leading role in this process of transformation. NGO initiatives were directed to areas which contributed in various ways to the enrichment of sustainable farming practices. Equitable sharing of the natural resources, especially land and water, as well as the benefits was an equally vital NGO concern.

OVERVIEW OF NGO INITIATIVES
India has a vibrant NGO sector. As a result of growing environmental and social awareness, NGOs in general now favor and promote sustainable agriculture, although a small number of them may still be enamored with the “new agricultural technology”.

The environmental NGOs have been making the most vital contribution to sustainable agriculture. There may be about 2,000 such NGOs in India; of which about 200 are quite active and about 50 are very effective and conspicuous. Most of the NGOs in India are multi-purpose, combining their work on environmental and sustainable agriculture with that in other fields.

Far more important than these numbers is the kind and quality of work done by NGOs in sustainable agriculture. Broadly, NGO sustainable agriculture initiatives may be classified into two categories:
Community-based Action and Social Movements.

In between, there are support NGOs in areas such as training of trainers (NGO functionaries) and knowledge building.

Before moving on to a few illustrative NGO initiatives of each category, it would be pertinent to mention that NGOs have a holistic approach to sustainable agriculture, addressing basic social, economic, and environmental issues of equity, efficiency, and ecological sustainability together. NGOs generally work with the rural poor—landless laborers and marginal and small farmers. These weaker sections, although constituting 30–90% of the Indian rural population, own a very small percentage of the area of agricultural land. Accordingly, equitable sharing of the natural resource base, namely land and water, as well as the benefits and income accruing from sustainable agriculture is a major issue addressed by the NGOs. Most of the marginal and small farmers have been left out of the Green Revolution and are still continuing with traditional agricultural practices at a very low level of efficiency. Farmers with medium- and large-size holdings are few but own a major portion of agricultural land. NGOs seldom work with them, except when sensitizing them to sustainable agriculture or social justice issues.

Inder Singh

Inder Singh, a farmer of Teral region in Uttar Pradesh continued to grow traditional varieties while most of the farmers in the area shifted to HYVs. As intensive irrigation and over-exploitation of groundwater led to the lowering of the water table, there occurred a shortage of irrigation water and HYVs could no longer be cultivated. However, Singh’s traditional varieties withstanded it well and were also able to cope with drought years much better than HYVs. Inder Singh’s seeds, which became popular as “Indrasan seeds”, yielded higher returns due to high yields, low cost of cultivation, and eco-friendly attributes. They eventually spread to about 50% of the cultivated area in the vicinity.

Water Users Association

The community-based Water Users Association (WUA) in Sukhomajri village in Ambala district (Haryana) has achieved tremendous success in micro-watershed development, village ecosystem management, and sustainable agriculture. As a result, agricultural production has increased three-fold, not to mention the many other benefits.

Community-based Action

Pani Panchayat

In many cases, community-based NGO initiatives in sustainable agriculture started with water, first because it is a critical agricultural input, and second because there is the least vested interest in water, making its community-based management and equitable sharing relatively easier compared to that of land. “Pani Panchayat” (water council) is an innovative community-based institution and system of water management developed by a local NGO, Gram Grahvan Pratisthan, in an acutely drought-prone Purandhar block of Pune district (Maharashtra). The initiative has moved on to ecosystem-based planning and development with the village as the basic unit. The councils have facilitated substantially increased production in income and employment, as well as greater food security for the communities and families involved. There has been a tremendous regeneration of the ecosystem in the villages covered.

Ralegaon Shindli Village

A similar community-based initiative under the inspiring leadership of a social activist, Anna Hazare, in Ralegaon Shindli village has produced equally remarkable results. It started with micro-watershed planning and water harvesting and moved on to village ecosystem-based planning and development with sustainable agriculture as a key ingredient. The village has since achieved full employment and a very high level of agricultural production and income without using chemical fertilizers, etc., as well as food security and considerable equity and social harmony.

Friends Rural Centre

A decade-long experiment with sustainable “Rishi Kheti” (alternative natural agriculture) undertaken by an NGO, Friends Rural Centre in Rasulia, Hoshangabad district (Madhya Pradesh) has yielded higher returns with indigenous seeds and organic manuring.

Society for Hill Resource Management School

Yet another relevant case is that of Chakriya Vikas Pranala, or CVP (cyclic system of development), an extremely promising concept and system of community-based efficient, equitable, and sustainable natural resource management developed by an NGO called Society for Hill Resource Management School (SHRMS). Starting in 1986 with one village, CVP now covers 23 villages in Palamau district (Bihar) and five more villages in the neighboring districts of Aurangabad and Buxar. With the village or hamlet as the basic unit, available land and human resources are pooled into a block. In CVP, the village manages the watershed and ecosystem, attempts to achieve zero run-off, and practices social fencing, completely stopping open grazing of livestock. Blending appropriate science and technology with the traditional wisdom and time-tested systems of organic farming, CVP promotes multi-layered multi-cropping agriculture based on the natural symbiosis between different species of plants. Each village unit under CVP is expected to achieve self-reliance in about seven years. A unique equitable and forward looking system of sharing of income, 3:0:3:1 has been introduced—one share of 30% each goes to (1) those who contribute labour, (2) those who contribute land, and (3) the village development fund for further investment; the remaining 10% goes to a village welfare fund to support educational and health care services, etc. Although now being experimented on in degraded land in hilly areas with a focus on timber and fruit tree cropping along with inter-cropping of legumes and tubers, the concept it equally applicable to sustainable agriculture with a very high level of efficiency and production and equitable sharing. CVP seeks to promote equity and social justice by realizing the tremendous potential of natural resources and human creativity even as it transcends the contentious issue of land ownership.
Krishi Vigyan Kendras
A number of NGOs have been running Krishi Vigyan Kendras, or KVKs (farm science centers), entrusted to them to generate and transfer agricultural technology with the active participation of farmers at the grassroots level. KVKs were started by the Indian Council of Agricultural Research (ICAR) in 1974. By the end of the Seventh Five Year Plan (1985-90), 109 KVKs had been established in 107 of about 450 districts in the country. Encouraged by the performance of NGOs, greater emphasis is being laid in the Eighth Plan (1992-97) on entrusting more KVKs to NGOs. Some of the KVKs run by NGOs have made notable contribution to sustainable agriculture.

Social Movements

The Bhooan-Grandan movement
The Bhooan-Grandan movement was a Gandhian movement led by Vinoba Bhave. It began with the Bhooan movement in 1951. It sought Bhooan (land gift) from land holders to redistribute among the landless. By 1957 the Bhooan movement had evolved into the Grandan (village gift) movement based on a comprehensive Gandhian philosophy of Gram-Swarajya (village self-government). The movement contained the basic elements of sustainable agriculture: equity, efficiency and sustainability involving autonomous and self-governed village communities. Physical achievements of the movement, although small as compared to the magnitude of the problem, were notable. Of a total of about 4.8M acres of land obtained in Bhooan, about 1.7M acres have been distributed among 709,209 landless households, most of whom belong to scheduled castes and tribes. It compares well with the ceiling-surplus land identified, acquired, and redistributed by the Government. Around 149,000 Grandans have been declared so far; follow-up has regrettably been weak as seen from the confirmation on only 13,054 Grandans. It was no doubt a social movement of great intensity and wide reach among the rural people during the post-independence period. The movement gradually fizzled out in the '70s, particularly with the passing away of its leaders, Vinoba Bhave and Jayaprakash Narayan.

Naxalite Movement
Although a Marxist political movement, the Naxalite movement is extremely relevant to the discussion on sustainable agriculture, especially as regards the issue of equity, social justice and social change. This movement emerged from exploitative and oppressive land and agrarian relations. Initially starting from Naxalbari in West Bengal in the late 1960s, the movement spread fast in states such as Bihar and Andhra Pradesh. However, due to its strategic inadequacies, lack of mass support, and rootless suppression by the government as well as due to inner conflicts and splits in the spearhead political party, the movement disintegrated and dwindled during the '70s.

It has been trying to reorganize and regenerate itself in the '80s through the '90s with the result that its area of influence now covers Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Orissa, and West Bengal. Many state governments are finding it difficult to cope with the movement. Notwithstanding the limited physical achievements of the movement, it has made vital contributions to the debate, thought, and action on the issue of equity and social justice in land and agrarian relations and access to natural resources, as well as on the larger issues of poverty eradication and social change.

Chhipko Movement
The Chhipko movement has contributed much to sustainable agriculture and eco-friendly development. Beginning in the early 1970s in the Garhwal Himalayan region of Uttar Pradesh, this movement has since gained worldwide recognition as a successful innovative ecological movement. It started with a focus on saving the forests. Since then, it has been addressing wide-ranging cultural, social, economic, and ecological issues including sustainable agriculture.

Bodh Gaya land movement
The Bodh Gaya Bhoon Anudolan (Bodh Gaya land movement) in Bihar, which started in the late 1970s, focused on the issue of redistribution of ceiling-surplus land of the Bodh Gaya Matt (a Hindu monastery) among the landless agricultural laborers of the area. In the process it addressed many vital cultural, social, and economic issues such as gender equity, prohibition, freedom from superstition, and rights of the poor to live with dignity. The movement succeeded in forcing the government to acquire and redistribute the ceiling-surplus land of the Matt among the landless labor households. The movement was spearheaded by a non-party youth activist organization called Kshatra Yuva Sangharsh Vahini.

Normada Bachao Andolan
Normada Bachao Andolan (NBA) (save Normada movement) is spearheaded by an all-India informal strategic network of NGOs and social activists. This movement opposes the multipurpose Normada Valley Development Project under which two large dams—Sardar Sarovar in Gujarat and Indra Sagar in Madhya Pradesh—would be constructed on Normada river along with eight other large dams, 300 medium dams and 8,000 small dams to be constructed in the valley over a long period. Normada river is the valley's lifeline. The project threatens to displace a large number of mostly poor and tribal people. The movement has been agitating on the issue of the inalienable right of the communities to their survival support systems and natural resource-base, while challenging the unsustainable growth-centered development model.

Research, Education, Advocacy
A number of apex, support, and/or research NGOs have been making notable contribution to documentation, articulation, knowledge-base, multi-level networking of local NGO initiatives, sensitization and policy advocacy, and training of NGO functionaries. Most of these NGOs address the larger issue of sustainable development and environment, which includes sustainable agriculture.

The Centre for Science and Environment (CSE), New Delhi is one of the most prominent NGOs of this type. Its publications, such as "State of India's Environment: A Citizens' Report" (First, Second, and Third), have made a tremendous contribution to
environmental awareness in the country. Hindi editions of the First and Second of these Reports brought out by the Environment Cell of Gandhi Peace Foundation, New Delhi have been extremely popular with grassroots NGOs and activists in large Hindi speaking areas. CSE has been equally active in the fields of networking, policy advocacy, and training. Likewise, the Research Foundation for Science and Ecology, Dehradun has been adding to the knowledge-base. Vandana Shiva's publications such as "Staying Alive" and "The Violence of the Green Revolution: Ecological Degradation and Political Conflict in Punjab" merit special mention. Awareness and action generated through such initiatives and efforts has greatly contributed to the cause of sustainable development and agriculture.

Last but not the least, media has been making tremendous contributions to the cause of sustainable agriculture as of sustainable development. NGOs’ alliance with media has been extremely helpful in this regard.

Lessons and Insights

- Notwithstanding the progress made during the post-independence period, Indian agriculture basically remains unsustainable and unjust. It remains mired in a state of decay, operating at a very low level of efficiency. Sustainable agriculture is essential not only for food security and an enhanced quality of life, but for the very survival of the people and the ecosystem.
- Numerous NGO initiatives offer valuable insights into appropriate systems of sustainable agriculture and demonstrate their feasibility in extremely diverse ecological and cultural conditions across the country. However, the multiplier effect of such successful initiatives has so far been very limited primarily due to the inadequate attention focused on these accomplishments.
- Extremely rich traditional knowledge systems of sustainable agriculture in India provide a solid foundation to build upon; but these need to be revived, renewed, adapted to prevailing conditions, and progressively upgraded to meet present and future challenges.
- The task of sustainable agriculture, however, is formidable and challenging owing to SA’s scope and diverse requirements as well as certain systemic constraints. A relatively limited but extremely rich natural resource-base and equally rich human resources help, but these challenges can only be met by active and direct participation of millions of people in autonomous rural communities.
- Considering the extreme diversity of ecological and cultural systems in India, sustainable agriculture can best be promoted by using the village micro-ecosystem and micro-watershed as the basic unit. Actually, this was how Indian agriculture had traditionally been organized with remarkable success until it was disrupted by British colonial rule.
- Active direct people’s participation based on shared concerns, perceptions, priorities and objectives with minimal conflicts can take place only by adopting cohesive and homogeneous small village/hamlet level people’s organizations as basic social units. Incidentally, almost 75% of Indian villages have fewer than 1,000 persons or 200 households. These are easily organized into small, manageable, and cohesive units and communities. Larger Indian villages are also typically subdivided into small cohesive hamlets, making it possible to form hamlet level people’s organizations in these villages.

The 72nd Constitutional Amendment passed by the Indian parliament in December 1992 provides for greater and more effective democratic decentralization through the organizational medium of so-called Panchayats in rural India. The law is expected to facilitate the creation of village level organizations, and to promote sustainable agriculture.

Agriculture, along with agricultural extension, land improvement and soil conservation, minor irrigation, water management and watershed development, animal husbandry, dairying and poultry, fisheries, social forestry and farm forestry, etc. are among the concerns sought to be entrusted to the restructured and strengthened Panchayati Raj institutions. The Amendment promotes deeper and fuller democracy, in contrast with the existing restrictive form beset with counterproductive over-centralization.

- Obviously, sustainable agriculture needs to form part of a bottom-up decentralized process of people-centered development to replace the ascendancy top-down, centralized growth-centered development model. The bottom-up process of organization and development entails representative people’s institutions at different levels/tiers. Smaller ecosystems and watersheds will comprise an integral part of larger ecosystems and watersheds. Sustainable agriculture demands the promotion of equity. There are various ways of doing this, starting with the equitable sharing of water, the benefits accruing from the management and development of degraded land, and the income accruing from more efficient and sustainable village ecosystem management and agriculture. Various social movements provide valuable insights into achieving equitable sharing of unevenly distributed land.

- As regards the issue of equity, social change, and public policies, changes may be brought about by persuasion where possible, by peaceful pressure and movements where necessary. Strategic networking of basic units at the regional level is called for at all times.

- The NGOs enabling and innovative support is critical in promoting sustainable agriculture. It must, however, involve much stronger and more widely spread community based action; far stronger initiatives on networking and policy advocacy, and on peaceful democratic social movements and pressure. NGO initiatives need to be strengthened in such a way that on the one hand, successful community based actions are multiplied and spread across the country; and on the other hand, multi-pronged, multi-level networking of such community-based initiatives is promoted so that SA groups benefit mutually from information sharing, cooperation, and interaction.

- NGO-Government cooperation in sustainable agriculture as in overall people-centered development has tremendous potential, but at present, this cooperation is only ad hoc and very weak, leaving much room for improvement. In the Indian context, such cooperation needs to be multi-level and multi-point. So it requires multi-level, multi-point joint NGO-Government mechanisms for regular systematic dialogue on
policies as well as operational collaboration.

- Sustained efforts and massive innovation, awareness generation and extension are needed to initiate and carry forward an effective participatory process of sustainable agriculture across the country. It is pertinent to mention here that due to heightened environmental awareness in the face of the current environmental crisis, a far greater receptivity to sustainable agriculture exists. Regrettably, agricultural education and research institutions, professionals and government policy-makers, and extension agencies largely remain biased in favor of the "modern" green revolution techniques. They remain quite sceptical, if not disdainful, of the success of alternative sustainable agricultural systems.

The official craze for globalization and liberalization, which is aggravated by pressure from multilateral inter-governmental institutions such as the World Bank, and from transnational corporations and their unimaginably potent information dissemination and communications machinery, pose far greater challenges to SA proponents. Accordingly, all these odds have to be well taken into account in promoting sustainable agriculture.

Future Directions for NGOs

- Successful community-based NGO initiatives on sustainable agriculture should progressively be strengthened and multiplied across the country in order to intensify and expand effective grassroots action with optimum speed and care with local NGOs acting as enablers and innovators.

- There should be multi-level networking of such community-based initiatives to strengthen SA groups through a process of mutual friendship, cooperation, and interaction. Networking may be at the level of the district, sub-state, state, zonal, inter-statal and national.

- Successful community-based action on sustainable agriculture interlinked through multi-level networks should be used to generate awareness and pressure for effective policy advocacy.

- The networking of community-based initiatives and institutions may also be used for peaceful democratic struggles and social movements to generate awareness and pressure for more radical changes. This kind of social action is considered essential in pushing for greater equity and social justice in rural India.

- NGOs should work more closely with community level people's organizations and newly created Panchayat Raj institutions at different levels as promoters, enablers, facilitators and innovators, spearheading and strengthening the sustainable agriculture movement.

- NGOs should invigorate efforts at building a knowledge-base for sustainable agriculture.

- NGO-Government cooperation to promote sustainable agriculture should be enhanced, fully realizing its tremendous potential. Multi-point, multi-level joint NGO-Government mechanisms for regular dialogue would be extremely helpful for this purpose.

- NGOs should work vigorously to ensure that effective Panchayat Raj institutions are established in various states across the country in accordance with the Constitutional Amendment within the stipulated time. After these institutions are established, NGOs should work with them closely to enable them to discharge their responsibilities in sustainable agriculture and in people-centered development effectively.

- It is pertinent to mention that an appropriate Indian framework for community-based sustainable agriculture—and people-centered sustainable development in general—would essentially be grounded in the traditional systems, adapted to present and future needs, conditions and challenges. Accordingly, it would possess the basic elements of community autonomy and village self-government as well as community-based natural resource management. The framework must, however, be flexible enough to deal with ecological and cultural diversity.

- Apart from using their own organs of communication, NGOs should forge effective alliances with media to disseminate information and generate awareness and pressure.

- A long-term strategy of sustained action and struggle is required to achieve the ascendency of sustainable agriculture. Since it involves the very survival of the people and the planet, the success of sustainable agriculture is expected to be realized through vigorous people's action ranged against formidable odds.

The foregoing was excerpted from the Country Report prepared by the Association of Voluntary Agencies for Rural Development (AVARD) for the Second Asian Development Forum.

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Malaysia

Profile of Agricultural Sector

LAND USE

Major Crops
Rubber
Area planted: 1.83 M ha. (1990), down 0.9% from 1989 (See Table 1).
Production: 1.29 M tonnes (1990), down 9% from 1989 (See Table 1).
The continued contraction in production can be attributed mainly to the conversion of rubber land to other crops and uses, and partly to the continued shortage of plantation workers who are increasingly being attracted to more lucrative jobs in expanding sectors of the economy.

Table 1. Rubber Area, Yield And Production

<table>
<thead>
<tr>
<th></th>
<th>1989</th>
<th>1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planted area ('000 ha)</td>
<td>1847.7</td>
<td>1831.6</td>
</tr>
<tr>
<td>Smallholders</td>
<td>1485.9</td>
<td>1479.9</td>
</tr>
<tr>
<td>Estate</td>
<td>361.8</td>
<td>351.7</td>
</tr>
<tr>
<td>Yield (kg/ha)</td>
<td>388.0</td>
<td>909.0</td>
</tr>
<tr>
<td>Smallholders</td>
<td>388.0</td>
<td>909.0</td>
</tr>
<tr>
<td>Estate</td>
<td>1389.0</td>
<td>1329</td>
</tr>
<tr>
<td>Production ('000 tonnes)</td>
<td>1419.0</td>
<td>1291.5</td>
</tr>
<tr>
<td>Smallholders</td>
<td>930.9</td>
<td>891.9</td>
</tr>
<tr>
<td>Estates</td>
<td>488.1</td>
<td>399.6</td>
</tr>
<tr>
<td>% world production</td>
<td>27.5</td>
<td>25.5</td>
</tr>
</tbody>
</table>

Source: Ministry of Finance: Report 1991/92

Policy/support for the sector: After the Second World War, the Peninsula rapidly rose to become the world’s foremost pro-

Contribution to the economy: Malaysia’s predominant export crop (in terms of volume); and fourth largest in terms of value.
Share of world market: (Malaysia is the world’s leading exporter of natural rubber.)
Policy/support for the sector: Since Independence, great stress has been laid on maintaining Malaysia’s position as the world’s leading exporter of natural rubber, on the one hand, and to restructuring the industry in the country so as to give Malaysians a greater stake in estate ownership and production, as well as to provide fairer and better opportunities to rubber smallholders.

Palm Oil
Area planted: 1.98 M ha. (1990), up 1.9% from 1989 (See Table 2).
Production (combined figure for crude palm oil and palm kernel oil): 6.92 M tonnes (1990), up 1.4% from 1989 (See Table 2).
Share of world market: (Malaysia has been the world’s largest exporter of palm oil since the ’60s.)

Table 2. Oil Palm Area And Palm Production

<table>
<thead>
<tr>
<th></th>
<th>1989</th>
<th>1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planted area ('000 ha)</td>
<td>1946.6</td>
<td>1984.2</td>
</tr>
<tr>
<td>Mature areas ('000 tonnes)</td>
<td>1658.6</td>
<td>1686.6</td>
</tr>
<tr>
<td>Production ('000 tonnes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude palm oil</td>
<td>6065.5</td>
<td>6094.6</td>
</tr>
<tr>
<td>Palm Kernel oil</td>
<td>759.0</td>
<td>827.2</td>
</tr>
<tr>
<td>Yield (Kg/ha)</td>
<td>3602.0</td>
<td>3562.0</td>
</tr>
</tbody>
</table>

Rainfall Distribution

- The amount of rainfall in Peninsular Malaysia ranges from 1,750 mm. (70 in.) to 5,000 mm. (200 in.). The annual mean rainfall in the Peninsula is over 254 cm. (100 in.). The annual mean rainfall in East Malaysia is 442 cm. (150 in.). The local variations within these zones are as follows: Jelebu in Negeri Sembilan -162 cm. (64 in.), Larut Hills Perk -508 cm. (200 in.).
- In Peninsular Malaysia heavy rainfall is associated with the Northeast Monsoon, Southwest Monsoon, as well as the transition period between the Monsoons. The Northeast Monsoon, which blows off of the North China Sea influences rainfall on the East coast during November and April. Sabah and Sarawak similarly experience their wettest season due to the Northeast Monsoon during December through February. The Southwest Monsoon causes heavy rainfall throughout the Western states, excluding the west coast (which is protected by the Sumatra Mountains) during May and October. The rainfall patterns and winds associated with the monsoons greatly effect Malaysian agriculture.
- Flooding in the lowlands during the inter-monsoonal periods and the Northeast monsoon influence the type of paddy rice cultivation. This double cropping method, in which rain water is stored during the rainy season to be used for irrigation during the relatively drier periods, is also employed.
With the exception of coconuts, the success of dryland crops is only possible in areas above the lowlands. Crop cultivation is more extensive on the
ducer of palm oil. This was a result of troubled political conditions in rival producing countries, and attention and encouragement given to the development of the crop in Malaysia. Not only has much research and investment gone into the promotion of the industry, but since Independence the Government has enabled smallholders to participate in oil palm cultivation, primarily through FELDA.

Paddy

Area planted*: 728,855 ha. (1991) (See Table 3)
Production†: 2.81 M tonnes (1991) (See Table 3)

Table 3. Extent of Cultivation and Production by Area for 1991

<table>
<thead>
<tr>
<th>Area</th>
<th>Extent (ha)</th>
<th>% of whole (tonnes)</th>
<th>Production (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peninsular Malaysia</td>
<td>468,337</td>
<td>70.8</td>
<td>1,562,000</td>
</tr>
<tr>
<td>Sabah</td>
<td>47,662</td>
<td>7.2</td>
<td>98,502</td>
</tr>
<tr>
<td>Sarawak</td>
<td>145,156</td>
<td>21.9</td>
<td>186,516</td>
</tr>
<tr>
<td>MADA</td>
<td>(n.a)</td>
<td>(n.a)</td>
<td>681,230</td>
</tr>
<tr>
<td>KADA</td>
<td>44,800</td>
<td>(n.a)</td>
<td>175,700</td>
</tr>
<tr>
<td>Barat Laut Selangor</td>
<td>17,900</td>
<td>(n.a)</td>
<td>110,507</td>
</tr>
</tbody>
</table>

n.a = not available

Economic Report 1991/92, Ministry of Finance

* Area covered in Peninsular Malaysia, Sabah, Sarawak, KADA, and Barat Laut Selangor
† For Peninsular Malaysia, Sabah, Sarawak, MADA, KADA, and Barat Laut Selangor

Policy/support for the sector: After the Second World War, great strides were made to reduce Malaysia's dependence on rice imports and to raise the productivity and living standards of paddy planters. Since 1985, the area under rice cultivation has almost doubled while production has increased by 60%. In the 1930s, the country imported almost 75% of its rice needs; rice imports have been reduced to around 40%, although in view of the growing population, the prospects for achieving self-sufficiency in rice production seem remote. As far as raising the incomes of paddy planters is concerned, while much has been achieved the situation is still far from satisfactory.

Cocoa

Area planted: 440,300 ha. (1990), up 7.1% from 1989
Production: 247,000 tonnes (1990), down 3.1% from 1989

Policy/support for the sector: Yields are expected to improve with the "maturation" of 250,000 ha. of newly planted shrubs in the estate sector and government land schemes. The consolidation of holdings and increased use of higher yielding clones and hybrids of cocoa, especially by the estate sector, are also expected to bring in higher yields. Malaysia is expected to continue to be the world's fourth largest producer of cocoa after The Ivory Coast (Cote d'Ivoire), Brazil, and Ghana. (See Figure 1)

Coconut

Area planted: The area for coconut cultivation in the 1980s has been declining steadily at a rate of 2% per year as more and more land is turned over to other crops, especially oil palm and cocoa which fetch better prices.
Production: Output of coconut oil and copra are down 26.8%

Biological...from page 53

West Coast as calmer monsoon winds and less rainfall alleviate the flooding and the drop of fruit and flower.

Temperature distribution
- The temperature and humidity are constantly high. The average maximum humidity in the air ranges from 94 - 100%. Mean temperature in the country (excluding the highlands) is 26°C (80°F). The average temperature range in the coastal area within Malaysia is 20°C (68°F to 35°C (95°F). The average temperature range in the coastal area is 21°C - 32°C(70°F - 90 °F) and 12.8°C - 26.7°C (55°F - 80°F) in the highlands.

Soil Types

Riverine alluvial
Suitability for cultivation: used for the cultivation of oil palm, paddy, and miscellaneous crops

Marine alluvial
There are two different types of marine alluvial deposit soils that contain clay.
- Type 1. Characteristic/s & suitability for cultivation: The most usable soils characteristically has a high base saturation and cation exchange capacity. Soils of this type are used for the cultivation of paddy, rubber, oil palm, coconut, cocoa, and coffee. These soils are also used for the cultivation of minor crops such as bananas, tapioca, vegetables, and sugarcane. Due to the high magnesium content of the clay, these soils are not suitable for rubber cultivation.
- Type 2. Found in: the East coast; Characteristic/s and suitability for cultivation: Due to the presence of sulphates (above 0.1%) and a pH below 3.5, these soils are not considered useful for agricultural in their natural state. In a similar fashion, without intervention the low-nutrient sandy soils are inappropriate for crops such as coconuts and cashew nuts.

Alluvial soils formed from organic residues
Found in: the Central West coast region (Perak and Selangor states); the South-west (Johor); and the Central East coast area (Pahang). Characteristic/s and suitability for cultivation: Soils containing decomposing weedy material are called tropical rainforest peats. The soils are acidic (pH 4.5). Soil depth ranges from less than 0.6 m. to 12 m. or more. Due to these soils' nutrient imbalance (Kananpathy, 1975), the only commercially successful crop grown in this type of soil is pineapple.
and 26%, respectively, amidst excess world supply and low prices.  
*Share of world market: 2.4% (1988).* As a commodity, coconut oil has always been subject to violent fluctuations on the world market.

**Tobacco**  
*Area planted:* The primary areas for cultivation are Kelantan (20%); Trengganu (22%), Kedah (5%), Perlis (4%), Pahang (2%); while the rest are in Malacca, Negeri, Selangor, and Johor.  
*Contribution to the economy:* Tobacco provides additional income to the inhabitants of the areas abovementioned, as well as helps sustain associated industries, such as fertilizers and plastics. In 1989, 29,134 workers were employed in the 360 curing stations all over the country, while about 37,078 households derived their livelihood from growing tobacco.

**Pepper**  
*Area planted:* 11,200 ha. (1990), up 19.2% from 1989 (See Figure 2)  
*Production:* 29,800 tonnes (1990), up 8.4% from 1989 (See Figure 2)  
Sarawak is the largest pepper producer in the country, with 97.6% of its total area devoted to the crop.  
*Share of world market: 17% (1991)*  
*Contribution to the economy:* 45,000 smallholders make their living from growing pepper (1990)

**Pineapple**  
*Area planted:* 9,200 ha. (of peat land, mainly in Johor)  
*Production:* 168,200 tonnes (1990)  
*Policy/support for the sector:* The rehabilitation of the industry after World War II culminated in the production of a record 313,400 tonnes of fruit in 1970. Various rationalization programs in and outside of the industry resulted in the exportation in 1990 of 2,463,600 standard cases of canned pineapple valued at $79 M to over 30 countries, and 26,000 tonnes of fresh pineapple worth $4 M mainly to Singapore.

**Vegetables**  
*Area planted:* Less than 1% of cultivated land  
*Production:* 100,000 tonnes  
*Policy/support for the sector:* Before independence, Malaysia was self-sufficient in vegetables. But the growth of town centers and the urbanization process has affected land use patterns. Vegetable growing land was the first to be affected. Malaysia currently imports much of its vegetable requirements.

**THE AGRICULTURAL SECTOR**

**Economic Contribution**  
Agriculture plays an important part in overall economic development. In 1991, the share of agriculture of Malaysia's GNP declined to 17.3% from 18.7% in 1990. Total export earnings from major agricultural commodities increased from $14,821 M in 1990 to $14,836 M in 1991. Total labor force is expected to decline by 1.0% to 26.7%. Agriculture also offers support to other sectors, in particular the manufacturing sector, by providing raw materials as well as a market for manufactured goods.

**National Development Framework**  
*National Agriculture Policy (NAP)*  
To support agricultural development in Malaysia, particularly the small holders, a National Agricultural Policy (NAP) was adopted in 1984.  
The NAP sets out the guidelines for agricultural development up to the year 2000. The policy has been formulated so as to ensure a balanced growth in the agricultural sector vis-à-vis the other sectors of the economy. The objective of the NAP is to maximize income from agriculture through the efficient utilization of the country's resources and the revitalization of the sector's contribution to the overall development of the country.
The activities of the Ministry of Agricultural are focused on smallholders, to improve crop production through improved agricultural services, such as irrigation and drainage facilities, research, agricultural inputs, credits, marketing and others. These services are required by smallholders in order to produce enough food for the nation and increase their income.

**Agriculture Extension Program**

The agricultural extension program is the core program of the DOA. The focus is on developing entrepreneurship and organizational abilities of existing as well as future farmers. The training and visit (T&V) System is the mechanism by which extension is carried out. Under the system, service areas have been identified and 7,727 farmer groups (comprising 481,717 farm families) have been established. Out of these, 4,236 farmer groups involving 78,716 ha. and 120,411 farmers have been organized to operate collectively. The immediate impact of the system has been the gradual rehabilitation of previously abandoned land.

In 1980, a total of 19,980 ha. involving 12,020 farmers were covered under the integrated crop demonstration program which was set up to introduce as well as to update farmers' knowledge of new technology, particularly with regard to the cultivation of such crops as paddy, vegetables, fruits, cocoa, coffee and maize.

**Integrated Area Development Strategy**

An important development strategy of the Ministry of Agriculture is the Integrated Area Development Programme whereby the delivery of agricultural services is concentrated and coordinated in a particular project area. Some of the projects that have been implemented through this strategy are the Muda Agricultural Scheme (MUDA I and MUDA II), Kemubu Agricultural Development Project, North Kelantan Integrated Rural Development Project, West Johor Integrated Agricultural Development Project, North-West Integrated Agricultural Development Project, Krian/Sg. Manik Integrated Agricultural Development Project, Negere Sembilan Timur Agricultural Integrated Agricultural Development Project, Semarak-Kemasin Integrated Agricultural Development Project, Trans-Perak Integrated Agricultural Development Project, Kedah Valley Integrated Development Project and Melaka Integrated Agricultural Development Project.

**Ministry Of Agriculture’s Support**

It is the responsibility of the departments/agencies under the Ministry of Agriculture to implement its policy and strategy. Of these departments/agencies, four are government agencies while the remainder are statutory bodies.

The government agencies are:
- Agriculture Department
- Fisheries Department
- Veterinary Service Department
- Drainage and Irrigation Department

The eight statutory bodies under the Ministry are:
- Farmers' Organization Authority (LLP)
- Fisheries Development Authority (LKIM)
- Bank Pertanian Malaysia (BPM)
- Malaysia Agricultural Research Development Institute (MARDI)
- Federal Agricultural Marketing (FAMA)
- Muda Agricultural Development Authority (MADA)
- Kemubu Agricultural Development Authority (KADA)
- National Padi and Rice Board (LPN)

**References:** *Information Malaysia 1992/93 Year Book*

**An Analysis of Agricultural Development**

If we study the government's policies, intervention and support we can see how successful the government has been in the agriculture sector. Three distinct developments can be identified in the Malaysian agricultural sector.

**Foreign Exchange**

Malaysian agriculture is geared more towards the production of export commodities. In 1991, it contributed 17.3% to the GNP. Total export earnings from major agricultural commodities increased from $14,821 M in 1990 to $14,836 M in 1991. The country is currently the world’s primary exporter of rubber and palm oil.

**Table 4. Palm Oil and Rubber Yield and Export Earnings.**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Year</th>
<th>Volume (1000 tonnes)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm Oil</td>
<td>1991</td>
<td>5490</td>
<td>4,941</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>5655</td>
<td>4,399</td>
</tr>
<tr>
<td></td>
<td>1989</td>
<td>4948</td>
<td>4,681</td>
</tr>
<tr>
<td>Rubber</td>
<td>1991</td>
<td>1268</td>
<td>2,976</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>1322</td>
<td>3,028</td>
</tr>
<tr>
<td></td>
<td>1989</td>
<td>1989</td>
<td>3,949</td>
</tr>
</tbody>
</table>

*Economic Report 1992/93: Ministry of Finance, Malaysia*
Employment
Agriculture in Malaysia is strongly characterized by the presence of an efficient and well-organized estate sector and a traditional and non-organized smallholder sector. The smallholder sector, though less developed, occupies about 60% of the land in Peninsular Malaysia. Most smallholders are involved in rubber, coconut and rice production.

The agriculture, forestry, and fishing sectors support about 1/3 of the working population. Around 2 M people are directly employed in the agricultural sector.

According to the 1992-93 Economic Report of the Ministry of Finance, employment in the agriculture, forestry and fishing sectors is expected to decline further by 0.1% in 1992 or a decrease of 8,000 jobs out of a total of 1,835 jobs in 1991. Consequently, its share in total employment is expected to decline by 0.8% to 26% in 1992, from 26.8% in 1991. The continuous decline in employment in this sector is in line with agriculture’s declining share of output in Gross Domestic Product.

Malaysian agriculture is still one of the major employment sources, although the manufacturing industry is fast growing. In 1984, there were 1,932,000 people employed in this sector. But since then there has been a gradual decline in employment in this sector. Total labor force is expected to decline by 1.0% to 26.7% in 1993.

Industrial Development Support
The agriculture sector is a strong support for industrial development in Malaysia. It is a provider of raw materials as well as the domestic market for manufactured products. In 1991, the manufacturing sector contributed 64.1% to the GNP.

Reorienting Agriculture: From Sustainable To Industrial
Malaysia had already moved to some extent from subsistence agriculture to industrial agriculture during the colonial rule. Rubber was one of the major export crops. After independence, Malaysia reinforced this pattern and helped to mainstream subsistence farmers into the industrial agricultural pattern.

According to the Malaysian Agricultural Director, 80% of the current cultivated land is used for export crops, such as rubber, palm oil, cocoa, pepper and pineapple. Only 10% is grown with rice and the balance is for fruits, vegetables and other crops for domestic consumption.

From Agriculture To Manufacturing
The third feature of a successful growth-led development model is to move from an agricultural economy to a manufacturing economy. Malaysia has achieved this in less than 25 years. Figure 3 illustrates this point.

Emerging Sustainability Issues

BIOLOGICAL LIMITS
The use of chemical inputs
Malaysian agriculture depends heavily on chemical input of fertilizers and pesticides. With increasing crop area there has been a corresponding increase in the use of fertilizers and pesticides.

Figure 4. NPK Nutrient Consumption in Malaysia


Nitrogen phosphate and potassium consumption in Malaysia is an excellent illustration of this fact.

As regards pesticide use, the 1990 statistics indicate that M$297 M a year was spent on agrochemicals, with M$250 M alone being spent on herbicides. The bulk of pesticides used are herbicides.

In 1989, 81% of the M$297 M expenditure on pesticides was for herbicides. Expenditure on insecticide and fungicides was respectively 12 and 4%. Rodenticides had the smallest market share at 3%. Table 5 (next page) illustrates this development.

Source: Economic Report 1991/92, Ministry of Finance, Malaysia
is the single most freely available pesticide and accounts for most of the poisonings and deaths.

A total of 737 farmers have received medical treatment for poisoning from pesticides introduced by the Agriculture Ministry in 1989-1990. (New Straits Times, Malaysia, 20 December 1990.)

Table 9. Human Poisoning caused Pesticides and Paraquat

<table>
<thead>
<tr>
<th>Year</th>
<th>Total pesticide Poisoning cases</th>
<th>No. of cases of paraquat</th>
<th>% of total poisoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>158</td>
<td>98</td>
<td>62</td>
</tr>
<tr>
<td>1982</td>
<td>178</td>
<td>126</td>
<td>71</td>
</tr>
<tr>
<td>1983</td>
<td>245</td>
<td>173</td>
<td>71</td>
</tr>
<tr>
<td>1984</td>
<td>259</td>
<td>177</td>
<td>68</td>
</tr>
<tr>
<td>1985</td>
<td>279</td>
<td>211</td>
<td>76</td>
</tr>
<tr>
<td>Total</td>
<td>1,119</td>
<td>785</td>
<td>348</td>
</tr>
</tbody>
</table>


FOOD IMPORTS

Malaysia, like many successful agricultural countries, is a net importer of food. In 1991 Malaysia imported food valued at $946 M.

Fig. 4. Total Food and Rice Imports


Sustainable Agriculture Initiatives

GOVERNMENT INITIATIVES

The University of Agriculture Malaysia (University Pertanian Malaysia) has already begun research and experiments on sustainable agriculture. Such problems as soil conservation, integrated pest management, indigenous seeds preservation, and hybrids are being looked into.

The Department of Agriculture (DOA), in particular, has
been involved in upgrading existing-plant protection services in paddy, cocoa, vegetables and fruit cultivation. In 1989, about 240,000 ha. of paddy and 59,000 ha. of cocoa were covered under the pest surveillance and forecasting activity, benefiting 246,300 farmers.

The DOA also actively promotes the integrated pest control concept which aims at achieving long-term sound pest management practices while minimizing disruptions in the agro-ecosystem and reducing production costs. This approach has successfully controlled major pests of paddy such as brown hoppers (BHP) and Penyakit Merah Virus (PMV). The IPM is also used to control the Diamond Black Moth in crucifers in major vegetable growing areas.

**NGO INITIATIVES**

NGO initiatives in Sustainable Agriculture began only in 1986, when the Centre For Environment Technology Development Malaysia (CETDEM) started an organic farming program, through which CETDEM forged its analysis of the agricultural system. The following are some of its salient points:

- Overuse of chemical fertilizers and pesticides in agriculture is harmful to both human health and the many other organisms that occur naturally in the soil and in water;
- Chemicals are generally derived from petroleum or other non-renewable resources so that their continued use depletes such resources;
- Chemical usage makes farmers more dependent on external sources;
- Organic farming makes maximum use of existing natural resources such as insects, earthworms and even crop waste; consequently, farmers become more independent and self-reliant;
- Most organic practices make use of the vast experience handed down through generations of farmers on how to reduce crop loss by making the best use of local environmental factors like rainfall and temperature patterns;
- Organic farming is generally more energy-efficient since it generally uses very little fuel and chemicals.

CETDEM's farm was also meant as a model farm to promote awareness of and to mainstream sustainable agriculture.

Following CETDEM's lead, Mr. B. K. Ong started the Penang Organic Farm in 1991. Similar farms were also put up in other parts of Malaysia: one in Sarawak is being run by the Community Education Services; another one in Malacca by the Seventh Adventist Church; and a third in Gopeng, Perk by the Centre for Sustainable Living.

Last 8-10 January 1993, a National Consultation on Sustainable Agriculture was held in Ipoh. Twenty-two NGO leaders, four from organic farm groups, six from consumer organizations, and eight from various other groups, met to validate the country paper presented at the Second Asian Development Forum held in the Philippines. They also discussed strategies and approaches which NGOs can adopt to promote sustainable agriculture.

They came up with the following recommendations:

**Within the NGO sector:**

- Provide government with success stories and successful models of sustainable agriculture initiatives;
- Lobby for:
  - equal subsidies to chemical and organic farming;
  - simplification of the registration of cooperatives;
  - sustainable agriculture research;
  - adoption of international standards for banning pesticides.
- Sponsor initiatives that will be seen as locally inspired, not foreign-influenced:
  - Use Farmers' Day to highlight sustainable agriculture;
  - Promote sustainable food production systems during World Breastfeeding Week;
  - Use government market facilities (e.g. Pasar Tani) to market organic products;
  - Apply for the use of state-owned land in setting up model farms.

**Towards the Private/Business Sector:**

- Promote consumer consciousness and demand for sustainable agriculture products;
- Encourage social enterprises as alternatives to conventional businesses;
- Monitor the use of unsustainable technology by the private sector.

**Towards Communities:**

- Start an alternative newsletter;
- Promote organic farming in schools; get the parents to participate;
- Promote home/community gardens ("Buku Hijati");
- Organize a "Sustainable Agriculture Week";
- Encourage farmers to switch to organic farming by demonstrating its potential to improve their standard of living. Suggest that they allocate a portion (e.g. 20%) of their land to organic farming, help them assess the costs and benefits of organic farming. Use instructional materials like comic books;
- Tap traditional/indigenous knowledge;
- Ensure/encourage greater farmer participation in future consultations;
- Put up model farms;
- Promote/facilitate networking among cooperatives, unions, farmer associations, and NGOs;
- Develop a test kit to identify pesticide residues in vegetables;
- Compile an organic farming kit, complete with seed supplies;
- Educate consumers about the hazardous chemicals used on imported agricultural products;
- Start a local seed exchange; put up a seed bank;
- Use local radio stations to disseminate information on sustainable agriculture; prepare simple and adaptable radio scripts;
Pakistan

Profile of Agricultural Sector

LAND USE

Class I
- Very good agricultural land
- 5.24 M ha.
- no limitations for general agriculture
- very high production potential.

Class II
- Good agricultural land
- 6.98 M ha.
- minor limitations
- high production potential for general agriculture.

Class III
- Moderate agricultural land
- 4.78 M ha.
- moderate soil limitations
- moderate production potential for general agriculture

Class IV
- Poor agricultural land
- 2.99 M ha.
- severe soil limitations
- low production potential, and for a few crops only
  Class V
- Good forest or range land
- 0.17 M ha.
- no or minor soil limitations for forestry or rangeland purposes
- high potential for forestry/range development
  Class VI
- Moderate forest or rangeland
- 1.27 M ha.

Dominant Bio-Physical Endowments

Rainfall Distribution
- Mean annual precipitation ranges from less than 100 mm to 760 mm.
- Most of the precipitation is concentrated in the monsoon period, i.e. July to September.

Temperature Distribution/Climate
- Five climatic types
  - Tropical semi-arid climate with dry winter: includes Karachi, Hyderabad, and Southern Khairpur Divisions. The mean annual temperature is above 18°C.
  - Tropical arid climate with average annual temperature about 18°C and dry winter: includes Southern Kalat and the whole of Indus Plains from Lahore, Rawalpindi and D.I. Khan Divisions to the Northern half of Khairpur Division.
  - Cold semi-arid climate with dry summer: includes hilly regions of Southern and Central Kashmir, Peshawar, D.I. Khan and Northern half of Kalat Division.
  - Snowfrost climate with the average temperature of coldest month below -50°C, warm summer with mean temperature of the warmest month between 10°C and 22°C. Includes Northern mountainous areas and part of Kashmir.
  - Extreme cold climate with average temperature of the warmest month between 10°C and 0°C. Comprises Eastern and Northern parts of Kashmir including Laddakh, Baltistan, Giltit and North Chitral.

Topography
- Pakistan has a highly diversified landscape and environment. Lofty snow-clad mountains, vast sandy deserts, and extensive river and pied-mont plains combine to give rise to a variety of soil characteristics.

Soil Type
- Generally calcareous and alkaline, with low organic matter.
- Over 50% of agricultural soils are clayey (heavy, fine clays) necessitating the inclusion of deep rooting crops in rotation, higher levels of tillage operations, and increased application of organic matter.
• moderate soil limitations
• moderate potential for forestry/range development

Class VII
• Poor forest/range land
• 15.41 M ha.
• severe soil limitations
• very low potential for forestry/range development

Class VIII
• Non-agricultural land
• 23.2 M ha.
• severe soil limitations
• no potential for any type of economic agriculture.

The scarcity of good land with no soil limitations is the major reason for low productivity of agricultural crops while the shortage of rainwater and canal irrigation further affects the production potential of the available land.

Table 1. Land Utilization in Pakistan

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Million Hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area reported</td>
<td>57.90</td>
</tr>
<tr>
<td>Forest area</td>
<td>3.43</td>
</tr>
<tr>
<td>Net available for cultivation</td>
<td>24.06</td>
</tr>
<tr>
<td>Culturable waste</td>
<td>9.39</td>
</tr>
<tr>
<td>Cultivated area</td>
<td>21.02</td>
</tr>
<tr>
<td>Current fallow</td>
<td>4.93</td>
</tr>
<tr>
<td>Net area sown</td>
<td>16.09</td>
</tr>
<tr>
<td>Area sown more than once</td>
<td>5.73</td>
</tr>
<tr>
<td>Total cropped area</td>
<td>21.82</td>
</tr>
</tbody>
</table>

Source: Agricultural Statistics of Pakistan, 1990-91

MAJOR CROPS
• Five major crops: wheat, rice, cotton, maize, sugarcane

Table 2. Area and Production of Important Crops (1991-92)

<table>
<thead>
<tr>
<th>Crop Area</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>(000 ha)</td>
<td>(000 tons)</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Wheat</td>
<td>7,795</td>
</tr>
<tr>
<td>Rice</td>
<td>2,007</td>
</tr>
<tr>
<td>Bajra</td>
<td>302</td>
</tr>
<tr>
<td>Maize</td>
<td>828</td>
</tr>
<tr>
<td>Barley</td>
<td>155</td>
</tr>
<tr>
<td>Total (Food Grains)</td>
<td>11,087</td>
</tr>
<tr>
<td>Gram</td>
<td>1,021</td>
</tr>
<tr>
<td>Other Pulses</td>
<td>446</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>877</td>
</tr>
<tr>
<td>Rapeseed &amp; Mustard</td>
<td>289</td>
</tr>
<tr>
<td>Sesamum</td>
<td>52</td>
</tr>
<tr>
<td>Cotton</td>
<td>2,898</td>
</tr>
</tbody>
</table>

Source: Agricultural Statistics of Pakistan

Table 3. Yield of Various Agricultural Commodities in Pakistan (1983-84)

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Yield Potential (under experimental conditions) (kg/ha)</th>
<th>National Average Yield (kg/ha)</th>
<th>Gap Between Potential &amp; National Avg. Yield (kg/ha)</th>
<th>Unachieved Potential (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>6,425</td>
<td>1,695</td>
<td>4,730</td>
<td>74</td>
</tr>
<tr>
<td>Paddy</td>
<td>9,489</td>
<td>1,703</td>
<td>7,785</td>
<td>82</td>
</tr>
<tr>
<td>Maize</td>
<td>6,944</td>
<td>1,272</td>
<td>5,672</td>
<td>82</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>256,000</td>
<td>35,672</td>
<td>220,328</td>
<td>86</td>
</tr>
<tr>
<td>Rape &amp; Mustard</td>
<td>2,743</td>
<td>641</td>
<td>2,102</td>
<td>77</td>
</tr>
<tr>
<td>Potato</td>
<td>38,128</td>
<td>10,403</td>
<td>27,725</td>
<td>73</td>
</tr>
</tbody>
</table>

Source: Amir Muhammad, 1984, Consultancy report for UNDP/FAO, Approach to the Transfer of Crop Production Technology in Developing Countries.

Cropping Systems

Rice-Wheat System
• Found in: irrigated areas of Punjab and Sindh provinces
• Description: The rice crop is followed by wheat
• Area under the system: 1.8 M ha.

Cotton-Wheat System
• Found in: irrigated areas of Punjab and Sindh provinces
• Description: Cotton is the principal crop. Farmers delay the cotton harvest up to the end of December or the beginning of January for an additional (delayed) cotton picking. Wheat sowing is delayed, resulting in a decrease in yield of up to 40%. However, this loss is compensated by the additional cotton picking.
• Area under the system: 1.5 M ha.

Wheat-Fallow System
• Found in: rainfed areas
• Description: Due to moisture shortage, only one crop can be planted.
• Area under the system: 1 M ha.

Sugarcane System
• Found in: Punjab, Sindh, NWFP
• Description: A crop of sugarcane once planted is harvested up to three years. After the third year, a crop of wheat, fodder, or some legume is planted after which the fields are again planted to sugarcane.
• Area under the system: 750,000 ha.

Maize-Maize System
• Found in: parts of NWFP
• Description: In high rainfall areas two crops of maize are planted in a year; in relatively low rainfall conditions, only one maize crop is grown.
• Area under the system: less than 0.5 M ha.
• Because of the law of inheritance, holdings are subdivided and continue to become smaller.
• 75% of the farms have less than 5 ha and constitute only 35% of the total area.
• 9% of the farms with areas 10 ha. and above account for over 40% of the cultivated area.
• In the inter-censal period between 1972 and 1980, the
number of small farms less than 2 ha. in size increased from 28% in 1972 to 34% in 1980.

Table 4. Private Farms by Size, 1980

<table>
<thead>
<tr>
<th>Farm Size (hectares)</th>
<th>Number (million)</th>
<th>%</th>
<th>Area (million has.)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 0.5</td>
<td>0.33</td>
<td>8</td>
<td>0.10</td>
<td>*</td>
</tr>
<tr>
<td>0.5 to under 1</td>
<td>0.37</td>
<td>9</td>
<td>0.28</td>
<td>1</td>
</tr>
<tr>
<td>1 to under 2</td>
<td>0.69</td>
<td>17</td>
<td>0.97</td>
<td>5</td>
</tr>
<tr>
<td>2 to under 3</td>
<td>0.68</td>
<td>17</td>
<td>1.63</td>
<td>9</td>
</tr>
<tr>
<td>3 to under 10</td>
<td>0.92</td>
<td>23</td>
<td>3.57</td>
<td>19</td>
</tr>
<tr>
<td>5 to under 10</td>
<td>0.71</td>
<td>17</td>
<td>4.0</td>
<td>25</td>
</tr>
<tr>
<td>10 to under 20</td>
<td>0.26</td>
<td>6</td>
<td>3.39</td>
<td>18</td>
</tr>
<tr>
<td>20 to under 40</td>
<td>0.26</td>
<td>6</td>
<td>2.80</td>
<td>15</td>
</tr>
<tr>
<td>60 and above</td>
<td>0.01</td>
<td>*</td>
<td>1.62</td>
<td>8</td>
</tr>
<tr>
<td>All farms</td>
<td>4.07</td>
<td>100</td>
<td>19.06</td>
<td>100</td>
</tr>
</tbody>
</table>

* Negligible
Source: Census of Agriculture, 1980 (Quoted by Agricultural Statistics of Pakistan)

It is interesting to study land use in relation to size of landholding (See Table 5). The uncultivated area, culturable waste, and unculturable area, including forests, have a positive correlation with the size of the holding.

Table 5. Land use in relation to size of landholdings

<table>
<thead>
<tr>
<th>Holding Size</th>
<th>Farm Total</th>
<th>Uncultivated Area (%)</th>
<th>Culturable Waste (%)</th>
<th>Unculturable (including farms) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 ha</td>
<td>2,969,985</td>
<td>7.9</td>
<td>3.9</td>
<td>4.0</td>
</tr>
<tr>
<td>3 - 5 ha</td>
<td>3,566,356</td>
<td>8.6</td>
<td>5.0</td>
<td>3.1</td>
</tr>
<tr>
<td>10 - 20 ha</td>
<td>3,392,721</td>
<td>18.1</td>
<td>11.9</td>
<td>6.1</td>
</tr>
<tr>
<td>over 20 ha</td>
<td>4,426,090</td>
<td>33.2</td>
<td>21.5</td>
<td>11.7</td>
</tr>
</tbody>
</table>

Source: Pakistan National Conservation Strategy

There is some evidence that the performance of smaller farms is superior in terms both of increasing the intensity of use and improving the quality of irrigated land. Relatively lower investments in agriculture, less use of pesticides, higher ratio of area sown to wheat, higher use of organic manure and family labor, among others, are important observations about small holdings.

AGRICULTURAL SECTOR

National Development Framework
Agriculture is the single largest economic sector in Pakistan:
- employs about 51% of the total labor force (31.82 M) and directly or indirectly supports 70% of the country's population;
- contributes around 26% of the Gross Domestic Product (GDP);
- share in export earnings amounts to about 80%, including both raw and processed commodities.

National policy
- Although recognized as important, agriculture has never been regarded as a leading sector
- The National Commission on Agriculture recommended that the sector be given a central role in Pakistan’s development strategy. The Commission's specific recommendations are:
  - that the growth of agriculture be accelerated to 5% per annum through institutionalized technological change reflected in higher yields and greater production of high value products;
  - that the additional income generated in agriculture lead to a corresponding increase in the demand for goods and services, thus stimulating the economy;
  - that the expansion of agricultural and related activities lead to a substantial expansion in employment opportunities while promoting relatively stable prices and wages.
- Government has adopted the following measures to spur agricultural growth: price support for major crops; subsidies to popularize new farm input; enhanced credit facilities to enable the farmers to adopt modern input and technology.
- A 3 to 4 B rupee package for agriculture announced recently will provide for subsidies for seed and fertilizer; cheaper and speedier distribution of agricultural loans for poor farmers; and the purchase of tractors on easy terms. More specifically, a 25% subsidy will be given for certified seeds of wheat, Rs. 8 per bag of DAP, and Rs. 25 per bag of Urea. The limit on loans used to purchase fertilizers, seeds and pesticides has been raised from Rs. 1,600 to Rs. 2,000 per acre. No duty or surcharge will be levied on the importation of equipment for poultry, fish, and milk industries.

Emerging Sustainability Issues

BIOLOGICAL LIMITS

Land Degradation

Soil Erosion
- Types of soil erosion:
  - water
  - wind
  - rain drop splash
  - sheet
  - gully
- geological (caused by formation of gullies)
Some estimates indicate that 1 B tons of soil are lost annually to soil erosion; 1,400 ha. of land are devastated.

Salinity and Waterlogging
- Excess salinity and sodicity affect around 12 M ha. of land. Affected areas have suffered from a range of problems: from slight yield reduction to complete crop failure.
- Waterlogging (saturation of soil by water for a significant period of time, adversely affecting crops and trees) affects 2.11 M ha. of land in the pre-monsoon, and 8.22 M in the post-monsoon period.

Moisture Shortage/Aridity
- Pakistan lies for the most part in the arid and semi-arid climatic zone, making rainfed crop production almost impossible.
- Scanty rainfall is unevenly distributed during the year: much of the rain comes during the two-month long monsoon season while the rest of the year is nearly dry.
- Approximately 4.7 M ha. under cultivation are dependent entirely on rainfall.
- Over 89,000 water courses deliver water to the farmers' fields but as much as 40% of the water is lost due to defective water courses.
- How do the farmers cope? Farmers have adopted rain water harvesting techniques, such as contour bunding, terracing, deep tillage, tide ridging and mulching.

Destruction of Crop Genetic Resource Base
- As far back as 1947, traditional varieties of wheat, cotton, rice, sugarcane, and fodder crops had disappeared from the fields and become almost extinct.
- Genetic erosion has been caused by:
  - the introduction of high-yielding varieties and the neglect of indigenous breeds;
  - lack of adequate institutional infrastructure, facilities, and resources for the collection, evaluation, documentation and conservation of plant germplasm;
  - lack of understanding of the role of species in sustaining and stabilizing an ecosystem.

Besides the agricultural crops, germplasm of indigenous oriental medicinal plants, once a highly popular and effective source, has been reduced. This is due mainly to deforestation, habitat destruction, and the shift to alternate sources of health care.

Fertilizer Use and Effects
- Chemical fertilizers were first introduced in Pakistan in 1952-53, and their use has risen dramatically since: from just 1,000 tons in the year of their introduction to 1,892.9 tons in 1990-91.
- Nearly half of the national fertilizer consumption is used in wheat production; the rest is used in the cultivation of cotton, sugarcane, maize and other crops.

Table 6. Fertilizer Consumption

<table>
<thead>
<tr>
<th>Crop</th>
<th>% of total consumption</th>
<th>Average rate (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>48</td>
<td>119</td>
</tr>
<tr>
<td>Rice</td>
<td>-</td>
<td>106</td>
</tr>
<tr>
<td>IR-6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Basmati</td>
<td>90</td>
<td>-</td>
</tr>
<tr>
<td>Cotton</td>
<td>15</td>
<td>120</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>15</td>
<td>230</td>
</tr>
<tr>
<td>Maize</td>
<td>3</td>
<td>94</td>
</tr>
<tr>
<td>Other crops</td>
<td>6</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: National Fertilizer Development Centre, Islamabad

On-farm studies conducted by provincial agricultural research departments on crop responses to fertilizer use showed that substantial yield increases in all major crops followed the application of fertilizers. However, the studies also showed that consistently greater applications are required to obtain the same high yields with the passing of time.

Table 7. Average fertilizer use per hectare (kg./ha.) of sugarcane and rice, and their corresponding average yields (tonnes/ha.) over time for selected provinces

<table>
<thead>
<tr>
<th>Period</th>
<th>Punjab</th>
<th>Sindh</th>
<th>NWFP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rice</td>
<td>Sugarcane</td>
<td>Rice</td>
</tr>
<tr>
<td>1975-76 to 1977-78</td>
<td>45.60</td>
<td>67.70</td>
<td>18.70</td>
</tr>
<tr>
<td>Fertilizer use</td>
<td>01.48</td>
<td>37.00</td>
<td>01.74</td>
</tr>
<tr>
<td>Average yield</td>
<td>76.00</td>
<td>109.00</td>
<td>44.50</td>
</tr>
<tr>
<td>Fertilizer use</td>
<td>01.30</td>
<td>35.90</td>
<td>2.07</td>
</tr>
<tr>
<td>Average yield</td>
<td>125.80</td>
<td>174.30</td>
<td>66.20</td>
</tr>
<tr>
<td>Fertilizer use</td>
<td>01.23</td>
<td>37.00</td>
<td>02.12</td>
</tr>
<tr>
<td>Average yield</td>
<td>1988-89</td>
<td>67.70</td>
<td>125.80</td>
</tr>
</tbody>
</table>

Since the soils of Pakistan are generally calcareous and alkaline, with low organic matter, much of the constituent minerals in the fertilizers (nitrogen, phosphorous, potassium) are fixed in the soil and rendered unavailable to crops:

Applied nitrogen recovery in upland crops is estimated at around 50%; 40% in lowland crops;

Only about 20% of the phosphorous is recovered by most crops;

(However, the rate of nitrogen/phosphorous recovery may vary among crops and according to soil moisture availability and crop management practices.)

- An annual loss of 8.76 parts per million (ppm) of phosphorous and 0.23 ppm of potassium has been estimated
- Soil phosphorous levels have decreased from 6.23 ppm in 1971-75 to 4.22 ppm in 1986-90.

### Pesticide Use and Effects

- Weeds account for 15 to 20% of losses in wheat yields, or about 2-3 M tonnes of wheat per year. Weed infestation has worsened because of enhanced use of fertilizers, intensive cropping, inadequate farm labor, etc.
- By 1991-92, 1.843 M ha. had been put under plant protection programs. Cotton, sugarcane, and rice are sprayed aerially.
- As early as 1952-53, 2,000 tonnes of pesticides costing Rs. 20,000 were imported by Pakistan. In 1990-91, more than 19,000 tonnes worth Rs. 1.49 B were imported.
- 15 pesticide formulation plants are currently in operation, but the active ingredients in pesticides are still being imported.
- The Pakistan Pesticide Ordinance of 1971 and Rules of 1973 set out regulations for the import, manufacture, formulation, sale, distribution and use of pesticides. However, the provisions under these laws are not strictly enforced.
- No systematic data on pesticide residues in the food chain is available. Nor information on pesticide poisoning.

### Cropping Systems

**Effects of Major Cropping Systems**

- Continuous monocropping under the Sugarcane System has led to problems of plant nutrient deficiency and pest infestations.
- Maize, grown under the Maize-Maize System, is an exhaustive crop and its cultivation has resulted in severe deficiencies in plant nutrients in soils.

### SOCIAL LIMITS

- Population: 110.36 M (as of 1 January 1990)
- Percent of population in rural areas: 70.4% (as of 1 January 1990); Source: Economic Survey of Pakistan, 1989-90
- Of the rural population, about 40% consists of landless tenants who work as farm laborers or artisans.

### Table 8. Rural-Urban Disparities

<table>
<thead>
<tr>
<th></th>
<th>Rural Area</th>
<th>Urban Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literacy rate (%)</td>
<td>17.3</td>
<td>47.1</td>
</tr>
<tr>
<td>School enrolment ratios of population 10-24 yrs. old (%)</td>
<td>11.4</td>
<td>31.3</td>
</tr>
<tr>
<td>No. of doctors per 100,000 residents</td>
<td>12.0</td>
<td>44.0</td>
</tr>
<tr>
<td>% of population with access to potable water</td>
<td>40.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Sewerage facilities % of population</td>
<td>10.0</td>
<td>52.0</td>
</tr>
<tr>
<td>Infant mortality per 1,000 persons</td>
<td>113.2</td>
<td>79.0</td>
</tr>
</tbody>
</table>

*Source: Pakistan Institute of Development Economics, Islamabad*

### Rural-urban disparities

Disparities between rural and urban populations have led to rural outmigration, and a decrease in agricultural populations.

A clear indication of this migration pattern is to be found in the fact that between 1960 and 1980, although the total farm area remained nearly constant, the number of farms has decreased appreciably. Both the total farm area and number of farms under tenancy control were reduced in 1980 to nearly half of the 1960 figures.

- 64% of the total cultivated area consists of farms 2 to 8 ha. in size while farms bigger than 8 ha. account for 19% of the total.
- Analysis of loans advanced by the Agricultural Development Bank of Pakistan (ADB) in the past 15 years shows that majority of borrowers have been farmers with holdings of up to 5.06 ha. followed by those owning 5.06-20.23 ha.

### Factors Contributing to Unsustainability

### GOVERNMENT POLICIES

#### Subsidy

- The Government spends more than Rs 9.5 B on subsidies. Many subsidies, although meant for producers, have benefited urban consumers to whom agricultural products are sold at less than the market price, the difference being paid from the current account of the Government budget. There is an implicit subsidy in the irrigation water charges to the extent that they do not recover full costs. Similarly, interest-free and low-interest loans to producers are also considered to be subsidized.

#### Consumer Subsidies

- The consumer price of flour, sugar, and edible oils is kept below the cost to the government of local and foreign purchases of wheat, plus transport, handling and storage charges.
- Most of the subsidy on wheat in earlier years was not on domestically produced wheat but on imported wheat. The
main beneficiaries of wheat subsidies have been the foreign producers and local urban consumers. Had the import parity price been paid to local producers, the wheat deficit could have been wiped out much earlier, achieving sustainable self-sufficiency. It would have helped, too, if the Government had improved the transport facilities for moving wheat to upcountry from Karachi.

**Direct Subsidies**

1. Fertilizers

<table>
<thead>
<tr>
<th>Year</th>
<th>Offtake 000 N tons</th>
<th>Subsidy (Rs million)</th>
<th>Subsidy per N Ton (Rs million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975-76</td>
<td>551</td>
<td>607</td>
<td>1,102</td>
</tr>
<tr>
<td>1976-77</td>
<td>632</td>
<td>381</td>
<td>603</td>
</tr>
<tr>
<td>1977-78</td>
<td>714</td>
<td>617</td>
<td>864</td>
</tr>
<tr>
<td>1978-79</td>
<td>880</td>
<td>1,692</td>
<td>1,923</td>
</tr>
<tr>
<td>1979-80</td>
<td>1,044</td>
<td>2,454</td>
<td>2,350</td>
</tr>
<tr>
<td>1980-81</td>
<td>1,079</td>
<td>2,457</td>
<td>2,270</td>
</tr>
<tr>
<td>1981-82</td>
<td>1,081</td>
<td>1,794</td>
<td>1,660</td>
</tr>
<tr>
<td>1982-83</td>
<td>1,244</td>
<td>1,948</td>
<td>1,566</td>
</tr>
<tr>
<td>1983-84</td>
<td>1,203</td>
<td>1,466</td>
<td>1,219</td>
</tr>
<tr>
<td>1984-85</td>
<td>1,253</td>
<td>1,501</td>
<td>1,198</td>
</tr>
<tr>
<td>1985-86</td>
<td>1,512</td>
<td>2,409</td>
<td>1,593</td>
</tr>
<tr>
<td>1986-87</td>
<td>1,784</td>
<td>2,026</td>
<td>1,136</td>
</tr>
</tbody>
</table>

2. Seed
3. Tubewells
4. Water rates
5. Credit

6. Electricity/Fuel—the provision of subsidies for electricity or fuel may seem desirable but the costs rise directly with volume pumped. When there is no cost penalty for excess pumping (since there is only one flat rate no matter how many hours the pump is used), there is no incentive to save water.

It may be desirable to subsidize actions that will promote water use efficiency. Such a step should be reserved, however, for approaches that are clearly major contributors to efficiency and that are relatively costly to initiate but hold promise of paying for themselves through higher productivity on low water usage over the longer term.

**POLICIES/INFLUENCE OF WB/IMF POLICIES**

- Following advice from and through arrangements with the WB:
  - the government is reviewing and reducing its subsidies particularly those associated with fertilizer imports;
  - heavy investments have been and are being made in the water sector. The provision of subsidies for electricity or fuel may seem desirable but the costs rise directly with volume pumped. When there is no cost penalty for excess pumping (since there is only one flat rate no matter how many hours the pump is used), there is no incentive to save water.
  - It may be desirable to subsidize actions that will promote water use efficiency. Such a step should be reserved, however, for approaches that are clearly major contributors to efficiency and that are relatively costly to initiate but hold promise of paying for themselves through higher productivity on low water usage over the longer term.

**RESEARCH BIAS**

- Agriculture research has in the past been heavily concentrated on major crops such as wheat, rice, and cotton. Oilseeds, maize, sugarcane, pulses, fruits and vegetables have been largely neglected.
- The transfer of technology to the farmers has been inadequate.
- The emphasis of agricultural research has so far been on production of technologies which could only be profitably used by growers who own lands with high potential for production. The government appears to be unwilling to extend research and extension efforts into areas that are not likely to yield surpluses. (High risk conditions also discourage agricultural credit and input supply agencies.)
- There is a need to reduce disparities in yield expectations from research stations and farmers' fields. This calls for more on-farm interdisciplinary research and special attention to innovative mechanisms for technology dissemination.
- Another problem is the existence of separate bureaucratic entities for agriculture, forestry, fisheries, and livestock.
- Research and extension workers have little contact with agricultural universities. Low operational budgets restrict the mobility of extension staff, resulting in little contact with farmers.
- The research system is plagued by high-turnover of scientific staff and inadequate operating budgets.

**Sustainable Agriculture Initiatives**

**SELECTED NGO INITIATIVES IN SUSTAINABLE AGRICULTURE**

Implementing organization: Aga Khan Rural Support Programme (AKRSP)

Type of (SA) Initiative: agricultural development

Strategy: enhancement of people's capacity for self-help, self-
administration and self-management

Activities: formation of village organizations (VOs) which help organize the rural poor and generate capital from their own resources; infrastructure development (widening and extension of existing irrigation channels; building of new irrigation channels; construction of link roads; establishment of reservoirs and tanks); agriculture and livestock training; provision of credit (for the purchase of fertilizers, agricultural machinery, etc.)

Implementing organization: Rural Development Foundation (RDF) of Pakistan
Type of initiative: agricultural development
Strategy: economic upliftment leading to social upliftment
Activities: organization and training of Village Development Committees (VDCs); assistance to VDCs in accessing financial support from government and donor agencies; facilitation of the "Credit for Small Farmers" scheme initiated by the Agricultural Development Bank (under which interest free loans of up to Rs. 6,000 are granted to small farmers); provision of small loans for income generation projects under a Revolving Fund Scheme; organization of consultations on sustainable development and conservation strategy.

Implementing organization: Pak-German Self Help Project
Type of initiative: development of the Balochistan province
Strategy: village-based development
Activities: research on water management/conservation; fruit production.

Implementing organization: Kissan Board Pakistan
Type of initiative: agricultural development
Strategy: information dissemination
Activities: documentation of current agricultural research in the country; assessment of government policies on agriculture; reportage on the current state of agricultural production.

Implementing organization: Cotton/Sugarcane Growers Associations
Type of initiative: sector development
Strategy: marketing assistance

Lessons Learned and Insights

1. For the successful adoption of Sustainable Agriculture in Pakistan efforts need to be guided by the following four principles:
   - People's participation and human resources development;
   - Integrated system and diversification of income;
   - Sustainable use of basic natural resources;
   - Safe and sustainable use of key input like seed, fertilizers, pesticides and energy.

2. The success of any development initiative depends on the quality of community involvement and participation. Hence, strong and viable community organizations are a basic prerequisite to achieving the objectives of any development programme.

The community organization does not refer to a small group of influential "representatives" of the people. Rather, grassroot participation involves broad-based, independent and homogenous local organizations at the village and neighborhood level. "Broad-based" and "homogenous" organizations are those in which membership extends to, and decision-making is done by, all those whose common socio-economic interests are best served by working together. Sponsor agencies provide technical and financial assistance, but they are not allowed to infringe

This Grass Feeds on Salt

Pakistan has a serious salinity and waterlogging problem. Much of the underground water in the Indus Basin is brackish. The idea of putting to use the country's degraded and barren soils and poor quality water resources to grow salt-tolerant plants was brought up as early as 1974 by scientists at the Nuclear Institute for Agriculture and Biology (NIAB) in Faisalabad.

Initially, tolerance studies under controlled environment conditions were carried out. Out of these a useful salt-tolerant plant, the kollar grass (Leptochloa fusca L.), was identified. This plant grows to a height of 1.5 m. and four cuttings of its grass can yield up to 40 tonnes of green matter per ha. This grass is used as fodder for cattle, sheep, and goats. After determining the utility of this plant in various green house and laboratory studies, a 60-ha area was selected at Rakh Dera Chahl near Lahore. The soil there was highly saline (with electrical conductivity of 40 dSm, and pH 10.7) and underlain with sodic water (SAR = 7-9, RSC = 9-10). Kollar grass was planted on this land, fed only by the underground sodic water.

After 18 months of kollar grass cultivation, the electrical conductivity of 25 cm. of top soil was reduced to 25 dSm. The salts from the top soil leached to deeper layers of the soil as the soils, aided by the profuse root system of the kollar grass and with the addition of organic matter from its decaying roots, became more permeable to water. In addition to a lowering of salt content, soil pH dropped from 10.4 to 9.8, and calcium content increased. The soil became fit for cultivation of normal crops after irrigation with good quality water. Brackish water was still used for irrigation and bumper harvests of kollar grass continued for many years.

Besides its utility as fodder, the kollar grass has other uses: green manure, organic compost, medium for raising edible mushrooms, raw material for the paper industry and production of methane (biogas) and fuel alcohol.
on the sovereignty of the community organization in any way. Various approaches to rural community development have been tried by government but none of them have proven sustainable.

Some lessons from such failures are:
- Instead of harnessing the potential of rural people to conceive and undertake development initiatives according to local needs, situation and priorities, the implementing agencies chose to take on the main responsibility for the programs.
- Specialized agencies established by the federal and provincial governments proved ineffective—spite of their number—in the absence of a broad institutional base at the grassroots level.
- Often the problems of the village community are inter-related and resource utilization needs to be systematically integrated. On the other hand, development agencies tended to operate on a sectoral or functional basis. For optimum use of resources and opportunities, villagers must have the management capacity to match the financial support from sponsor agencies with their own requirements.
- Many attempts to promote group cooperation and initiative have been taken over by special interest groups to serve their own purposes.
- The innovative capacity and potential of people have gone largely undeveloped. The rural poor have a better appreciation of their own socio-economic problems. Hence, they must be encouraged to come forward with some innovative approach to solving their problems.
- Past development programs were designed to follow a definite timetable (usually only a few years) whereas the creation of a self-operating system by the community requires commitment which is built over long periods of time. The task of changing human behavior and harnessing the capabilities of the masses for self-help involves a slow process and requires consistent unremitting effort.

8. The management of sustainable agriculture systems is based on the following principles:
- **Agriculture—An Integrated System.** An agricultural production system is not a compose of different entities; it is an integrated system and must be treated as such. Once an eco-system is established, all its units sustain more or less equal importance. For instance, when the Nuclear Institute for Agriculture and Biology (NIAB) succeeded in rehabilitating an area in Lahore which had been rendered unproductive by salt leaching and brackish waters, even the latter (which is otherwise a liability for any crop production system) has become an important and indispensable input in the system. In a sustainable agricultural system, diverse sources of income pop up automatically.
- **Long vs. Short-Term Objectives.** To attain sustainability in any agricultural system, long-term objectives should be the basis for the planning and implementation of any activity. For example, economic returns from the growing of trees or from stabilizing sand dunes through various biological means cannot be expected in the short-run. A reasonable period of time is required to realize the benefits of such initiatives.
- **Emphasis on Favorable vs. Unfavorable Environment.** There have been extensive discussions on the relative importance of favorable against unfavorable environments in past agricultural production ("Unfavorable conditions" include salinity, soil erosion, low fertility, aridity, etc. Conditions are "favorable" when no constraints to production exist). While recognizing and appreciating the contribution by the "Green Revolution" to cereal production, many have suggested that these advances have been made under more favorable conditions, coupled with high levels of fertilizer and pesticide input. While taking full advantage of opportunities to expand production under favorable conditions, greater emphasis should be given to agricultural production in unfavorable environments, as is the case in much of Pakistan.
- **High vs. Low Input.** Because of financial constraints and marketing problems, among others, farmers in many parts of the country are unable to get hold of necessary chemical input like fertilizers and pesticides. Furthermore, in less favorable environments farmers are reluctant to invest in these expensive chemicals even if these are readily available for fear that they might not earn enough to recoup their investment. Hence, there is a need to maximize the productivity of low input systems, especially where conditions do not seem to favor the use of high input. Favorable results from using organic manure together with chemical fertilizers have been obtained in many studies. Even nominal amounts of organic manure added to chemical fertilizers have resulted in appreciable yield increases. Efforts to develop plant cultivars with genetic resistance to diseases, insects, and pests should be encouraged. In the context of low input systems, the increased use of green manure crops and the development of more efficient sources of rhizobium and other nitrogen fixing organisms, as well as the full exploitation of the potential of mycorrhiza to facilitate soil phosphorous uptake, are all important.
- **Improved Production Systems vs. Traditional Systems.** History shows that many traditional agricultural production systems had been sustainable but began to break down when population pressure demanded greater output than such systems could supply. This necessitated modifications in traditional systems, e.g. significant reduction of fallow periods. Although production capability under such systems is no longer adequate to meet growing food needs, this in no way suggests that the principles which made traditional systems work are no longer of value. On the contrary, many of such principles should be adopted to improve current agricultural systems. Some of these are:
  - use of leguminous trees and shrubs to replenish the supply of nitrogen and organic materials in the soil, improve soil structure and water holding capacity, and reduce erosion;
  - adoption of zero or minimal tillage systems;
  - growing of salt-tolerant tree species like *Eucalyptus* and *Leucaena* along with salt-tolerant grasses or salt-tolerant plants in multi-story continuations;
  - rotational cropping to stem soil fertility depletion and the
Directions for Sustainable Agriculture

Compared with government agencies, NGOs have the following advantages and characteristics:

- They have access to, and operate at, the grassroots level.
- They are better able to communicate with the rural masses (i.e. in their own language and at their own level).
- They allow for flexibility in planning strategies and operation.

These qualities will continue to prove useful as NGOs tackle the following aspects of sustainable agriculture promotion:

Social Organization and Human Resource Development

This includes:

- Providing basic education to selected areas in rural Pakistan;
- Disseminating information on food-related issues affecting the rural population;
- Making farmers aware of the potential of sustainable agriculture;
- Establishment of village-level organizations (as envisaged by the Rural Development Foundation of Pakistan).

Management of Agricultural Inputs

While judicious application of chemical input is beneficial, indiscriminate use of such chemicals results not only in economic loss but also environmental degradation. The effective management of expensive chemical-based systems can be undertaken by NGOs through the following:

- Development of an agricultural input package for various agricultural systems and for different regions, in consultation with technical experts and village organizations.
- Supplying farmers with their input requirements;
- Popularization of supplementary sources of nutrients, like farm yard manure, organic manure, etc.;
- On-site demonstration by experts on the proper and efficient use of agricultural input;
- Establishment of a direct link between the village organizations and chemical manufacturers (farmers will thereby benefit from discounts on bulk purchases);
- Facilitating farmer's access to various technology packages (e.g. integrated pest management).

The foregoing was excerpted from the Country Report prepared by the Rural Development Foundation of Pakistan (RDFP) for the Second Asian Development Forum.

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The Greening of Gunyar

Background

"Gunyar" is a small village situated 4 km south of the town of Thana, just four hours' drive from Islamabad. Orchards, rice fields, farms of maize and onion dot its less than 500 ha. land area. Rainfall supplies much of the village's irrigation water, although water is also available from five springs and from some shallow tubewells installed along the main stream.

Until recently, Gunyar was covered by a carpet of chirpine/carpane forests. Due to extensive logging, however, the area is now almost completely denuded. Shrubs and bushes have been cut down indiscriminately for fuel. Grazing animals have decimated grasslands and other natural vegetation. All these have made the land vulnerable to erosion. The soil's moisture retention capacity has been greatly reduced. Rainfall is lost as run-off instead of being used to irrigate the fields. It is therefore not surprising that crop yields in the village have been steadily declining; so have the farmers' income as a result.

Some of the younger residents of Gunyar, majority of whom are subsistence farmers, decided to mobilize the largely poor and apathetic village to stem the destruction going on around them. They formed the "Gunyar Youth Association" and in 1984 this NGO was registered with the government as a social welfare organization.

Objectives

The Gunyar Youth Association set out the following objectives toward the sustainable management of their village's natural resources:

• Prevention of soil erosion and rehabilitation of degraded lands;
• Reforestation of land not suitable for cultivation;
• Conversion of marginal land into pastures for cattle, goats, sheep and other livestock;
• Improvement of irrigation facilities;
• Improvement of the land's productivity and intensification of cropping;
• Establishment of a coherent agricultural system to ensure the sustainability of resources in the area.

Process/Strategy

The Gunyar Youth Association sought the help of the Pakistan Agricultural Research Council (PARC). Using an integrated land use approach, PARC had previously rehabilitated highly degraded rangelands in the Pothwar plateau. The first thing that PARC did was conduct a detailed soil and vegetation survey of the village. Among others, soil moisture content and retention capacity, fertility, salinity, root foothold, potential for cropping were determined in each land use category. The suitability of certain areas for forage production or for conversion to natural pastures was also considered. The project area was then categorized according to characteristics and potential.

Following this, members of the Gunyar Youth Association, which by then included elder residents of the village, conducted the following activities in the project area:

1. Land and infrastructure development
   • Uniform terraces were hewn out of cultivated land;
   • Structures were constructed to collect run-off water from steeply sloping land;
   • Tubewells were installed to supply additional irrigation water for vegetable and high value agricultural crop production;
   • Channels conducting spring water to fruit orchards were improved and constructed;
   • Facilities to supply water to the animals were built.

2. Afforestation and pasture development
   • The area along channel beds and on steep terraces located above the flood line were planted with poplar, eucalyptus trees;
   • Steep mountain slopes were planted with eucalyptus and fast growing shrubs to provide off-season forage to the animals;
   • An area more than 200 ha. in size was set aside for grazing;

[Gunyar] looks so much better now that people who last visited it before 1986 will hardly recognize it. Yields of almost all crops have increased by 200 to 300%. Forage production in the pastures has gone up five to six times compared to a previous period...

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The whole farming community now has more and better quality livestock. Consequently, morale in the community is today at an all-time high; the people are proud of their success and are brimming with enthusiasm.

growth types of high nutritive value were planted on it.

3. Fruit trees and vegetable cultivation
- With the improvement of spring water supply, orchards of persimmon, apricot, plum, and apple were put up on the upper and lower piedmont slopes.
- With irrigation water being brought in through tubewells, the people started cultivating onions, tomatoes, potatoes, and chillies in the same area.

4. Crop production
- A balanced use of fertilizers was started.
- With improved moisture conservation practices and supplemental irrigation, it became possible to cultivate two crops a year.
- Improved varieties of wheat and maize crops were introduced.
  
  The whole area was declared catchment.
  
  Funding for the project was collected from households in the area and thereafter managed by members of the Youth Association. Technical advice was provided by experts from the federal and provincial government agencies.

Accomplishments and Constraints
In the six years since the project began, the Gunyar Youth Association has had a number of problems. Since most of the villagers were subsistence farmers, the collection of funds for the project proved quite difficult. Especially in the first few years, some members of the Youth Association had not been as committed to the project as expected. This affected the progress of the work considerably. Before the tubewells and water channels were constructed, the trees had to be irrigated manually; watering trees planted on steep slopes proved especially tedious. The lack of water supply also hindered the establishment of pastures and orchards. Another problem, this time concerning the lack of alternative sources of fodder for the animals, cropped up when heavily grazed grasslands were closed and the animals had nowhere to go.

However, after the difficult first few years the project was up and running, and substantial improvements in the village have more than made up for all the hard work. The area looks much better now than the people who first visited it before 1986 will hardly recognize it. Yields of almost all crops have increased by 200 to 300%. Forage production in the pastures has gone up five to six times compared to a previous period. The whole farming community now has more and better quality livestock. Consequently, morale in the community is today at an all-time high; the people are proud of their success and are brimming with enthusiasm. Impressed with such accomplishments, representatives of government and foreign organizations have been paying frequent visits to Gunyar. The International Union for Conservation of Nature (IUCN) has included the area in its activities list and started complementing the activities of the Gunyar Youth Association.

The NGO has cited a number of factors to explain the project’s success. Helping the members of the community to identify and analyze their problems was the indispensable first step. Enthusiasm and a voluntary spirit had to be sustained in order to surpass all the problems that came up. Technical expertise and guidance was just as invaluable as it had helped to keep the NGO on the right track.
Profile of Agricultural Sector

LAND USE
- The country's major sources of irrigation water are rainfall, surface water and ground water.
- Groundwater resources reserves are associated with four major drainage basins: Cagayan Basin (1 M ha.), Pampango-Agno Basin (0.9 M ha.) in Luzon, Agusan Basin (0.85 M ha.), and the Cotabato Basin (0.6 M ha.) in Mindanao. Combining these with other smaller resources, about 5 M ha., or approximately 17% of the country's total land area, have adequate ground water supply.
- Surface water sources abound through the 421 river systems with catchment areas ranging from 40,000 ha. to 2.5 M ha. Ten major river systems have an aggregate catchment area of 8.5 M ha., representing 28% of the country's total land area.
- Irrigation is provided by systems put up by the National Irrigation Administration (NIA). It is estimated that 4.3 M ha. of the total area is readily irrigable. As of 1990, 50% of this has been irrigated. NIA operates 150 national irrigation systems serving a total of 0.6 M ha., while communal irrigation systems (CIS) extend service to about 1.7 M ha.
- In 1983, 11.6 M ha. of land were estimated as being fully utilized for various agricultural activities. 3.1 M ha. are either idle or underutilized with potential agricultural uses. (Bureau of Soils)
- In 1986, total crop area under cultivation was estimated at 12.2 M ha. During crop year 1987, 12.3 M ha., or 41% of the country’s total land area was utilized for agriculture. Of this, 67.9% was devoted to food crops for domestic consumption while the rest was used for export crops. (Bureau of Agricultural Economics)

Major Crops and Cropping System
- Three general cropping systems in the country:
  § upland farming and forestry
  § lowland cropping and plantations (both rainfed and irrigated)
  § coastal fisheries, such as aquaculture, artisanal and commercial fishing
- The three major crops in terms of area devoted to their cultivation are rice, corn and coconut. These three alone comprise almost 80% of the total cultivated area, proof of the monocrop nature of Philippine agriculture.

Table 1. Harvest area devoted to major crops, 1989

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area (ha.)</th>
<th>% of total</th>
<th>% of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palay</td>
<td>3,497,300</td>
<td>26.60</td>
<td>34.1</td>
</tr>
<tr>
<td>Corn</td>
<td>3,689,200</td>
<td>28.07</td>
<td>20.0</td>
</tr>
<tr>
<td>Coconut</td>
<td>3,110,400</td>
<td>23.66</td>
<td>24.0</td>
</tr>
<tr>
<td>Total</td>
<td>13,143,900</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Selected Statistics in Agriculture, Bureau of Agricultural Statistics, April 1990

Dominant Bio-Physical Characteristics

Rainfall distribution
- uneven rainfall distribution
- weighted mean annual rainfall: 236 cm. or an annual volume of about 700 B c.u.m. on an area of 30 M ha.
- two distinct seasons: dry and wet/rainy
- four classifications of climate based on type of rainfall, presence (or absence) of a dry season, and maximum rain period.

Type 1
- has two pronounced seasons: dry from the month of November until April and wet during the rest of the year
- covers all the provinces in the Western part of Luzon, Mindoro, Negros, and Palawan.

Type 2
- has no dry season, with a very pronounced maximum rainfall from November to January
- covers Catanduanes, Sorsogon, the Eastern part of Albay, the Eastern and Northern parts of Camarines Norte and Sur, a great portion of the Eastern part of Quezon, the Eastern part of Leyte and a large portion of Eastern Mindanao

Type 3
- characterized by seasons that are not very pronounced - relatively dry during the months of November to April and wet during the rest of the year
- covers the Western part of Cagayan, Isabela, Nueva Vizcaya, the Eastern part of the Mountain Province, Southern Quezon, the Bicol Peninsula, Masbate, Romblon, Northeast Panay, Eastern Negros, Central and Southern Cebu, part of Northern Mindanao and most of Eastern Palawan.

Type 4
- rainfall more or less evenly distributed throughout the year
- covers Batanes province, Northeastern Luzon, Western Camarines

Next page
Norte and Sur, Albay, Eastern Mindanao, Marinduque, Western Leyte, Northern Negros and most of Central, Eastern and Southern Mindanao

- Clay loam-20-42% sand, 8-18% silt, and 27-40% clay
- Clay less than 42% sand, less than 40% silt, and more than 40% clay

Topography
- The Philippines is an archipelago
- The country has a varied topography, with lowland plains, lofty highlands, and numerous valleys

- There are an estimated 10 M workers in agriculture. The bulk of these can be found working in the industries devoted to the three main crops.
- Uplands areas support about 18 M people, of whom 8-10 M are farming on forestal lands.
- Land utilization by region

Table 2 shows agricultural land capability and its utilization by region. There was rampant over-utilization of agricultural lands in most regions resulting in the conversion of non-agricultural lands, mainly forest and wetlands into agricultural purposes. Out of 12 regions, only four (II, IV, VIII, X) showed desirable land utilization rates.

Factors Determining Land Use

Population Pressure

With a present population of 60.7 M and a growth rate of 2.3%, present levels of agricultural productivity should keep pace. Conventional agriculture’s answer to the growing food needs of the population was to open up more areas to crop cultivation. This strategy was effective when there were still abundant land resources and a manageable population size.

However, while the population expands, arable lands remain constant. This factor as well as the skewed pattern of landownership results in a situation in which a large number of the population lack access to A & D lands which are suited for agricultural activities. Thus, large areas which should have been maintained in their original state were converted to other uses, e.g. forest lands being devoted to agricultural uses.

A study by Sajise and Argayoso (1990) shows a positive correlation between the rate of deforestation and the size of cultivated areas. This confirms that forestal lands are indeed converted to agricultural uses once a confluence of factors, including population pressure, necessitates such a move.

Population pressure likewise contributes to over-utilization and maximization of land resources. Since higher productivity levels are needed to feed a growing population—with arable lands remaining constant—lands presently under cultivation are induced to produce more by using various technologies which do not allow a regeneration/recovery period.

Economic Considerations

Since the country is part of the global capitalist system, it has to look after the interests of the country and provide for the needs of its inhabitants according to its present system and role in the system. Thus, the country’s economic policies are export-oriented, import-led and promotes enclave industrialization.

This situation justifies land conversion from the point of view of the landowners while calculating some rough benefit-cost for the country as a whole in terms of employment, taxes, and foreign exchange earnings/savings.

However, it neglects an intermediate concept that of the community having a direct stake in the land within its immediate habitat. The benefits which this community must obtain from the land use pattern adopted should be of primary concern.

Table 2. Land Capability and Utilization

<table>
<thead>
<tr>
<th>Class/Region</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
<th>XI</th>
<th>XII</th>
<th>XIII</th>
</tr>
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<tbody>
<tr>
<td>Agricultural Capability</td>
<td>398.3</td>
<td>916.7</td>
<td>734.1</td>
<td>1,504.7</td>
<td>392.7</td>
<td>480.6</td>
<td>244.7</td>
<td>1,030.1</td>
<td>744.9</td>
<td>676.7</td>
<td>554.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing</td>
<td>534.5</td>
<td>678.3</td>
<td>777.3</td>
<td>1,477.5</td>
<td>1,085.0</td>
<td>807.3</td>
<td>506.6</td>
<td>578.4</td>
<td>741.9</td>
<td>702.9</td>
<td>921.9</td>
<td>935.1</td>
<td></td>
</tr>
<tr>
<td>% Utilization</td>
<td>134.2</td>
<td>74.0</td>
<td>105.9</td>
<td>98.2</td>
<td>276.3</td>
<td>175.3</td>
<td>207.0</td>
<td>56.1</td>
<td>15.6</td>
<td>94.3</td>
<td>136.2</td>
<td>168.6</td>
<td></td>
</tr>
</tbody>
</table>

Source: Balanced Regional Development Study, PIDS for ADB, 1990
Feudal structure

The feudal structure existing in the country intensifies the effects of the economic policies on the utilization of the country's land resources. Since land ownership determines one's social status in capital, only those who control the land resources are able to engage in conventional agricultural activities which require high levels of external input. And because only a few families own substantial landholdings in the county, conventional agriculture, which has proven to be an unsustainable land utilization technology, predominates in large areas of the country.

Current policies governing land use and classification

The predominant principle in all such policies is that prime agricultural lands which display economic viability shall not be converted to non-agricultural use. Likewise, the development of agro-based enterprises and industries shall be encouraged within the protected areas as long as the ecological stability of the area will not be threatened. Finally, the economic viability of the lands in question shall be determined by the Department of Agriculture in consultation with concerned local government units and the affected sectors, such as farmers and fisherfolk.

One possible loophole in the policies on land use conversion is the clause on economic viability. Since economic viability may be viewed from different perspectives, it is possible to invoke the greater national interest in recommending conversion to non-agricultural use by citing probable short-term benefits which may be derived from the setting up of, say, industrial sites.

AGRICULTURAL SECTOR

National Development Framework

The aim to transform the Philippine economy into Asia's next economic tiger through industrialization had been a primary goal of both the Marcos (1965-1986) and Aquino (1986-1992) governments. Although both administrations had different notions on how this would be attained, it remained a central theme in their development policies.

The Marcos government granted incentives to foreign investors which would invest in labor-intensive light manufacturing industries primarily devoted to export products. Thus, several export-processing zones and industrial estates were set up in different areas of the country to promote this export-oriented growth strategy.

Marcos' national development framework led to the formulation of policies which created an incentive structure which favored the urban and industrial sectors at the expense of the rural and agricultural sector.

In general, the following policies were formulated:

- trade, tariff and tax policies which stripped agriculture of its attractiveness to private investors;
- excessive government interventions in agricultural markets and private trading monopolies which distorted agricultural markets and denied primary agricultural producers their just share of the fruits of their labor;
- price structures which held food prices down for the benefit of urban consumers, even as production expenses as well as consumer goods prices were rising due to inflation;
- exchange rate policies and other macro-economic programs/policies which overvalued the peso, making the country's mainly agricultural export less competitive in the international market; and
- insufficient allocation of public funding for rural infrastructure and services needed to attract investments to spur the growth of the agricultural sector.

However, it is significant to note that despite the bias for industrial growth in government policies in the last four decades, the industrial sectors' share in the Gross Domestic Product (GDP) registered only insignificant increases. The manufacturing sector contributed 19% to the GDP in the 1960s, which increased to only 25% in the 1980s. On the other hand, while the contribution of agriculture to the GDP over the same period also declined, it was only a slight decrease from 33% in the 1960s to 27% in the 1980s. These figures fall short of the targets of a healthy industrializing economy which should have exhibited a fairly rapid transformation towards industrialization.

For its part, the Aquino government purportedly committed itself to an agriculture-led and farmer-focused development path. The objective was to raise farm income beyond subsistence levels and make it the basic building block of equitable and sustainable economic growth.

The Medium-Term Development Plan drafted for 1987-1992 aimed to reduce poverty, increase employment opportunities and promote equity and social justice. But while this Plan put more emphasis on developing the rural areas, other policies were formulated and implemented which negated whatever gains were achieved from the said strategy.

For one, enclave industrialization strategy continued in earnest.

This industrialization strategy, however, is bound to fail without instituting a genuine agrarian reform program to address the decades-old problem of inequality in the ownership and control of the country's land resources.

Even the Department of Agriculture pointed out that an agriculture-led, employment-oriented development strategy without land reform would not lead to sustained, broad-based rural development.

President Fidel V. Ramos came to power riding on a promise of people empowerment and the transformation of the country into Asia's next economic miracle. However, critics are at a loss as to how he would achieve this considering that his administration's economic blueprint bears much resemblance to the failed programs of his predecessors. Thus, no radical changes are expected to happen during his incumbency.

Besides, a number of developments seem to negate whatever prospects the planned industrialization under Ramos has.

One pronouncement which has a considerable effect on sustainable development is the relegation of agrarian reform to the sidelines and the emphasis placed on increased productivity. It betrays a flawed analysis of the root causes of poverty. For while
increased productivity is indeed important, it is still insignificant if its benefits do not accrue to the majority of the population.

The current administration’s adoption of development policies of the past administrations points to the direction it would take the country to. The continuing emphasis on enclave industrialization has continued to wreak havoc on the country’s natural resources.

The recently issued Administrative Order No. 20 instituting guidelines on agricultural land use conversion may have contained provisions which purport to prohibit conversion of prime agricultural lands into industrial sites. But it fails to provide an airtight mechanism by which prime agricultural lands may remain as such.

**Contribution to the Economy**
- Agriculture has contributed at least a fourth of the Gross National Product (GNP). Since 1986, Gross Value Added (GVA) in Agriculture has come up to nearly a third of the GNP.

**Table 3. Gross Value Added in Agriculture, 1985-1989**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GNP (Million Pesos)</td>
<td>89,611</td>
<td>94,815</td>
<td>101,050</td>
<td>106,659</td>
</tr>
<tr>
<td>Growth Rate (%)</td>
<td>2.0</td>
<td>5.8</td>
<td>6.6</td>
<td>5.6</td>
</tr>
<tr>
<td>GVA in Agriculture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Million Pesos)</td>
<td>26,579</td>
<td>26,186</td>
<td>27,082</td>
<td>28,255</td>
</tr>
<tr>
<td>% of Total</td>
<td>29.70</td>
<td>27.62</td>
<td>26.80</td>
<td>26.60</td>
</tr>
</tbody>
</table>

Source: Selected Statistics in Agriculture, Bureau of Agricultural Statistics, April 1990

- The agricultural sector contributes more than a third of export revenues and provides employment to almost half of the total labor force. Two-thirds of the total population who live in the rural areas are directly or indirectly dependent on agriculture.

**BIOLOGICAL LIMITS**

**Land Degradation**

- In the 1950s, 3/4 of the country’s total land area was covered in forest. By 1972 this had shrunk to 1/2, and to 1/4 by 1988 (or about 988,000 ha. of virgin forests)
- 50,000 ha. are cleared annually
- Because 59% of the country’s lands have a slope of 18° or more, deforestation has resulted in soil erosion.

**Soil Erosion**
- Annual erosion rate: 1 B cu. m. of top soil, or 100,000 ha. of land with a depth of 1 m.
- About 8.4 M ha. of croplands in at least 13 provinces are already eroded. Of total croplands under cultivation, only 5.8 M ha. are considered suitable for crop production, while a mere 2.8 M ha. in the lowlands are capable of producing more than one crop a year. (This is aggravated by soil pollution due to the application and indiscriminate use of pesticides and chemical fertilizers, solid wastes such as mine tailings, and intrusion of salt water.

- Soil erosion also causes the silting and sedimentation of the country’s estuaries, irrigation systems as well as coastal areas. The sedimentation of coral reefs, which are the main habitat and breeding ground for fish and various forms of marine life, has serious repercussions on the people’s protein sources.
- The island province of Cebu in Central Philippines is a prime example of an island which has practically no forest cover. The result is salinization of its water table as well as threat of desertification of the entire island. The province even has to tap drinking water sources for its inhabitants from neighboring Bohol island.

**Genetic Resource Erosion**
- Widespread and continuous planting of only a few cultivars of a crop and the corresponding disappearance of the indigenous varieties from the field result in genetic base erosion.

Before the introduction of high-yielding varieties (HYVs) in the early 1960s, there were about 3,000 indigenous varieties of rice being planted in the Philippine rice fields. Farmers also practised diversified farming—both in terms of crops and enterprise and varieties planted. This practice changed when the Green Revolution program was launched and vigorously promoted by the government. The cultivation of the country’s main cereal crops, such as rice and corn, was immediately affected. The government’s Rice Self-Sufficiency Program and the Masagana 99 Program called for the use of uniform cultivars. This was done by making the cultivation of approved varieties a condition to approval of farm loans.
Fertilizer Use and Effect

Limitations of fertilizer effectiveness

- Fertilizer efficiency has proven to be lower than expected, exacerbated by unfavorable environmental and biophysical factors, such as droughts, too much rainfall, eroded soils and the low organic matter content of soils. In tropical rice, losses reach up to 50%, while in irrigated rice they are seldom less than 60-70%.

- Acidifying mineral nitrogen fertilizers applied in unbalanced quantities decrease soil pH and the availability of phosphorous to plants.

- Micronutrients such as zinc, iron, copper, molybdenum, and boron are depleted because NPK fertilizers, which are nitrogen-phosphorous-potassium based, do not supply these. Production eventually declines and pest infestation and disease incidence increase.

- Ground water pollution attributed to fertilizers has not been substantially proven because of lack of data. However, Castaneda and Bhuiyan (1991) have reported that shallow ground wells in Laguna contain 2.8 parts per million (ppm) of nitrate. This is still below the maximum allowable concentration (MAC) of 10 ppm. However, with the current usage rate, the MAC will likely be exceeded in 18 to 20 years.

Pesticide Use and Effects

- Pesticide use in the country has become so widespread that nine out of 10 farmers think they cannot grow crops without them.

- The data presented below show the widespread application of pesticides in approximately 20% of total croplands.

Table 4. Farm Hectarage Applied with Pesticide per Cropping Year 1985-1990 (in M ha.)

<table>
<thead>
<tr>
<th>Crop Year</th>
<th>Farm Hectarage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>2.35</td>
</tr>
<tr>
<td>1986</td>
<td>2.49</td>
</tr>
<tr>
<td>1987</td>
<td>1.822</td>
</tr>
<tr>
<td>1988-89</td>
<td>no data</td>
</tr>
<tr>
<td>1990</td>
<td>3.006</td>
</tr>
</tbody>
</table>

Source: Agricultural Pesticide Institute of the Philippines (APIP) as cited by J. Burgos, Philippines Daily Inquirer 1992

Pesticide Use

(1) Groundwater contamination

- Data gathered by Medina et al. (1991), as cited by Zamora (1992), on seven selected artesian wells adjacent to or within rice paddies in Calauan and Calamba, Laguna in the Southern Tagalog Region show that groundwater was contaminated with residues of monocrotophophan, endosulfan, and chlorpyrifos.

(2) Pesticide poisoning/pesticide induced death

- Benguet General Hospital, located in the vegetable growing province of Benguet in Northern Luzon, where an estimated P593M worth of pesticides are sold in a single cropping season, reports an annual average of 44 persons treated for pesticide poisoning while the Lutheran Hospital in Baguio, found in the same province, had an annual average of 44 persons from 1970 to 1983.

- Scientists at the International Rice Research Institute (IRRI) led by M. E. Loevinsohn made a study in 1982 in a city and three municipalities in Nueva Ecija and discovered a positive correlation between the increased use of pesticides and non-accidental death rates. The rate began to rise dramatically starting 1970 when agrochemical sales began to increase and then rose to 300% in 1972-1975.

- Comparative levels of rural and urban mortality rates point to pesticide-induced deaths. From 1964 to 1970, rural and urban mortality rates were about the same. However, starting 1970 rural deaths have been consistently higher. This may be attributed to the widespread use of pesticides starting that year.

- A study conducted by the Association of Community and Educational Services (ACES) reported farm animal deaths as well as aquamarine life depletion among the effects of the use of pesticides in the rural areas. Respondents reported a high 20% farm animal mortality rate due to pesticide poisoning. There was also a noticeable decrease in the population of edible frogs, snails and crickets, all of which provide a supplementary source of protein for the rural family.
68% of the respondents in the study complained of decreasing fish population and cited changes in the taste of the remaining fish, all attributable to the use of pesticides.

(3) Pesticide related deaths
- Reported cases of gastro-enteritis, influenza, pulmonary tuberculosis and bronchitis point to their causative factor. Data from the then Ministry (now Department) of Health show an increased incidence during the months of January to February and August to September, periods when pesticide application for the dry and wet season crops is at its highest.
- Dr. Nelia Maramba of the Philippine General Hospital (PGH) has said that although pesticide caused poisoning still has to be documented in the country, it has been shown to be among the four most common causes of poisoning diagnosed at PGH from 1974 to 1977.

(4) Emergence of pesticide resistant pests
- The increased frequency and heavier doses of pesticide application have facilitated the emergence of resistant pest strains. Eventually, this will translate to more costs since new pesticides need to be developed to replace existing ones.
- The Farmers Assistance Board reported in 1982, among others, that 400 species of insects and mites have become resistant to pesticides, some even tolerating whole categories of agricultural poisons and becoming more serious pests than ever before. This phenomenon is even more serious in the Philippines because pest resistance develops more rapidly in tropical than in temperate climates.
- Gips (1987) reported that in 1984 resistance to pesticides was known for 447 insects and mites, 100 plant pathogens, 55 kinds of weeds, two kinds of nematodes, and five kinds of rodents.
- Clear evidence of the close correlation between widespread HYV cultivation and the timing of outbreaks of brown planthopper (BPH) infestation of rice has been established. The IR-8 cultivar, a rice HYV, was widely distributed in 1966 as part of the Rice Self-Sufficiency Program of the government. The first major BPH outbreak in the country happened mostly in the Central Plain in 1973, damaging 80,000 ha. of rice.

(5) High costs
- Pesticide use pushes the Filipino farmer further into poverty and dependency. The only beneficiaries are the transnational corporations (TNCs) which manufacture and market pesticides. Indeed, as Figure 3 shows, the pesticide business in the country is a lucrative enterprise.

Degradation of Marine Resources
- Data from the UP Marine Science Institute show that 70% of the country’s 300 M ha. of coral reefs have been destroyed, mostly as a result of dynamite fishing, cyanide fishing, and illegal harvest and trading of corals. It would take 30-50 years for the coral reefs to recover even half their original size.
- Figures from the Bureau of Fisheries show that from a high of 448,000 ha. in 1962, only 110,000 ha. of mangrove forest remain today. Conversion into prawn and fish ponds and industrial areas has further reduced mangrove areas by 25%.
- The destruction of the country’s marine resources translates into a loss of P14 B yearly.

SOCIAL LIMITS
- The Philippine landholding pattern is skewed—with only a few landowners controlling large parts of the total agricultural area. This situation has only changed slightly over the years despite the implementation of different agrarian reform programs by various administrations.

Table 5. Size Distribution of Farms, 1980

<table>
<thead>
<tr>
<th>Farm Size</th>
<th>Number (% of total)</th>
<th>Area (% of total)</th>
<th>Ave. farm size (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 ha.</td>
<td>22.7</td>
<td>3.8</td>
<td>0.5</td>
</tr>
<tr>
<td>1 - 2.99 ha.</td>
<td>46.1</td>
<td>25.9</td>
<td>1.6</td>
</tr>
<tr>
<td>3-4.99 ha.</td>
<td>17.2</td>
<td>21.2</td>
<td>3.5</td>
</tr>
<tr>
<td>4-9.99 ha.</td>
<td>10.5</td>
<td>23.1</td>
<td>6.2</td>
</tr>
<tr>
<td>10 ha. and over</td>
<td>3.5</td>
<td>26.0</td>
<td>21.3</td>
</tr>
<tr>
<td>Total number of farms</td>
<td>3,420,323</td>
<td>Total physical area of farms</td>
<td>9,725,200 ha.</td>
</tr>
</tbody>
</table>

Source: NCSO, Census of Agriculture, 1980

- A profile of Philippine farm operators in 1980 showed that:
  (1) Individually operated farms under 3 ha. in size represented 68% of the total number of farms but covered only 30% of the total farmlands used to cultivate. On the other hand, farms 10 ha. or more in area occupied 26% of the total farmlands but represented only 3% of the total number of farms.
- From 1979 to 1985, 24% of 31,149 sugar planters owned 79% of all lands planted to sugarcane; 1.6%, or some 504 planters, owned over 100 ha. each and controlled between them 25% of all lands planted to sugar (Philippine Sugar Commission). Data from a study of the Philippine Peasant Institute (PPI) showed that 95% of the sugarcane plantation in Negros are owned by only 3% of its local population.
- 2% of coconut farms are over 10 ha. in area yet represent only 1/10 of the total number of farms. 45% of total

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coconut lands belong to only 2% of the population.

- Department of Agrarian Reform (DAR) officials have estimated that only 20% of the country's population control 80% of the total arable land.
- The Philippine agricultural labor force numbers 10 M. Only 15% of this number are owner-cultivators and therefore have control over their landholdings. The remaining 85% have no control over the lands they till.

Table 6. Agricultural Labor Force, 1985

<table>
<thead>
<tr>
<th>Sub-class</th>
<th>Total Number</th>
<th>% of Total (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner-cultivators</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>Farmers in publiclands</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>without titles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share/leasehold tenants</td>
<td>2.0</td>
<td>20</td>
</tr>
<tr>
<td>Farmworkers and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>subsistence fisherfolk</td>
<td>5.0</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: Department of Agrarian Reform, 1985

- Credit from institutional sources is scarce and whatever is available for agricultural activities has become increasingly costly to secure. From 1978 to 1988, only 8.5% of loans granted annually by the country's financial institutions went to finance agricultural ventures. The Farm Indebtedness Survey of 1982 revealed that only 30% of the farmers were able to avail of the credit.
- Interest rates have also risen. The Development Bank of the Philippines (DBP)'s interest rate on agricultural production loans to individual farmers and fisherfolk rose from 17.5% in 1987 to 22% in 1990. Likewise, the Land Bank of the Philippines (LBIP) increased its interest rate from 16% to 18% over the same period.
- Widespread landlessness among the rural population breeds poverty. 30% of the poorest Filipinos are from the rural areas. Rural poverty accounts for nearly 3/4 of the national figure, partly because of the greater number of rural families and partly because poverty gaps are larger in rural than urban areas. The vast majority (62 to 68%) of the rural poor are farmers.

Self-employed farmers, such as small owner-cultivators, lessees and tenants, make up almost half of the rural poor. Most of them are engaged in subsistence farming using non-sustainable agricultural technologies, raising only one crop and a few heads of livestock and poultry. Since they have very limited purchasing power, it is difficult for them to acquire even the minimum needed input to raise the level of productivity. Low productivity means less income to purchase the basic needs of living.

Salaried agricultural workers are not better off. Although there was a legislated wage increase in December 1987, agricultural workers received only 1/4 of the mandated wage rate. The minimum daily earning needed to stay above the poverty line was then pegged at P125.50 (or about P3,707.00/month) in the rural areas, and yet plantation agricultural workers received only P58.50/day. Non-plantation workers received P47.12/day. Ibon Facts and Figures (1988) estimated that actual wages received by agricultural workers were only P20 to P35 daily.

- Urban families are better economically than their rural counterparts. Statistics indicate that more than half of rural families have incomes below the poverty level. In contrast, only 1/5 of urban families live below the poverty line. On the average, rural families earn only half of what an urban family does.

Table 7. Urban-Rural Income Disparities, 1961-1985 (in pesos)

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban</th>
<th>Rural</th>
<th>Total</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>12,273.00</td>
<td>4,971.00</td>
<td>7,454.00</td>
<td>14.89</td>
</tr>
<tr>
<td>1971</td>
<td>14,741.00</td>
<td>7,080.00</td>
<td>9,387.00</td>
<td>108.21</td>
</tr>
<tr>
<td>1985</td>
<td>13,081.00</td>
<td>6,204.00</td>
<td>8,806.00</td>
<td>110.85</td>
</tr>
</tbody>
</table>

Source: Department of Agriculture, October 16, 1990

- At least 2/3 of all rural households suffer from undernourishment, according to the Food and Nutrition Research Institute (FNRI). Three out of four children of school age suffer from varying degrees of malnutrition. One million such children are blind. Infant mortality rates are also rising. Pneumonia, measles and tuberculosis are the common killer diseases.
- Living below the poverty line also means being unable to afford decent housing and formal education. Likewise, adequate plumbing and sanitary facilities are almost non-existent in rural areas. This lack of the barest sanitary facilities makes them more susceptible to diseases.
- The drop out rate among school children is quite high. At age 10, 1 out of 100 schoolchildren who enrolled in Grade I will drop out of school; at age 13 to 14, another 36 will leave school.
- The World Bank has said that even if the country's economy improves at the rate of 6% annually until the year 2000, Filipinos will still suffer a decrease in net income of 3% annually.

Factors Contributing to Unsustainability

INFLUENCE OF WB/IMF POLICIES

- Heavily indebted Third World countries like the Philippines have to secure a Seal of Good Housekeeping from international financial institutions such as the IMF-World Bank regarding the implementation of their economic policies and programs. This approval is necessary for the release of new or additional loans needed to sustain development programs being implemented. Because of this influence, national development perspectives are oriented towards the Western development paradigm which encourages industrialization, free trade, deregulation and liberalization. This paradigm has proven to be biased towards the industrialized countries and the technology it encourages has been shown to be harmful to the environment.

- Foreign financial and technological assistance finances resource-based projects which are inappropriate and unsuitable to local conditions. These projects destroy the natural environment and deprive the poor of access to the produc-
itive assets on which they depend for their livelihood.

GOVERNMENT POLICIES

- Government programs and policies reflect its conformity with the existing international economic and political order. The Philippines' preoccupation with becoming a Newly Industrialized Country (NIC) is proof of this. While the Philippines has a comparative advantage in agriculture given its rich natural resources, favorable climatic conditions and abundant human resources, development policies of past governments have ignored this advantage and instead opted to develop the industrial sector first. Policies also favored the urban segment of the population and relegated the rural areas to the sidelines.

This bias is apparent in allocations made in the national budget. Public funds spent for infrastructure and support services in the rural areas are insufficient to support the development of the sector. Much of government spending on infrastructure and other support services, such as telecommunications and transportation, are poured into the urban areas to encourage investments in industries.

The corn-growing industry suffers from inadequate shipping facilities and road networks. Since the corn-surplus areas are in Mindanao and Cagayan Valley, while the main consumers are large poultry and livestock integrators in Metro Manila, high transport costs make it cheaper to import corn instead.

- Infrastructure development in the rural areas is geared towards servicing certain resource-rich investors—many of which are big agribusiness transnational corporations. The impressive road networks in Northern Bukidnon, South Cotabato and Davao del Norte in Mindanao benefit corporations like Del Monte, Dole, the DAHITRI Group of Companies and the Florendo-owned banana plantations. In contrast, distressing road conditions in the Zamboanga provinces and most of the corn-growing province of Bukidnon may be due to the limited presence of big-time agribusiness investors in these areas.

- Exchange rate policies which overvalued the peso also hampered the growth of the agricultural sector. Because much of the Philippines' exports are agricultural, an overvalued peso made these exports more expensive, and therefore unattractive, in the world market.

- Price structures for food products are inherently biased against agricultural producers. Government sets minimum procurement prices and price ceilings on consumer goods, benefitting urban consumers and impoverishing rural producers while production costs have soared, farmgate prices have dropped to economically unviable levels. (This pricing policy is especially true in the case of rice which has to be kept at prices affordable to consumers to avoid unrest.)

- The combination of high tariffs on imported agricultural input and taxes on agricultural exports has been detrimental to agricultural growth.

- Government subsidies on fertilizer and pesticide purchases, purported to protect farmers against price fluctuations in the world market, resulted in heavy losses for the government and hefty profits for fertilizer companies, all paid for by the taxpayer.

MARKETING CARTELS

- Inadequate infrastructure in rural areas, farmer indebtedness, basic needs and capital requirements, among others, put farmers at the mercy of the buyers of their products.

- Rich businessmen control the marketing business in rural areas. These businessmen form part of several layers of buyers of farm products. The marketing of palay and the rice distribution chain is a case in point. This chain generally consists of seven intermediaries: middlepersons, landlords, wholesalers, small wholesaler-retailers, millers, retailers/small stores and the government, through the National Food Authority, all of whom add on profit margins which account for the huge disparity between the farmgate and the market price of rice.

The existence of these marketing oligopolies does not encourage the shift to more productive and sustainable agricultural techniques. Since farmer-producers earn less than subsistence incomes after months of back-breaking labor, they tend to be indifferent to the technology currently in use.

RESEARCH BIAS

- Current activities and procedures in agricultural research favor the development of High-External Input Agriculture (HEIA) over traditional agriculture.

- Cost-effectiveness demands that investments in research be made in areas that can yield profits for industry and export, or products for urban consumption. Resource-rich farmers are also able to influence the agenda of official agricultural research.

MARGINALIZATION OF INDIGENOUS KNOWLEDGE AND PRACTICES

Formal education is considered the ultimate source of innovation. Knowledge inculcated in schools and universities reinforces the top-down approach to technology development. This orientation denies the farmers the opportunity to contribute to the development of technologies using the knowledge they have acquired through years of working in the fields.

EMPHASIS ON SCIENTIFIC METHODOLOGY

The emphasis on scientific methodology, defined according to Western standards, has contributed to the marginalization of indigenous knowledge. Because traditional agricultural practices do not conform to this definition, these are considered primitive and unscientific.

This is so since modern technology tends to be organized in terms of disciplines, whereas traditional agricultural practices are multi-disciplinary and holistic.

As a result modern agriculture produces output which are incomplete and answer only specific disciplinary problems.
## Sustainable Agriculture Initiatives

### SELECTED NGO INITIATIVES
### IN SUSTAINABLE AGRICULTURE

<table>
<thead>
<tr>
<th>Implementing Organization</th>
<th>Type of initiative</th>
<th>Strategy</th>
<th>Activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sibol ng Agham at Teknolohiya (SIBAT) (network)</td>
<td>Community seed banking/nursery</td>
<td>Coordinate community seed bank (CSB) activities.</td>
<td>Develop appropriate &quot;descriptors&quot; of seed collections; Field-test the suitability of developed descriptors; Maintain quality and quantity of seed collection; Check the progress of member CSBs; Network with other organizations (e.g. the National Plant Genetic Resource Laboratory)</td>
</tr>
<tr>
<td>South Cotabato Foundation, Inc. (SCFI) (network)</td>
<td>Promotion of upland farming technology</td>
<td>Help grassroots communities take advantage of the government’s Integrated Social Forestry (ISF) Program (which gives forest dwellers a renewable 25-year secure tenure in a 3-7 ha. tract of forest land in which they can engage in agroforestry).</td>
<td>Organize people in communities into people’s organizations (POs) and assist them to acquire Certificates of Stewardship Contract (CSCs) under the ISF Program; Maintain a central nursery and establish community tree nurseries; Provide services such as linking and training; Provide initial credit for short-term production of cash crops.</td>
</tr>
<tr>
<td>Philippine Association for Intercultural Development (PAFID)</td>
<td>Promotion of upland farming technology</td>
<td>Help secure the tenure of tribal communities on ancestral land through the ISF Program.</td>
<td>Organization building: Establish and strengthen upland farmers’ organizations by developing organizational skills and creating organizational systems. Upland integrated farm development. Hold technology assessment exercises involving other institutions to determine the suitability to the area of upland technologies; Train beneficiaries in the use of different upland technologies, and sponsor cross farm-visits and field demonstrations; Help plan for individual or group agroforestry projects. Monitor the implementation of plans; Conduct farm visits to strengthen gains as well as attract new participants; Train community organizer volunteers chosen from members of the beneficiary community to assist in program and membership expansion.</td>
</tr>
<tr>
<td>Gagnay'ng Mangingisdas sa Bato/Gagnay'ng Mangingisda sa Riverside (Small Fishfolk of Bato/Riverside)</td>
<td>Marine resource conservation</td>
<td>Protect and reforest mangrove areas within members’ fishing grounds.</td>
<td>Plant mangrove tree species such as bakawan, pagatpat, larangay, and payapi; Erect wire fences around the project area to protect the trees from illegal logging.</td>
</tr>
<tr>
<td>Implementing Organization</td>
<td>Type of initiative</td>
<td>Strategy</td>
<td>Activities</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>Tugong Aksyon ng Masa Laban sa Krisis (TUGMA-KRISIS)</td>
<td>Alternative marketing system</td>
<td>Link direct producers of food crops to consumers, especially the marginalized sectors in urban areas.</td>
<td>Tapped grassroots suppliers (e.g., organizations affiliated with farmer-fisherfolk networks) of rice and other products being traded; Opened outlets in the capital, Metro Manila; Set up an efficient system to release rice at affordable prices; Facilitated discussions on food prices between producers and consumers.</td>
</tr>
<tr>
<td>Aniban ng mga Manggagawa sa Agrikultura (AMA)</td>
<td>Commercialization of sustainable agriculture technology</td>
<td>Develop and market organic fertilizers.</td>
<td><em>(See sidebar, A Fertilizer Called 'Green Earth', p. 85.)</em></td>
</tr>
<tr>
<td>Abra River Irrigators Association, assisted by IKAPATI Farms and the Center for Alternative Development Initiatives (CADI)</td>
<td>Commercialization of sustainable agriculture technology</td>
<td>Produce higher rice yields using non-chemical bio-dynamic farming technologies</td>
<td><em>(See sidebar, &quot;And They Said It Couldn't Be Done&quot;, p. 87.)</em></td>
</tr>
</tbody>
</table>

Technological developments, therefore, may be favorable to a particular discipline while being harmful to the entire system.

**Lessons Learned and Insights**

Lessons and insights gained through the promotion, practice and replication of sustainable agriculture were generated from the observed principles, policy directions, management practices and operational strategies of the organizations involved.

**Management Practices**
As was evident in MASIPAG and ODISCO, one common management practice in all of the initiatives undertaken is the close coordination and participation of the people directly affected by the initiatives. Thus, grassroots communities and the common farmer were part of the conceptualization, implementation and evaluation of what was being done which would have a great impact on their lives.

This is a step in the right direction. The return to the technological innovations of traditional farming formed over long periods of time renews the value of the culture of the indigenous people. In this way, the initiatives to develop technologies are centered on the farmer.

Moreover, the participatory approach to economic empowerment has generated a degree of enthusiasm rarely seen in the top-down approaches to development. For instance, the farmers of Abra have shown their capability to manage the change process themselves. Only minimal support is initially required.

Thus, all of the initiatives are prime examples of the participatory approach in social development. There were no attempts to present a package of solutions to the problems. Instead, innovations were added to the "basket" of possible solutions from which each and every farmer or group of farmers choose.

**Policy Directions**
Many organizations involved in sustainable agriculture are small and diverse. Usually, they only have limited resources at their disposal. Their approach inherently tends to be critical of "official" development policy. Thus, they are usually viewed with suspicion and/or hostility by the government.

However, there has been an increasing shift away from this very adversarial attitude. Especially during the Aquino administration, there has been an increasing trend towards opening up communication channels and initiating cooperative efforts with the government. This can be partly attributed to the perceived widening of the democratic space and the installation of formal institutions of power.

The efforts of the Sustainable Agriculture Coalition (SAC) in engaging the Department of Agriculture (DA) in a continuous consultation to lobby for the institution of several aspects of sustainable agriculture in DA programs is a step towards this direction.

And this has produced results. The lobbying initiatives had been
A Fertilizer Called “Green Earth”

A niban ng mga Magsasaka sa Agrikultura (AMA) is a farmers’ organization based in Bulacan. Seeking alternatives to chemical-dependent farming, farmer members of AMA, together with agronomist Mr. Melchor David, developed an organic fertilizer which they called “Luntiang Daigidig” (Green Earth). This fertilizer is rich in minerals (nitrogen, phosphorous, molybdenum, boron, silica, calcium, sulphur, carbon, wheat, and chlorine) and contains organic matter like poultry waste and beneficial microbes necessary for nitrogen fixation.

Prior to the commercial production of Luntiang Daigidig, members of AMA formed the Agricultural and Fishery Multipurpose Cooperative, and with their combined shares of stock put up P5,000.00 for the project. The farm of Mr. Francisco Baltazar, one of AMA’s leaders, was used as base of operations.

The farmer members made the fertilizer themselves and then sold them to other farmers in their community. They also used Luntiang Daigidig to fertilize their own crops, and thereby demonstrate its efficacy.

From the sale of 286 bags of Luntiang Daigidig in its initial venture, AMA made a profit of P23,600.00 in just three production cycles.

The fertilizer proved its capacity to raise farm productivity and income. Mr. Baltazar’s 2,000 sq. m. (or 1/5 ha.) farm, for instance, yielded 31 cavans of palay, eight more than his usual harvest using inorganic input.

In further trials, farm income was seen to increase by an average 10%.

Milling recovery also improved. 50 kilos of palay grown with Luntiang Daigidig yields 35 kilos of rice, for a recovery rate of 70%. The average milling recovery is 30 kilos of rice for every 50 of palay.

Moreover, soil quality improved and fertility was enhanced with the use of Luntiang Daigidig.

Successful in the banning of four pesticides which have been banned in most First World countries because of their proven harmful effects. The lobbying also included other organizations such as HARIBON, CADl and farmers organizations like the Lakas ng Magsasakang Pilipino (LMP).

Even as the environmental organizations like the SAC become more active in their efforts and have gained significant victories as well, there is still the prevailing attitude of resignation among the population. Most of them are resigned to the fact that while chemical agriculture may be hazardous to the environment and the health of man, it has proven effective in answering the food needs of a growing population.

Even government bureaucrats hold this line of thinking. The then DENR Secretary Fulgencio Factoran Jr. stated that “alternative technologies still have to be perfected and then transferred to our tradition-bound farming communities. The transformation to soft agriculture could take a generation. Meanwhile, we have almost no choice except to live dangerously with our Faustian agriculture.”

As Nicky Perlas looks at it, “The biggest obstacle now is that many of the biggest programs of government are insensitive to changes. As it is, there are well-placed economic and political structures which block the shift to sustainable agriculture. Subsidies, for one, are biased in favor of chemical agriculture. He then concluded that “technologically, there is no obstacle. The reality will be gradual replacement.”

Principles

The track record of the sustainable agriculture advocates showed their adherence to one very consistent principle: that their social development programs should have a holistic and integrated approach towards the solution of the problems besetting the agriculture sector in particular and society in general.

Thus, the sustainable agriculture initiatives do not only offer technological advancements but also aim to reorient human attitudes and values. They also recognize the role of spiritual forces in all the processes of life.

ODISCO’s technological innovations designed to utilize indigenous and locally available resources in the farming
enterprise is complimented by a reorientation of the human values and mental attitudes of the peasants to instill in them a strong moral framework. The system also encourages the spirit of cooperation and mutual help through the formation of production-based multipurpose cooperatives. A strong national peasant-workers organization consolidates and institutionalizes the gains from these initiatives.

Likewise, IKAPATI’s recognition of the functions of “life forces” in the inter-actions of nature is a step away from the materialist concept which is one of the causes of the failure of the dominant scientific model. Its technology also veers away from the reductionist tendency of modern agriculture. It approaches farming by recognizing the biological inter-action of the whole community of species and its habitat and the natural symbiosis and balance of nature. The use of inorganic and chemical-based inputs has disturbed and destroyed this natural state.

The initiatives also had emphasized the concept of an intensified land-use through multiple-cropping and diversification. This is reintroducing one of the tenets of traditional agriculture. MBRLC’s UPLIFT, for one, is a multiple cropping system which intensifies land utilization but preserves and enhances the soil condition.

Operational Strategies
One of the lessons learned from the experience of the commercialization of the IKAPATI Farms is that an immediate shift from chemical pesticides and fertilizers to biodynamic farming can be done without reducing yields. Yields can even be increased resulting in more income. As in the case of the Abra biodynamic rice farmers, yields increased by 50% more than those of chemical farmers.

Furthermore, the IKAPATI experience is proof that sustainable agriculture technologies can go beyond backyard farming. It showed the commercial viability of such technologies.

One problem which IKAPATI encountered is the very high overhead cost of their present farm site. While indeed the gross revenues of the farming venture were remarkable, the land rental expenses form a big share in their expenses. This has a corresponding lowering effect on the net income of the farm.

To remedy this situation, IKAPATI would be setting up other farms outside of the metropolis. A farm has been set up in Iloilo while another one is planned to be set up in Bulacan. In this way, land rent would not form such a large part of the overhead cost. Consequently, the income would reflect approximate revenues of a real farming enterprise.

IKAPATI’s Nicky Perlasmil quoted the fact that “despite a lot of interest, there is no significant movement” in sustainable agriculture. He also believes that the technology may take some time to take root because of a lack of trained and committed technicians. In addition, the transition to chemical-free agriculture involves a reorientation of values, even a change in lifestyle. “Sustainable agriculture must not only be ecologically sound or commercially viable but socially just as well,” he concluded.

On the other hand, ODISCO’s strength lies in its training program. It is a five-level program designed to reorient one’s concepts of landownership, leadership and power as well as train managers and educators on management skills and the biodynamic sustainable agriculture technology. Training is done mostly in the ODISCO Demonstration Farm in Victorias, Negros Occidental or in the other demonstration farms scattered all over the country.

Directions for Sustainable Agriculture
The fact that the Western model of development causing economic dislocation, ecological destruction, social and political instability has spurred the search for viable alternatives which can respond to the growing needs of the population.

Sustainable agriculture has to respond to this need. It should wean the people away from harmful practices connected with the agricultural model which is part of the dominant socio-economic and political system.

Central to this attempt to veer away from the dominant development paradigm is the study and development of indigenous cultural, economic and socio-political ways of living. The erosion of the technological innovations of traditional farming must be stopped. There should be conscious and consistent efforts to adopt again and reinvigorate the rich knowledge and culture of traditional agriculture. This would allow the farmers to live according to their communal objectives and allow for sustainable development. This would enable the farmers to chart their own destinies.

Towards this end, sustainable agriculture advocates should invest more resources in research on, and development of, traditional agricultural practices. They should also be conscious of the fact that the biophysical and ecological diversity of communities requires the adaptation of technologies to each particular situation. There is no single package of solutions applicable to all conditions.

Sustainable agriculture advocates also have to strive to increase the awareness of people regarding the problems besetting society, enlightening them on the root causes and presenting sustainable agriculture as part of an integrated approach to development. It has to counteract the vertical communication model being used by the dominant agro-industrial system as an instrument of domination and disinformation of rural producers, which promotes the commercial interests of agro-industry.

Finally, more vigorous advocacy efforts for more equitable ownership and control of our natural resource base and production and income should be undertaken. Advocacy for changes and reorientation in government policies such as genuine agrarian reform and the efforts to block “liberalization” policies as contained in the GATT should also be intensified.

Activities to be Given Emphasis
Therefore, initiatives on sustainable agriculture have to focus on three important lines of action. First, a conscious effort to bring back into the mainstream the technological know-how of indigenous cultures. Second, a vigorous promotion of sustainable agriculture to encourage a shift away from conventional technology. And lastly, intensified advocacy efforts to bring about a radical reorientation of state policies, strategies and programs towards a bias for a more equitable distribution of resources, production and
“And they said it couldn’t be done”

The Abra Irrigation Project is an experiment in growing rice without using agro-chemicals. It was conducted in Abra, northern Luzon, by farmer members of the Abra River Irrigators Association (ARIA) in collaboration with IKAPATI Farms and the Center for Alternative Development Initiatives (CADI).

IKAPATI Farms has gained some prominence for growing vegetables and other crops in a 3-ha. farm without using chemical input. In fact, it has shown that it is possible to obtain paddy rice yields of over 110 cavans, or approximately six tons, per ha. per harvest. This yield is almost twice the national average and more than the Masagana 99 target (of 99 cavans per ha per harvest). Masagana 99, now defunct, was a rice production enhancement program undertaken by the government of former President Ferdinand Marcos. Members of ARIA heard of IKAPATI Farms’ successes in what was called “bio-dynamic farming” and asked for assistance in adopting the new technology to their farms.

In a cooperative venture between ARIA and IKAPATI/CADI, 18 farmer members of ARIA were selected to participate in an experiment aimed at demonstrating that the shift from chemical to ecological farming (using biodynamic methods) can be made without loss of productivity and income.

The participating farmers were among the beneficiaries of the Masagana 99 Program. One of them, Mr. Lorenzo Jose, had in fact been lauded as a “Green Revolution Hero”. At the height of the Green Revolution in the country, Mr. Jose was producing 80 cavans of rice per ha. per harvest, or eight tons of palay per ha. In less than 10 years, however, he was using four times more fertilizer just to maintain the same yield. Larger quantities of pesticides were also needed to control what had become pesticide-resistant insects. Mr. Jose finally ended up sick and P45,000 in debt.

At the start of the Project, ARIA and IKAPATI Farms’ director Mr. Nicanor Perlas agreed on a framework of collaboration. The farmers would set out the objectives and implement the trials. They would also decide which aspects of the biodynamic technology they wished to adopt. IKAPATI and CADI, on the other hand, would give instructions in the technology and draw up a scheme to measure yield components of the rice crop.

Guided by IKAPATI/CADI, the participating farmers themselves made the “biodynamic preparations” and, together with compost or chicken manure, fertilized their crops with it. Not a drop of toxic pesticides was used. Instead, the farmers allowed the teeming populations of beneficial insects, specifically wolf-spiders, to control the spread of harmful insects. One wolf-spider proved to be as effective in controlling pests as P60.00 worth of pesticides in one cropping season.

At the start of the Project, technicians from the Department of Agriculture (DA) refused to cooperate with the farmers and scoffed at what they considered a ridiculous experiment. They said the biodynamic approach was good only for small-scale farming. However, when it came round to harvest time, the DA technicians had a sudden change of heart. In front of one of the larger biodynamic demo farms, they erected a big placard which said “Biodynamic Rice”, printed in the department’s signature green and yellow. A video footage was also taken in which the narrating DA official announced that the department was now endorsing sustainable agriculture.

The results of the experiment were truly impressive. A participating farmer who used the full spectrum of the biodynamic technology harvested 130 cavans, or 6.5 tons of paddy rice per ha. This is three times the provincial average yield of 40 cavans per ha. and 65 cavans more than the average yield of chemical farming (65 cavans per ha.). Five of the farmers, or 1/3 of the Project participants, produced 100 cavans per...
Revitalizing farmer’s knowledge

The major strength of traditional agriculture systems is in their functional integration of different resources and farming techniques. The integration of different biological components (large stock, small stock, food crops, fodder crops, trees, green manures) and various land-use functions (crop protection, soil and water conservation, food and fuel production) ensures the stability and productivity of the farming system and the conservation of the natural resource base.

Indigenous knowledge is a valuable source of information about the local farming systems. Moreover, the farmers’ knowledge and skills in adapting new ideas to their local conditions and needs provide an insight into how they consider changes in their modes of production.

The recognition of the cultural wealth of indigenous people and renewing the value of their technological knowledge should be an important approach towards the reinvigoration of their cultural identity.

Towards this end, sustainable agriculture advocates should pour additional efforts in the research and documentation of traditional technologies. However, this study should be done from an “insider’s” perspective by way of sharing and living with the community. Likewise, actual field experiences in sustainable agriculture should be documented for use in promotion and advocacy work.

Information obtained and validated by the farmers should be disseminated as a way of acknowledging and giving it renewed value. Moreover, this can stimulate reflection and the development of technological adaptations in other communities. This would be a very effective encouragement towards a shift to sustainable modes of agriculture. Towards this end, using a farmer-to-farmer approach would effectively reach out to as many farmers as possible given the limitations of the sustainable agriculture advocates.

A continuous and more systematic process of innovating these technologies should be installed. This can be done by intensifying collaborative efforts and among sustainable agriculture advocates. This should involve a large segment of society—farmers, scientists, NGOs, members of the academe and government technocrats. More conscious efforts of collaborating with sympathetic government technocrats should be done to influence as much as possible policies pertaining to agricultural development.

Efforts should also be exerted to substantially increase investments on agricultural research. Advocacy programs should be launched to pressure government to increase public allotment for research on sustainable agriculture.

Formal institutions of learning should strive to re-orient their curriculum and activities towards the integration of sustainable agriculture. More research on sustainable agriculture should be encouraged. An incentive system should be instituted to recognize exemplary performances in the development of sustainable agriculture.

Resources of state-controlled learning institutions such as the University of the Philippines, Visayas State College of Agriculture, Mindanao State University and Central Luzon State University should be harnessed for the study and improvement of sustainable agriculture technologies.

All of these should be undertaken with the end in view that economy and technology are not ends by themselves but are rather the means towards the realization of self-sustaining development, with the people finally having control over their lives.

Promotion of sustainable agriculture as alternative

There should be a concerted effort to promote and disseminate sustainable agriculture as one of the important answers to the
nagging issues of poverty and hunger. The use of various media available to reach as large a part of the population as possible should be explored.

Moreover, methods to be used in promoting sustainable agriculture should be culturally sensitive and innovative to command the attention and interest of the people. It should be effective against the enormous propaganda machinery and communication tools being used by promoters of the dominant agro-industrial system.

These moves are intended to make the people understand the current situation and evoke a positive response for sustainable agriculture. It would galvanize people’s action against conventional agriculture and its institutions such that they would opt for a more sustainable approach.

Advocate for radical changes in the control of resources

Finally, the national development paradigm should be re-oriented towards serving the interests of the vast majority. The national economy should be freed from the control of foreign interests.

Thus, vigorous and sustained campaigns should be undertaken to institute radical changes in the ownership pattern of the natural resource base and the inequitable distribution of the production and income of land. Central to these efforts should be the implementation of a genuine agrarian reform program which would give actual and direct producers control over the land they till.

Access to adequate and timely support services such as credit and capital should be opened to favor resource-poor farmers. Thus, a financial intermediary system owned and managed by and for the marginalized rural population should be put in place. This would ultimately empower them financially and bring about a real channeling of the flow of wealth and finance back to the countryside - thereby thwarting the propensity of the rural elite to invest in urban centers and leaving the countryside as impoverished as ever.

One important component of this action would be the recognition of the role of banks and financial institutions as holders of much of the country’s liquidity in an alternative national development paradigm. Hence, sustained networking and coordination with financial institutions should be done with the aim of designing appropriate financial programs that would redound to the benefit of much of the rural population and advance further the cause of sustainable agriculture.

The resulting investments in the rural areas would hopefully spur agricultural productivity and raise rural income. A corresponding multiplier effect would be an expansion of the domestic market and the encouragement of the manufacturing sector to increase production. There should also be efforts to counteract policies having global implications which favor and strengthen the present agro-economic system to the detriment of the Southern countries. The “liberalization” policies contained in the GATT as well as the setting up of free trade zones in several regions must be opposed.

Corollary to this, measures to achieve political influence should be undertaken. This would enhance the opportunities of the advocates of sustainable development to promote and expand their coverage and influence.

It must be pointed out, however, that while ecologically sound technologies could spur increased productivity and income, this per se could not institute radical changes in the state of wealth distribution among the population. It is the organization of low income people, empowered to mobilize and allocate real resources through access to finance, that possesses the live energy to bring about fundamental changes. This is essential in sustaining the financial gains that accrue with the adoption of sustainable agriculture technologies.

All of these should be undertaken to keep the gains of sustainable agriculture under the control of the majority. For without an equitable distribution of the resources and its fruits, sustainable agriculture would only be enjoyed by the few and the rich.

The foregoing was excerpted from the Country Report prepared by the Philippine Partnership for the Development of Human Resources in Rural Areas (PhilDHRRRA) for the Second Asian Development Forum.

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Case Study: Philippines

Science in the Service of Farmers

Background
Like other Asian experiments with high-yielding rice varieties (HYVs of rice), the one in the Philippines has proven to be unsustainable.

Introduced in the 1960s as part of the Green Revolution strategy and promoted by a government rice yield enhancement program, HYVs were hailed as an agricultural miracle, with not a little help, of course, from the package of agro-chemicals and farm machinery that came with it. At the same time the International Rice Research Institute (IRRI) was established in the Philippines by the Rockefeller and Ford Foundations purportedly to improve the quality and quantity of rice worldwide. From its inception, IRRI has devoted its efforts to breeding chemical-dependent rice varieties. It has since directed the country’s agrarian policies; in fact, the then Ministry of Agriculture, had even relinquished to IRRI its authority to decide on the use of herbicides and fertilizers and institute policies on water management and irrigation.

Experiments with traditional rice varieties that were then being conducted at the state-run University of the Philippines in Los Banos, Laguna (UPLB) were put to an end. All research on rice production was left to IRRI (purportedly to avoid duplication), and as a result the country-side quickly became one big monocrop field and traditional varieties were decimated.

Controlled conditions in the IRRI laboratory ensured that target rice yields were attained. However, out in the fields the new varieties did not quite live up to their promise.

Typhoons, droughts and pests showed up the vulnerability of the hybrids. Farmers also observed soon after that the soil in their fields was becoming acidic with increasing applications of fertilizers. Every year, more and more fertilizers and pesticides became necessary to sustain the initial high yields. However, limited capital and delayed loans forced the farmers to cut back on the required input, causing a continuing decline in both yield and farm income. The HYV miracle had turned into the Filipino farmers’ biggest nightmare.

The Agency for Community Educational Services Foundation (ACES), a Philippine non-government organization (NGO), has documented proof of this. A study conducted in various barrios of Nueva Ecija (a province located in Central Luzon) showed that from 1970 to 1981 farm expenses (from the use of rice HYVs) had increased 51%. On the other hand, because and in spite of a 72% improvement in rice production during the period under study, market prices decreased 46% and reduced farm income to a low 52%, of previous incomes. Thus in July 1983, 13 farmers’ organizations, together with scientists from the UPLB and other institutions, held a national consultation on the rice crisis (Bahanggunian sa Isyu ng Bigas, or BIGAS). The consultation aimed to consolidate regional comparative analyses of traditional and high-yielding rice varieties and to discuss the various issues concerning the call for a genuine nationalist agro-industrial program.

At the end of the consultation an Ad Hoc Committee composed of farmers, scientists and NGO representatives was formed to develop alternative methods in rice production, with farmers participating actively in planning agricultural programs. This Ad Hoc group later formed MASIPAG (acronym for Mga Magasaka at Siyentipiko para sa Pagpapautsadi ng Agham Pang-Agrikultura), a partnership of farmers and scientists for the development of agricultural science.

Objectives
MASIPAG aims to initiate grass-roots-based change by consolidating the partnership of farmers, scientists, and NGOs, thereby combining the knowledge systems of these three sectors.

The farmers’ research and problem-solving skills are harnessed to seek solutions to farm problems. In consultation with the farmers, the scientists then adapt lab experiments to actual farm conditions, following which the farmers test the technology on their farms. In this way, the two groups are able to reconcile modern and traditional farming practices.

On the other hand, the NGOs serve as arbiters between the scientists and the farmers. They also facilitate exercises to help the partners understand and internalize the socio-political context of their work.

Process/Strategy
In 1987 MASIPAG put up its Central Station on a 3-ha. land in Rajaq Centro, Sta. Rosa in Nueva Ecija province. The rice fields in the station are fertile and easily accessible
to members of DIWA, a farmers organization in the area. DIWA provides the labor in field experimentations while MASIPAG trains them in research methods and agricultural processes.

Satellite stations or trial farms have been established in Atimonan, Quezon, Buhí, Camarines Sur and San Luis, Aurora. Seeds developed at the Central Station are tested in these trial farms.

The MASIPAG strategy includes the collection, identification, multiplication, maintenance, evaluation and hybridization (CIMMEH) of rice and other crops. It also promotes pest management, diversified and organic farming, green manuring and farmer training.

Seeds are still processed in laboratories, but they are made non-chemical dependent. From the laboratories, high yielding and traditional varieties of crop seeds are tested on sections of the participating farmers' land. This method has proven to be effective since it takes into consideration the diverse and changing conditions in Philippine rural farms.

Pest control has also been addressed by MASIPAG. Part of the 3-ha. Central Station has been set aside for pest management experimentation. MASIPAG's Alternative Pest Management program aims to eliminate pesticide dependence by studying plants' natural defenses and the relationship between insects and the environment. (One approach being tried involves determining at which stage of development the pest is most resistant to pests.)

MASIPAG is also exploring the concept of diversified farming, ie cultivating other crops with rice, aquaculture. Diversified farming is currently limited to backyard and upland farming.

Week-long seminars are given to farmers and other interested groups on modern and traditional farming, alternative agricultural techniques, research methods, and pest control, among others.

Accomplishments and Constraints
 MASIPAG has been able to develop and distribute seeds that produce crops which are resistant to pests, droughts and typhoons. The rice yield is greater, high in nutrition, and—because of inexpensive input—cost much less than chemical rice yields. And because they do not use toxic chemicals, the MASIPAG varieties do not cause soil erosion and poisoning.

Farm incomes have also improved. Farmer adopters save more because of lower and inexpensive input; reported aggregate savings in fertilizer and pesticide purchases range from P4,000.00 to P6,000.00.

The farmers have also been able to recover traditional and other crop varieties which are more compatible to soils and climates in different areas. As of 1990 MASIPAG has added 59 more traditional rice seed varieties to its collection from previous cropping seasons.

Indeed, the MASIPAG experiment has proven that with the proper merging of farm theory and practice, better yielding and ecologically safe methods are possible.

However, not everything has been smooth-sailing for MASIPAG. For one thing, the regeneration of chemically damaged soils is a gradual process; hence, the results will not be immediately evident. Furthermore, like all development initiatives, MASIPAG needs to dispel skepticism among farmers towards the new technology. Acceptance may have come easily, but sustaining the farmers' interest is another story altogether. Developing a market for the products is an equally, if not more, taxing challenge.

However, as benefits from using the MASIPAG varieties and methods become more evident, more farmers are expected to make the shift back to traditional varieties. In time, the "HYV miracle" will be thoroughly repudiated and MASIPAG and efforts like it will be recognized as the real "green revolution".
Sri Lanka

Profile of Agricultural Sector

LAND USE

- Total land area: 6.5 M ha.
- Area under cultivation: 2,275,000 ha. (35% of total)

Survey of Crops, Area Planted, Contribution to the Economy, Productivity and Problems

Paddy
Area planted: 726,958 ha. (32% of cultivsted land) (1989)
Cropping system: lowland (rainfed, irrigated)
Cropping scale: primarily small holder. 80% of paddy farmers cultivate less than 1 ha. of land.
Contribution to the economy: Rs.6,301 M (4.8% GNP) [1991, Central Bank of Sri Lanka]

Problems: (1) The price of locally grown rice has increased steadily compared to world market prices. (2) Productivity is low because of the poor varieties being grown and because rising input costs and lack of credit have made paddy growing unprofitable to farmers. (3) As early as the 1980s profit and income levels in paddy cultivation have been showing negative trends. The paddy economy is highly dependent on heavy input use, including irrigation water; most of the agrochemicals, fertilizers and machinery are imported. With increasing oil prices and the withdrawal of government support (price guarantees, fertilizer/seed subsidies) it is doubtful whether the traditional paddy production system in Sri Lanka can continue.

Table 1, Annual Imports of Fertilizer, x 1,000 mt

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Source: NFS (The Review of Fertilizer)

(4) Most of the potential water resources have already been tapped and much of the available land is already under cultivation. (5) Poor upper stream watershed management and deforestation have adversely affected water yield in most of the country's water streams. Some of the major reservoirs are silted and lack of water has created a salinity problem in many irrigated areas.

Subsidiary Crops (maize, green gram, chillies, onion, oil crops, minor cereals such as kurakkan, millet, roots and tubers)
Area planted: 180,000 ha. (7.8% of cultivated land) (1986)
Cropping system: chena (shifting) cultivation; irrigated lowlands during the yala (dry) season (following a national policy to

Dominant Bio-Physical Endowments

Rainfall distribution
- Mean annual rainfall is around 2,000 mm. per year and total water yield is about 181,250 M cum.
- Mean annual rainfall varies from 1,500 mm. in the arid parts and 5,500 mm. in hilly areas of the country. Within the hill country the Southwestern flanks receive the highest rainfall; Northwestern and Southeastern parts of the country receive the lowest rainfall.

Temperature distribution
- Mean temperature in the lowlands is 27.5°C. Lowlands in the North West and North East are warmer, particularly from March to June.
- The highlands in the Central part of the island are comparatively cooler with a mean temperature of 17.5°C. With each 1,000 m. rise in elevation, temperature drops by 6.5°C. At the hill station in Nuwara Eliya which is 1,800 m. above sea level, temperature is 15.5°C.
- Temperatures are lowest in December-January just before dawn when temperature ranges between 21.1°C and 23.8°C. In lowlands close to the sea, at altitudes similar to that of Nuwara Eliya, the temperature is about 7.7°C. February temperatures may even fall below freezing point.

Topography
- Total land area of the island, including inland waters, is 6.5 M ha.
- Sri Lanka's topography has the following features: hill country which occupies the central part of the island; ranges of mountains and peaks; dry zone plains; rivers that flow from the central hills to join the sea at different points around the island; waterfalls; coastal plains; plateaus; inland waters.

Soil Type
The more important soil groups in Sri Lanka are: red-dish brown earth; non-caliche brown soils; red-yellow podzolic soils; red-yellow latosis; reddish brown latosols; immature brown soils; solodized solonetz; grumusols; reosols; bag and half-bag soils; low humic gleys soils; alluvial soils; calcic red yellow latosols; soils on old alluvium.

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diversify cultivation in irrigated areas during the dry season). 

**Cropping scale:** primarily small holder; home gardens

**Contribution to the economy:** 3.73% of GDP (1986)

**Current policy:** Most subsidiary crops have traditionally been grown for home consumption only. The food crisis in the '70s prompted the government to encourage their wider-scale cultivation.

**Sugar**

**Area planted:** 10,501 ha. (1990)

**Current policy:** 75% of domestic sugar requirement is imported. In order to save foreign exchange earnings government aims to increase domestic production and encourage investment in this sector. The major constraint to increasing domestic sugar production is the lack of suitable land for sugarcane cultivation. The average yield in two major sugar plantations is 4 to 4.5 mt./ha., about 3 mt./ha. lower than the world average. Other factors cited for this low productivity are genetically defective varieties planted, lack of irrigation facilities, and poor management.

Consumers have had to pay 200 to 300% higher prices for their sugar. The government therefore seems intent on abandoning efforts to attain self-sufficiency in sugar. Though it owns three of the country's six sugar factories, the government has been buying cheap sugar from multinational companies and reselling to consumers. Subsidies to the sugar sector are also drying up.

**Plantation crops**

1. **Tea**

**Area planted:** 222,110 ha. (9.8% of cultivated land) (1989, Department of Census Statistics)

**Cropping system:** plantation and lowland

**Cropping scale:** 25% small holder

**Contribution to the economy:** 25% of foreign exchange earnings; 2.45% of GDP; (to GNP, 1986) Rs.178,724M; (to foreign exchange earnings, 1986) US$3930M; employs 600,000 workers.

**Problems:** Low productivity: average yield per ha. is 300 to 400 kg. compared to the world average of 1,150 kg./ha. Insufficient input, poor extension services, inefficient state management of tea estates have been cited as the reasons for low productivity in this sector.

Two of the country's tea estates, the Janatha Estate Development Board and the State Plantation Corporation, used to be managed by the state. However, due (reportedly) to poor management and in accordance with the economy's liberalization, the administration of these corporations was transferred in 1992 to 22 private groups composed of foreign and local entrepreneurs in Sri Lanka.

2. **Rubber**

**Area planted:** 199,648 ha. (8.8% of cultivated land) (1989, Department of Census Statistics)

**Cropping system:** Cropping scale: 55% small and medium scale; 33% government-owned plantation

**Contribution to the economy:** 13% of foreign exchange earnings

**Problems:** Low productivity. In the last 20 years, yield has averaged 700 to 800 kg./ha. compared to a potential yield of 2,000 kg./ha. Uncompetitive prices, poor adaptability to local conditions of rubber varieties and poor estate management have been cited as reasons for low productivity.

3. **Coconut**

**Area planted:** 416,423 ha. (18.3% of cultivated land) (1989, Department of Census Statistics)

**Cropping system:** primarily small holder. 90% of holdings are about 10 ha. in size

**Contribution to the economy:** 5.5% of foreign exchange earnings; employs 100,000 workers.

**Problems:** (1) Low yields in tea, rubber and coconut estates is attributed to low input use. This problem is likely to grow more serious with the withdrawal of fertilizer subsidies. The declining share of these products in the world market is a further disincentive to their cultivation which is already proving unprofitable to their largely small-scale growers. (2) The government has turned over estates it formerly managed to private companies. But instead of improving the sustainability of the plantation sector the profit orientation of these companies will likely exacerbate its decline. (3) Research undertaken in this sector has not been of much help. On the whole, it has been oriented to the needs of the large estates. However, in recent years widespread fragmentation of land has taken place and in all three major export crops the small holder sector has expanded. The small holders are unable to use the technology designed for the large estate sector due to lack of capital. There is an urgent need to re-orient research based on the needs of the small holder plantations. Again, except for coconut, the
plantation sector has not practiced intensive agriculture. Not much mixed or intercropping has been done in large- or small-scale plantations either. (4) Post-harvest technologies need to be improved, outdated machinery replaced, output diversified.

**Spices**
- **Area planted:** 60,000 ha.
- **Cropping system:**
  - **Cropping scale:** primarily small holder
  - **Current policy and problems:** Until the 1950s Sri Lanka enjoyed a surplus of foreign exchange from the export of its major plantation crops. But in the 1990s export markets for these crops have steadily declined. This led the government to look for other sources of foreign exchange earnings, hence, the recent emphasis on minor export crops, composed mainly of spices such as cardamom, clove, pepper, cinnamon, nuumeg, and beverage crops such as coffee, cocoa, etc.

Continuous government support has improved the performance of the spice sector. Until the mid-1980s export earnings from spices have continuously increased. In 1970 it was Rs.614 M, reaching a peak value of Rs.1,495 M in 1982-83. Since then, however, earnings from this sector have shown a trend of decline and stagnation.

Several factors are responsible for this. One is fluctuating prices in international markets. Another reason is low productivity due to unavailability of good varieties, bad management practices, inadequate extension facilities and low level of input use. Most of the cultivation is being done by small-scale cultivators. Owners, therefore, cannot afford the high level of input due to lack of capital.

**Factors Determining Land Use**
- **State ownership of land**

Under the Crown Lands (Encroachments) Ordinance instituted by the British colonizers in 1840 all lands in the country became state property; none of the lands could be used for the traditional seasonal cultivation.

The British then sold vast tracts of land (mostly hill slopes) in the Wet Zone region to British Agency House at a nominal price. These lands were turned into plantations of export crops.

In more contemporary times, state policy on land ownership does not appear to have changed much. By virtue of the Land Reform laws of 1972 and 1975, tea and rubber plantations established by the colonizers became state property. As of 1984 80% of all land in Sri Lanka is owned by the state, making the latter the biggest landowner in the country.

**Settlement**

Previously uncultivated land, primarily those in the dry zone, have been opened up to settle people under major colonization schemes. After independence about 300,000 families were settled in the dry zone.

**Encroachment of state lands**

In 1979 about 500,000 people were reported to have encroached on 6% of the total land area in the country; most of these lands belong to the state. From 1979 to 1985 another 104,000 people encroached on 70,000 ha. of land, most of which are found in the central province, the most ecologically vulnerable area in the country.

**Urban and commercial expansion**

There has been a steady demand for land, particularly in the South West, for urbanization, commercial and industrial use, leading to conversion of agricultural land.

Plantation crops such as rubber and coconut have been hardest hit. For instance, from 1962 to 1982 tea and coconut lands were reduced by 10% each. In the most highly urbanized districts in the country like Colombo and Gampaha, 25% of plantations have given way to urban expansion.

**Change in crop priority**

Due to agricultural policies and infrastructural developments, the allocation of cultivable land to various crops has changed from time to time. For example paddy land area has increased over the years: from 614,000 ha. in 1956 to 760,000 ha. in 1988. Land allocations to other crops, such as sugar cane and export crops, have also increased in recent years.

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**Potatoes, Chillies, and Liberalization**

Before the liberalization of Sri Lanka's economy, growers of potatoes, chillies and onions got a good price for their produce. The potato growing sector was protected by the government to such an extent that consumers were paying 100 to 200% more for potatoes than world market prices. Thora parippu and cowpeas were grown to replace the formerly imported dhal. These policies benefitted the rural producers although the same cannot be said about the consumers.

With the adoption of liberalized policies, cultivation of these crops ceased to be profitable. The area planted to them decreased and investments dried up.

Where government used to invest in such protectionist measures as price guarantees and subsidies, it has now chosen to import from abroad. Big and red onions are currently being imported. The government owned Oils and Fats Corporation and privately owned grain elevators which used to purchase the bulk of the maize and soybean produce have now started importing these products at much lower prices. From 1984 to 1986, the volume of imports rose 700%. In 1986 alone Rs.4.113.1 M worth of subsidiary crop products were imported by Sri Lanka.

As a result, chena cultivators, marginal land owners and other poor farmers have abandoned growing these crops. That production has remained stable in spite of this is due to the fact that new cultivators have been taking up the slack.

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Shifting cultivation
Although chena or shifting cultivation is considered inefficient use of land, from 1956 to date land under this scheme has increased from 1 M to 1.2 M ha.

Agricultural Sector
National Development Framework
Although agricultural policies seem to have changed from government to government, in essence they were the same: geared toward increasing production.

General agricultural policies in Sri Lanka:
- Increased basic food production towards self-sufficiency via expansion of area cultivated and increasing land productivity;
- Expansion of agricultural exports.
- After 1977 emphasis was given on the following:
  - Liberalization of domestic and international trade activities;
  - Discontinuance/abolition of various types of market intervention programs;
  - Employment generation and alleviation of rural poverty with the help of long-term structural changes in the agricultural sector.

The goal of agricultural self-sufficiency was no longer considered economically efficient, and was therefore given less importance.

Contribution to the Economy
Agriculture is the single most important sector in Sri Lanka’s economy. In 1990 it contributed about 23% of the Gross National Product (GNP) and about 43% of foreign exchange earnings.

Emerging Sustainability Issues

Biological Limits

Land Degradation

Soil Erosion
- Sri Lanka loses about 132,833 tons of soils from the Mahaweli catchment alone per year. This is equivalent to 115 tons/ha/year.
- About 44% of the Polgolla reservoir, which is one of the most important man-made tanks in the country, was silted for 13 years.

Coastal Erosion
- From the coastal area of Kalpitiya to Yala (685 km.), 175,000 to 285,000 sq.m. of land are lost annually.
- The reasons for coastal erosion are natural and man-made. Man-made causes include sand mining, coral mining, felling of mangroves and destruction of coastal vegetation.

Salinity and Water Logging
- Found primarily in coastal areas and irrigated lands in the dry zone.

Water Resources
- Rainfall is the major source for both groundwater and surface water; the contribution from mist, fog, dew, and cloud water is negligible.
- 65% of the rain water discharges into rivers.
- Total annual runoff is estimated at 5.0 m ha meters (HM); 3.3 HM escapes unutilized to the ocean. About 60% of this water comes from the wet zone of the country.

- Inland Reservoirs
  - There are about 12,000 operational village level irrigation tanks in Sri Lanka and they supply irrigation water to about 2,600,000 ha. of paddy lands. They are primarily located in the dry and intermediate zones.
  - 80% of the inland fish production comes from these reservoirs. Inland fish is the cheapest source of protein available to Sri Lanka’s poor. Thus, it is important to maintain these reservoirs in a sustainable manner.

- Ground Water
  - Ground water is poor except in the North and Northwest areas.
  - Wells tapping shallow ground water supplies serve as the major source of domestic water supplies to the country, esp. in the rural areas. In the wet zone, tea, rubber, and coconut as well as other minor crops are cultivated under rainfed conditions.

Problems in Water Resources Management
- There has been a 20% reduction in rainfall over the last 100 years.
- The frequency of drought in the country has been increasing. From 1873 to 1974, seven out of 11 major droughts in the country occurred in the latter years.
- Sources of water pollution: urban waste; industrial waste; agricultural waste; oil discharge; poor sanitation.

Deforestation
- Present forest cover-1.82 M ha., or 28% of the country.
- In the period 1956-1986, the forest cover decreased by 60%, or 42,000 ha. per year.
- Today, Sri Lanka imports a substantial amount of timber and timber products. In 1990 it spent about Rs.770 M importing timber and related products, excluding different types of paper.
- Major reason for deforestation: expansion of planned agricultural activities. Other causes are chena cultivation, encroachments, illicit logging, and fuelwood extraction.
- The forest cover in 1900 was around 70% of the total land area. Today, forest cover is less than 20% of the total. National Parks and other wild life reserves declared as such under the Fauna and Flora Protection Ordinance represent about 11.5% of the total land area.

Erosion of Genetic Resources
- Sri Lanka has the highest biodiversity per unit area among the Asian countries. Around 30% of the angiosperm flora, 18% of ferns, and 16% of terrestrial vertebrates are endemic to Sri
Lanka.
- Sri Lanka has 2,800 rice varieties. In the 1920s farmers were growing over 500 paddy varieties. These varieties have great adaptability to a broad range of soil and agro-ecological conditions.
- Highland varieties are drought-resistant while those grown in coastal and river floodplain areas can tolerate submergence and flash floods. Some can tolerate low temperatures in the hilly areas while others have broad-based resistance to a large number of pests and diseases.
- Sri Lanka has 170 plant species with ornamental value and 74 of them are endemic to the country. It also has over 500 local selections and 10 wild species of pepper.

SOCIAL LIMITS
- Total population: 17 M
- 75% of population lives in rural areas.
- Per capita land availability has dropped to 0.38 ha in 1990. In 1871 this figure was around 2.7 ha.
- 27% of households are landless (1982 survey).
- 80% of paddy farmers have less than 1 ha. lands.
- About 42.4% of peasants have less than 0.4 ha. and 82% have less than 0.8 ha.
- Wages of the rural sector are at par with, if no higher (especially during peak periods) than urban wages.
- 50% of the labor force is employed in agriculture.
- 22% of labor force is unemployed; 70% of them are in the rural areas.
- Average growth of the economy: 4.5% in 1989-1990
- The estimated budget deficit for 1991/92 is as big as the total revenue of the country.
- About 50% of the population is under the food stamp scheme.
- National average of chronic malnutrition: 36.58%.
- 25% of infants born in Sri Lanka have low birth weights.

Poverty amidst progress
Studies show that the labor utilization pattern has not changed much in step with the use of new technology for agricultural activities. Paddy production has led to further stratification of the rural sector, thus widening the income gap.

Furthermore, a large percentage of landless people and marginal landholders have not benefited from recent improvements in the agricultural sector. The lack of employment opportunities for the marginalized people in the Sri Lankan rural sector is fast becoming a breeding ground for rural unrest and violence. Improvements in the rural economy have not been sufficient or have not trickled down fast enough to arrest the brewing social upheaval in the country. This threatens the sustainability of whatever gains have been made. Therefore, high on the list of priorities ought to be alternative measures to absorb this unemployed labor. It is important that agro-based industries as well as urban industrial activities be established in the country as quickly as possible.

Gender and Technology
When not working as hired labor in other people’s farms, women in rural Sri Lanka are involved, together with the men, in all phases of production in the family farm: transplanting, weeding, fertilizing and harvesting.

In spite of this, the husband or the father, being the recognized head of the family, still makes all the farming decisions. Only men can apply for credit. They alone can join cooperative societies. The marketing of the produce is also done by them. As a result women are deprived of any real economic and social power.

The introduction of HYVs and mechanized farming technologies have not rectified this imbalance between women and men. At worst, these so-called improvements have even added to the women’s burden of work load. The men have appropriated for themselves the use of the tractor and other machinery, while the HYVs which require more weeding, fertilizing, and watering—tasks consigned to the women—have changed the women’s lives only by giving them more work.

Land control
In Sri Lanka, makers of policies on land and land use need to consider not just development goals and requirements. The more important consideration should be how to solve the land centered conflict which has been wrecking havoc in the country for many decades.
Control over land in the Northern and Eastern provinces has great importance to the Sri Lankan Tamil minority. Their political and economic life, indeed, their identity as a people, is closely bound up with it. Consequently, state programs to settle other people in these lands have been met with violent opposition. The Tamils denounce the settlement programs for threatening their economic resource base and undermining the basis of their ethnic identity.

The state, which owns 80% of the country’s total land area, has been wont to exploit this situation for various reasons—most of them self-interested. For instance, all development projects carried out on state-owned land are controlled by the government. Surplus generated from land which it controls is appropriated by the state.

In addition to the economic benefits, control over most of the land has helped the government to maintain a vital relationship with the Sinhala peasantry, which form the bulk of Sri Lanka’s population. This relationship has assured the continued rule of the prevailing government and thus explains the “devotion” accorded to the small holder Sinhala peasant class by every single political party in Sri Lanka.

In order to put an end to the ethnic conflict, the government must devolve central control of land and grant regional autonomy. Unfortunately, the government has remained fiercely protective of its present privileges. For instance, the 13th amendment to the constitution and the Provincial Council Act have been circumvented and watered down to effectively limit the powers of provincial councils where land is concerned. To illustrate: under current proposals for devolution land that comes under inter-provincial settlement schemes is to be centrally controlled. This will ensure that the government retains control of development programs (e.g., the Accelerated Mahaweli Programme), which absorb huge amounts of funds and resources.

Furthermore, with the ongoing expansion of large scale commercial agriculture, the government would naturally be loath to part with its share of earnings from such ventures.

But perhaps the more compelling arguments against devolution are political in nature. As previously stated, centralized control of land is an invaluable tool to ensure the loyalty and support of Sri Lanka’s biggest voting bloc. Moreover, liberalization policies which have recently forced the government to withdraw its subsidies to the small peasants will undoubtedly cause a backlash. Hence, the government will hold on to and find other mechanisms to reinforce its traditional patron relationship with the Sinhala peasantry and so maintain its local power base. In this context, devolution will be a long time coming, if it comes at all.

Factors Contributing to Unsustainability

NATIONAL POLICY

With the liberalization of Sri Lanka’s economy in 1977, the country’s development policies underwent a significant change.

Two main features of this capitalist development are, one, the integration of the Sri Lankan economy into the international capitalist system, and two, the expansion of capitalist relations in the domestic economy.

The development of capitalist relations in Sri Lanka underwent three phases. The first began with independence and ended in the mid-1950s. The second phase covers the period from the mid-1950s to 1977. The third phase started in 1977. (It is with developments in this last phase that we are most concerned.)

The second phase of Sri Lanka’s capitalist development is characterized by state regulation and “inward looking” policies. The state was the main engine of economic growth. It protected its markets, controlled prices, restricted the movement of foreign exchange, and set production quotas, among others. Such policy prescriptions added up to dependence on state regulation.

You Can’t Eat Tobacco

For many years a multinational tobacco corporation had been enticing the traditionally food-growing farmers in the Hewaheta and Uda Dumba areas and certain parts of the Matale and Kurunegala Districts to shift to tobacco cultivation. At first, the farmers resisted but after being offered a variety of incentives by the multinational corporation, the farmers agreed to abandon growing food crops and started to cultivate tobacco instead.

The real beneficiaries in this deal, however, turned out to be the middle men. After a couple of decades of growing tobacco, the soil has become degraded and the forest cover in these areas has been completely depleted. The Soil Conservation Act, passed in the 1950s seeking to enforce proper soil management, was reduced to a dead letter law by the machinations of the tobacco company.

The growing of Gherkin, another exotic crop, is also being vigorously promoted by multinationals. Through the lure of foreign exchange they have largely succeeded in getting farmers to plant it. This particular crop, however, attracts a variety of pests and requires intensive use of imported fertilizers. Furthermore, it is feared that the pests attracted to gherkin may start attacking local varieties of pumpkin, cucumber, and other vegetable species.

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and involvement in economic development, on one hand, and protection of the economy from external forces, on the other.

State involvement drew legitimacy from social justice imperatives; it was said that intervention by the state in the economy is necessary to redress prevailing injustices in society. Some even referred to the predominance of state ownership within a capitalist framework as "socialism".

To be sure, the state promoted social welfare. The prices of essential commodities were controlled, and in some cases subsidized. A state managed cooperative system was given the monopoly in selling such goods. Moreover, to make the subsidized distribution scheme effective, state agencies intervened as purchasers in the market for essential items; for example, the state was the virtual monopoly buyer in the paddy market.

The state also played a dominant role in other spheres of social development, like education and health. Welfare policies initiated and implemented by the state have had a long history in Sri Lanka, extending through all the phases of post-independence capitalist development. This has resulted in the development of an extensive network of state managed education and health services.

This inward-looking phase in Sri Lanka's development came to an end with the ascendancy of the United National Party in 1977. Policies since then have shifted to promoting the greater integration of the country's economy with the international capitalist system. This integration has now extended to most sectors of the Sri Lankan economy, and its influence is relevant to understanding production processes in the remotest villages.

In other words, the dynamics of the development process are increasingly being determined by processes that operate internationally. This is happening not just because of the intervention of the Bretton Woods institutions—the International Monetary Fund (IMF) and the World Bank (WB)—but is a natural result of the workings of the capitalist system.

The liberalized policies introduced since 1977 are based on what have come to be known as monetarist theories of economic development and have been strongly supported by the IMF and WB. Because of this, some authors have referred to these policies as "Monetarist/IMF/WB (MIW) type". Briefly, MIW-type policies emphasize economic liberalization, export-led growth, and fiscal balance. "Great faith is [attached to] the market mechanism as a panacea for economic ailments, and government intervention in the economy is opposed in almost any form." [Howard Nicholas (1987)]

These policies take either of two forms. Structural adjustment policies prescribe the liberalization of trade and financial dealings with the international system, development of financial institutions and money markets, and diminution of the size and economic role of the state. On the other hand, stabilization policies recommend the balancing of budgets and the maintenance of a stable growth in money supply. These recommendations are based on the tenets of free market theory which emphasizes market forces, comparative advantages, reliance on private capital (local or foreign), balanced budgets (cutting down on government expenditure and welfare), and control of money supply.

As shown by several writers there are significant differences between the theoretical model for a liberalized economy as advocated by the IMF and WB and the model being followed in Sri Lanka. Nevertheless, this theoretical model helps us to identify two salient features that mark the shift in policies from 1977 onwards: the greater integration of the economy with the international system and the restructuring of the state's role in the economy.

**Liberalized Policies in Agriculture**

The impact of liberalized policies on the agricultural sector and the peasantry will be analyzed under three themes:

**Impact at the level of smallholder production, particularly in paddy agriculture.**

An important characteristic of all governments in Sri Lanka is their commitment to the smallholder peasant as a class. This has contributed to the creation of a welfare ideology in the context of capitalist development. This political commitment springs, partly, from recognition of the rural sector's electoral strength. Until the proportional representation system was introduced, the electoral system in Sri Lanka had a conscious and positive bias towards the rural areas; rural votes carried more weight. The rural sector therefore enjoyed a built-in advantage, and the political parties went out of their way to placate the rural voter. (This policy was supposed to make up for disadvantages the rural sector had in other areas.)

In addition to this, all Sri Lankan governments have been ideologically bound—by virtue of the Sinhala nationalist and populist ideology upheld by the ruling sectors—to look after the interest of rural people. An administration claiming to champion their cause acquires that all-important legitimacy and secures its continued stay in power. Even while pursuing a development model that links Sri Lanka to the outside world, the country's rulers have to espouse, in the interest of political survival, the ideals of an idyllic village economy and community.

Not only have Sri Lanka's welfare policies benefited the rural population as consumers, they have provided a boost to their activities as producers as well. Settlement schemes, subsidies for agro-input, credit facilities, crop insurance, price guarantees, among others, have all been provided for the peasants to improve agricultural production.

The liberalization phase of capitalism ushered in a shift in these policies towards the smallholder peasant. The gradual removal of farm subsidies has been a consistent feature of the post-'77 period. Producers, more than consumers, have suffered the withdrawal of government subsidies.

Changes in land and water resource use have likewise undermined the smallholder's tenure on his/her land. In contrast, the government has facilitated access by better-off farmers to these resources. Agrarian laws have been changed to dilute the protection given to the small holder. "Act No. 58 of 1979 tends to restructure agrarian relations so as to reinforce the rights and interests of landlords. The security of tenancy has been tied to the productivity of the tenant. The de facto share
going to the landlord has increased, while ensuring that big
tenants do not emerge. No attention has been paid to the
minimization of legal obstacles to entrepreneurs controlling
large tracts of land allocated to the peasantry. Bureaucratic
controls over peasant production [have] been enhanced and
the Act is designed to create a more favorable atmosphere for the
properly classifieds in the countryside (Newton Gunasinghe.
Open Economic Policy and Peasant Production. Upanathi Vol.1,
No.1 January 1986)."

The introduction of a water tax for the use of irrigation facilities has
had the effect of limiting the small holder's access to this resource
as well.

Emphasis on market oriented policies has also meant allowing
the market to determine the price of agricultural input
and machinery. The private sector has profited handsomely
from monopoly trading in these commodities. The fertilizer
subsidy was first reduced, then removed altogether in 1990.
Steps are now underway to privatize the state-run Fertilizer
Corporation.

Credit policies in the rural sector have become much more restrictive
since 1978 when the Central Bank withdrew its guarantee on farm loans.
From then on commercial banks have been more cautious about
extending agricultural credit.

This tendency has been further strengthened by recent
demands by the IMF and WB that the state should run two
government-owned banks on a commercial basis. A direct
outcome of this is further restrictions on rural credit avails.

Finally, with the removal of the rice subsidy the state drastically reduced its role as a major buyer in the paddy market.
Many of the functions of the Paddy Marketing Boards have been abolished, effectively doing away with guarantee prices
to the small farmer. The state now pays lower prices for the
small holder's produce than what the private buyers offer.
This trend is even more widespread in the vegetable trade.

In addition to reduction of the state's role in rural production,
there have been reforms of an institutional nature to curtail the state's agrarian extension services. Farmers' or-
organizations have been established, and a number are being
formed, to take over this role.

All these policy changes, part and parcel of the overall
strategy of capitalism at this stage of its development in Sri
Lanka, have been promoted as an appeal to building national
and individual "self-reliance." On one hand, the call for self-
reliance is taken to mean reduction of dependence on the state
for various services. On the other hand, it is related to the
goal of making farmers economically viable within a market
economy. Seen from the latter perspective programs are undertaken to make the farmer more commercially- and market-oriented. They are motivated to take out and repay agricultural loans rather than depend on subsidies. Diversification of farming to more commercially viable crops is an important element of this self-reliance building process.

NGOs have become unwitting partners with the state in
furthering state-sponsored self-reliance. In fact, self-reliance
has become an integral part of many NGO projects. However,
the manner in which this concept is concretized depends on
the overall dynamics of the liberalized economy. In some
instances, these projects serve only to further the cause of
reducing the role of the state. In other cases, however, where
NGOs work among "successful" farmers, the goal of self-
reliance helps develop entrepreneurship among the target group.

The foregoing policies resulting from economic liberalization have set in motion socio-economic processes of a capitalist nature in Sri Lanka's countryside. Especially in the dry zone region, farmers are abandoning paddy cultivation and opting to plant more commercially viable crops. Big business which controls the agro input trade is now engaging in commercial agriculture, encouraged by the liberalization of the agricultural sector and helped along by state guarantees of access to small holder lands.

These have created problems for small farmers. With farm subsidies cut off, few of them are now able to survive. Neither are small farmers able to benefit from many NGO projects which do not focus on this sector's needs but the community's as a whole.

Many small farmers now depend on wage incomes provided by welfare programs such as the Food Stamps Scheme and the Janasaviya poverty alleviation scheme. However, agricultural wages have been perennially depressed and have not kept pace with inflation. Hence, the widespread poverty in the country-side.

Growth of an agricultural working class and their condition under a liberalized regime.

Even before the liberalization of its agricultural sector, Sri Lanka had already been grappling with a land problem. The fact that resettlement projects in the dry zone had been undertaken as early as the pre-colonial period shows that there were landless Sri Lankans even then.

Demographical distribution had something to do with this. In the pre-colonial period large numbers of Sri Lankans migrated to the wet zone, found in the Southwest quadrant of the country. As a result, this area had and continues to have a high population density. For the same reason, cultivable land in the area was subdivided into smaller and smaller-, and thus non-viable-, size holdings. Recent surveys in the southern district of Matara, for example, show that only about 10% of the holdings are large enough to provide their tillers adequate livelihood. Small holders who are not so fortunate have been working as hired labor to make a living.

This observation seems to belie the popularly held view that
Sri Lanka's rural population consists primarily of small holder
peasants; majority of rural people, it turns out, are working in
plantations, paddy and minor export crop farms, or as laborers
in public works projects or house constructions.

The regime of liberalized economic policies has certainly
contributed to the emergence of a working class in the
agricultural sector. The proportion to other sectors of this
class of workers is so high that some have theorized that depressed wages of unskilled rural workers would explain the increasing
poverty in Sri Lanka.

Land distribution policies in the post-'77 period

Irrigating the dry zone and settling landless peasants there has
so far been the most effective way of easing the country's
landlessness problem. At the same time, this measure is
calculated to increase agricultural production by opening up new land to cultivation.

Recently, the government launched the biggest land settlement program it had ever undertaken. Called the Accelerated Mahaweli Programme, it involves diversification of Sri Lanka’s biggest river, building of dams and four reservoirs to harness hydro-electric power, irrigation of vast tracts of land, and settlement of landless Sri Lankans. Although settlement in the dry zone is a policy that dates to colonial Sri Lanka, the real motivation for this fast-track program is access to financial grants. In the last 10 years, the program has absorbed the bulk of foreign aid received by the country.

Between 1976 and 1990, 73,551 families have been settled under the Accelerated Mahaweli Programme. In the same period, however, demand for land for commercial purposes has skyrocketed. The government has responded by giving private businesses top priority as well as a wide range of incentives.

Many schemes have been introduced to facilitate access to state lands by commercial farmers and corporations. By leasing out land to these sectors the government has successfully circumvented the land reform laws which prohibit the transfer or sale of state lands.

Unfortunately, this expansion of commercial agriculture coincides with the continuing decline in cultivable land. Already, there is hardly enough land left to settle landless peasants. While the government gives preferential treatment to big businesses, it has clamped down more severely on encroachment, the only remedy to acute landlessness in the rural areas. Though the state has in the past turned over land to settlers through various land alienation programs, it has in recent years instituted stricter measures against encroachment.

Table 2. Extent of Land Alienation by the Government, 1935 to 1985 (ha.)

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major colonization schemes</td>
<td>175,941</td>
</tr>
<tr>
<td>Village expansion</td>
<td>357,238</td>
</tr>
<tr>
<td>Highland settlement schemes</td>
<td>13,504</td>
</tr>
<tr>
<td>Youth settlement schemes</td>
<td>7,963</td>
</tr>
<tr>
<td>Regularization of encroachments</td>
<td>205,762</td>
</tr>
<tr>
<td>Middle class allotments</td>
<td>55,081</td>
</tr>
<tr>
<td>Land grants (special provisions)</td>
<td>9,977</td>
</tr>
<tr>
<td>Rainfed farming settlement schemes</td>
<td>5,363</td>
</tr>
</tbody>
</table>

RESEARCH BIAS
Research undertaken in agricultural production has mostly been uneventful. In the plantation sector, in particular, research has been largely inappropriate. What research has been undertaken so far has been oriented to the needs of large estates. The plantation crops, especially tea and rubber, may be grown in estates but in recent years widespread land fragmentation has taken place and the small holder sector has grown. Due to lack of capital and technology small holders are unable to use the technology designed for the large estate sector. There is an urgent, therefore, to re-orient research activities towards the needs of small holder plantations.

Sustainable Agriculture Initiatives

The Sri Lanka based Network of Organic Farmers aims to:

- disseminate information on organic farming;
- encourage farmers to make the shift from conventional to organic agriculture;
- mobilize support for organic farming;
- train farmers and other sectors in organic farming techniques/methods;
- develop a system to certify organic products;
- encourage local consumers to buy organically grown vegetables and other organic products.

Members of this Network are, on their own, engaged in similar activities. The member organizations are:

- Anthodaya Community Development Foundation, Gampola;
- Christian Workers’ Fellowship, Anuradhapura;
- Christian Workers’ Fellowship, Badulla;
- Christian Workers’ Fellowship, Kandy;
- Community Development Society, Suriyawara;
- Devasaranaya Development Society, Ibbagamuwa;
- Future in Our Hands Foundation, Badulla;
- Gamini Seva Sevana, Galaha;
- Human Development Centre, Tuntota;
- IRED Foundation, Colombo;
- Isura Development Centre, Avugama;
- Navodaya Fellowship Farm, Dunhinda;
- Nawamgaha Foundation, Nipawera;
- Sarvodaya, Nellumukalama;
- Sayoyada, Kandy;
- IFAD Loan Project, Bowilana Watte, Deltota;
- PALM Foundation, Nuwara Eliya;
- P.M.H.E. Project, Kandy;
- Ran Riwan Kala Sangamaya, Ragala;
- Samadeepa Samaja Kendraya, Anuradhapura;
- Sarvodaya, Avissawella.

Gami Seva Sevana acts as the network coordinator.

Lessons Learned and Insights

1. The high degree of responsiveness to and trust in the Sustainable Agriculture Movement in Sri Lanka is attributed to a number of factors, among which are:

   - a self-effacing and democratic style of leadership;
   - a deep commitment to cooperation and networking among NGOs and POs;
   - advocacy of the principle that the techniques and knowledge of sustainable agriculture are to be shared without thought for profit or enhancement of status of individuals or groups;
• the realization among the public that the movement is motivated by the ideals of service and truth;
• the spiritual hunger of people everywhere to be restored to a true relationship with nature.
The movement is expected to grow in stature so long as the above-listed attributes alone are observed and honored.

2. The central policy initiatives of the Sustainable Agriculture Movement call for a countrywide agricultural structure based on self-sufficiency in food and fertility. In practice, this means that NGOs and POs must consistently emphasize small, integrated farms with the following components:
• livestock unit(s) (ideally with the added component of biogas digester);
• a farm design which provides for three zones or parts: (1) the Home Garden Site devoted to intensive cropping activities, such as growing vegetables, medicinal plants, and some fruit and spice trees; (2) the Traditional Crops Zone devoted to wet paddy, upland rice, potatoes, cassava, beans, maize, forages, etc.; and (3) the Forest and Tree Crops Zone which also doubles as a zone for birds, reptiles and other forms of wildlife.

3. The idea of small integrated farms is the basis for the NGO/PO research agenda for sustainable agriculture. To date research has focused on the following:
• techniques in soil and water conservation, including, in particular, Sloping Agricultural Land Technology (SALT);
• biogas units composting;
• animal husbandry;
• legumes (both trees and herbaceous plants) for soil regeneration and conservation, fertilizer, food and forage;
• nutritional aspects of home gardens;
• internal biological control through the use of natural pest predators and measures that contribute to plant health and vigor;
• diversity and integration, species/genetic complementation and synergy leading to plant and animal health.

In addition to the above, NGOs must now begin work on preserving indigenous genetic resources and home/village techniques in seed propagation and saving.

4. The first and guiding principle of the most progressive and effective NGOs and POs is to identify with, and work among, the poor and marginalized communities. This principle is grounded not only in compassion but also in a very practical vision that the transformation of the country to a sustainable, biologically based agriculture can best be achieved from the grassroots up.

The poor and marginalized are the ones most receptive to controlling costs by reducing external input and conserving resources. Indeed, the poor and marginalized were the first to see (and become aware) that conventional agriculture based on synthetic inputs is a dead-end approach. The poor's ability to see things as they are stems, in part, from the fact that they do not have the money to continue to delude themselves that there are ways to bypass nature and that the environment can continue to be exploited for profit and power.

Another reason why work among the poor and marginalized is given priority by NGOs and POs is the awareness that the poorest communities live in places where the land is richest—and where the signs of imminent collapse and death are clearest. Therefore, it is for very practical survival reasons that the poor and marginalized be empowered because they are situated in the earth's organs or vital zones.

5. The ultimate evaluation of the work of NGOs and POs in sustainable agriculture will be measured by its effect on the lives of children in poor and marginalized communities. It is among the children that NGOs and POs must build a new generation of farmers with a commitment to the well-being of people and a powerful aversion to the continued degradation of the natural world.

The Sustainable Agriculture Movement can find no clearer underlying philosophy for its work than the words of Lord Buddha who said:
"The forest (the natural world) is a wonderful object with unbounded kindness and goodness. It does not ask anything for its existence, it distributes generously the things it produces, it provides protection for all beings, and it gives shelter even to the man who destroys it."

The foregoing was excerpted from the Country Report prepared by P. Abeygunawardena (University of Peradeniya, Sri Lanka), Sunil Bastian (International Centre for Ethnic Studies), L. M. Samarasinghe (National NGO Council of Sri Lanka), and Ranjith de Silva (Gani Seva Sevana) for the Second Asian Development Forum.
A Dairy Farm Run by Children

Background
This integrated farming project started simply enough. A teacher of agriculture at the Dunhinna village school, located in the Central Province of Sri Lanka, wanted his students to have hands-on experience in dairy farming, which was part of their curriculum. The school, however, could not afford to put up nor operate a dairy farm. The teacher, therefore, requested help from an NGO, the Gami Seva Sevana. Gami Seva Savana had previously done farmer extension work in the Dunhinna village.

Objectives
Specifically, the practicum was intended to teach the students to set up a cattle shed and raise cows. However, Gami Seva Sevana, which actively promotes organic agriculture in Sri Lanka, decided it would teach the students just a little more.

Process/Strategy
Gami Seva Sevana started by constructing a cattle shed that could accommodate three cows. While at it, the NGO designed an 8 cu.m biogas digester that could generate energy for cooking and lighting purposes from cow dung. Below the digester, it set up a home garden. Another part of the shed was set aside to grow fodder for the cows. A pipe line to a nearby spring was installed to bring in water for the animals.

Two days a week, students from the village school came to visit the dairy farm. Gami Seva Sevana assigned an extension worker who, together with the school teacher, gave the students hands-on training in running a dairy farm. A caretaker was stationed at the farm to maintain it; since he was trained in animal husbandry, he, along with the extension worker, demonstrated to the students how to properly take care of the cows.

Thirty-two students, both boys and girls, participated in the practicum. They were divided into groups of five and the following tasks were rotated among them so that they would learn every aspect of integrated farming:

- **Maintenance of the cattle shed and the biogas tank.** This included cleaning the cattle shed, the water troughs and the feed compartments, and bathing the cows. Dung was collected and put in the inlet chamber of the biogas tank.

- **Grass planting and field maintenance.** Since this was terrain land, the students were taught how to use the "A" frame and make contour lines. Double hedgerows were planted half a meter apart, leaving a distance of 6 m. between hedges. *Glitricida* sticks were planted in the hedgerows while grass of different kinds was planted between the hedges.

- **Cutting of fodder for the animals.** The students were taught how to harvest grass with sickles. The harvested grass were then piled near the cattle shed leaving the first group students to feed the cows.

- **Compost making.** All the rubbish in the premises of the farm was collected together with the grass left over in the feeding bins. All this was then taken to a space near the cattle shed and made into compost using bio-slurry as liquid manure.

- **Maintenance of the home garden.** The students made garden beds, used compost as fertilizer, set up nurseries, transplanted seedlings to the planting beds, and used mulching techniques to lock in moisture in the soil. They also used bio-slurry as liquid fertilizer. To maintain the home garden when the students were away, the mother of one of the students was recruited to do part-time work in the garden.

To reinforce the learning process the students were encouraged to keep records; each of the five groups was assigned a leader who made sure that this was done.

Tea was prepared during each visit using the bio-gas cooker. Through this, the students saw for themselves that energy can indeed be generated even from animal waste.

In a meeting with the students, the teacher and the Extension Worker decided to have each student demonstrate in her/his home what s/he had learned from the dairy farm. Since most of the students' families were poor they couldn't afford to buy animals. Some did not have land of their own. Students from such families were told to join up with one whose family did or else request to use a piece of abandoned land from a neighbor. Gami Seva Sevana would provide the seed while the seedlings would come from the home garden at the demonstration farm. These materi-
als would be given to the students on credit which they would pay back with income from selling the vegetables they would grow.

The extension workers of the NGO would visit the students periodically to assist them. The teacher was also requested to visit his students whenever possible.

Accomplishments
It is too early to evaluate the home garden plots of the students. However, when Gami Seva Sevana looked in on the home gardens recently it observed that they were growing quite well and some students have done exceptionally well.

One gauge of the project’s success is the fact that 80% of the participating students got good grades in examinations for the dairy farming course.

The parents of the students had good things to say about the work their children were putting into their home gardens and expressed interest in trying out organic farming methods in place of chemical farming. They requested Gami Seva Sevana to come and help them, too.
Thailand

Profile of the Agriculture Sector

LAND USE

- Total land area: approximately, 320,960,888 rai (6.5 rai to 1 ha).
- 65% of the land, or 152 M rai, is under cultivation compared to 50 M rai in 1950. At the same time major reductions in forested land in all parts of the country corresponded to increases in agricultural land. From 1979 to 1989 there was a 22.4% such increase.
- The average size and number of landholdings are misleading. Many farm lands, particularly those in reserve forest areas, are without titles. Farm size is also skewed by the inclusion of large plantations. Lower figures have been suggested by the Thai Development Research Institute (TDR): 22.3, 27.4, 22.6, 22.6 respectively, in 1983.
- The size of landholdings has little to do with poverty. The argument that Thai NGOs work with marginalized farmers who have, on average, less land has no basis; as many hold land equal to the national average size. The marginalization of Thai farmers has been caused by the commodification of agriculture and Thailand's industrialization in the last 20 to 30 years. Hence, NGOs are not dealing with a distinct, static population confined always to the periphery but one which is migrating there under pressure.
- The number of households involved in agriculture: 6,464,801 (1990-91). This number is distributed as follows:
  - Northeast—3 M; North—1.29 M; Central—0.18 M; Eastern provinces—0.52 M; Western provinces—0.47 M; South—1.01 M (Agriculture Statistics 1992).

- Table 1 indicates the number of families associated with various crops by region. Almost 5 M households planted rice and other annual crops, while an estimated 1.5 M planted fruit and other tree crops.
- According to these figures, northeastern households are most dependent on rice, maize and cassava as crops, while the south depends mainly on tree crops, particularly rubber. The east is more diversified overall, with some fruit crops, particularly mango; however, it still depends heavily on maize and cassava. Rice, soybean, mungbean and maize are the primary crops of households in the north. The central region is also heavily rice dependent while the west is the largest sugarcane growing region by household.
- Monocrop agriculture is still the dominant land use in Thailand. Although diversification has been encouraged since the 1980s, it has been a diversification of crop choices at the macro level, especially agricultural end products, but not cropping methods or patterns.
- Rice production commands the major share of agricultural land use, taking up half of all farm lands, and approximately one quarter of total lands within the country. In the 1960s almost 60% of crop lands were devoted to rice. Area devoted to cash crop plantations increased 5 times, from 5.8 M rai in 1959 to nearly 36 M rai in 1988.
- A breakdown of farm land shows that while there were small but insignificant increases in paddy area over the last 15 years, expansion in agricultural lands has occurred mainly in other kinds of uses.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Paddy</th>
<th>Field crops</th>
<th>Fruit &amp; tree crop</th>
<th>Livestock</th>
<th>House</th>
<th>Idle</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>112.22</td>
<td>71.24</td>
<td>19.95</td>
<td>10.41</td>
<td>0.49</td>
<td>2.84</td>
<td>4.55</td>
<td>2.73</td>
</tr>
<tr>
<td>1980</td>
<td>119.00</td>
<td>73.56</td>
<td>25.76</td>
<td>11.14</td>
<td>0.52</td>
<td>2.52</td>
<td>3.06</td>
<td>2.43</td>
</tr>
<tr>
<td>1985</td>
<td>125.60</td>
<td>73.90</td>
<td>31.60</td>
<td>13.46</td>
<td>0.65</td>
<td>3.03</td>
<td>3.75</td>
<td>2.00</td>
</tr>
<tr>
<td>1990</td>
<td>147.80</td>
<td>74.19</td>
<td>35.72</td>
<td>19.53</td>
<td>4.76</td>
<td>3.34</td>
<td>7.68</td>
<td>1.72</td>
</tr>
</tbody>
</table>

Source: Agriculture Statistics, various years
Unit: million rai

Table 1. Utilization of Farm Land

Dominant Bio-Physical Endowments

Rainfall distribution
- The country receives monsoon rains from the direction of the Gulf of Thailand and the Andaman Sea.
- Average rainfall: 1,550 mm. annually. However, distribution and duration vary widely, both within and between regions. Rainfall ranges from lows of less than 1,000 mm. per year in some areas of the central and northeast regions, to as much as 3,000 to 4,000 mm. in the south where monsoon rains come from both sides of the peninsula.

Temperature
- It is cool from November to February, hot from March to May, and rainy from May to October.
- Mean monthly temperatures range from 20° to 28° during the cool season in lower elevations. Lower temperatures prevail in the higher elevations of the north. In the hot season temperatures increase monthly from 26° to 30°C. The south has more even temperatures averaging about 26° to 30°C throughout the year.

Topographical, demographic, soil type, forest cover, crops, and other statistics, by administrative region:

North
- Main topographic feature: hills rising to high mountains towards the border of Burma and Laos. The watershed catchment of the Maeklong river.
- Most common soil types: inceptisols, alfisols and ultisols. Much of these...
Field crops increased dramatically from almost 20 M to 33.72 M rai. Fruit and tree crops include rubber and palm oil but not eucalyptus plantations, hence the figure is skewed to lower than normal. However, fruit and tree crops still have a significant 15-year increase of almost 10 M rai. Idle farm hectarage is not free for agricultural use by the landless; it is not certain whether this category includes agricultural land bought up by speculators in the last 10 years. Livestock lands have increased by approximately 4 M rai within the last five years.

Table 2. Land Utilization by Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Total land</th>
<th>Forest</th>
<th>Farm holdings</th>
<th>Farm size</th>
<th>Number of farms</th>
<th>Unclassified land</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>106,027,680</td>
<td>50,251,470</td>
<td>34,020,778</td>
<td>24.80</td>
<td>1,371,921</td>
<td>21,755,432</td>
</tr>
<tr>
<td>Northeast</td>
<td>105,553,963</td>
<td>43,808,342</td>
<td>60,827,495</td>
<td>28.18</td>
<td>2,158,780</td>
<td>29,068,126</td>
</tr>
<tr>
<td>Central</td>
<td>64,938,253</td>
<td>15,673,853</td>
<td>39,926,885</td>
<td>34.05</td>
<td>997,492</td>
<td>15,301,515</td>
</tr>
<tr>
<td>South</td>
<td>44,196,992</td>
<td>9,143,517</td>
<td>18,989,498</td>
<td>26.51</td>
<td>716,450</td>
<td>16,063,977</td>
</tr>
<tr>
<td>Whole Kingdom</td>
<td>320,969,888</td>
<td>89,877,182</td>
<td>147,800,656</td>
<td>28.18</td>
<td>5,244,643</td>
<td>83,019,050</td>
</tr>
</tbody>
</table>

Source: Agricultural Statistics 1990/91
Unit: rai

Table 3. Households Associated with Various Crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>North</th>
<th>Northeast</th>
<th>Central</th>
<th>East</th>
<th>West</th>
<th>South</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>527,941</td>
<td>1,714,377</td>
<td>102,473</td>
<td>155,906</td>
<td>250,874</td>
<td>366,780</td>
<td>3,118,347</td>
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<tr>
<td>Cassava</td>
<td>39,435</td>
<td>456,854</td>
<td>3,720</td>
<td>78,761</td>
<td>11,288</td>
<td>590,058</td>
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<tr>
<td>Maize</td>
<td>268,525</td>
<td>150,815</td>
<td>32,441</td>
<td>36,566</td>
<td>18,772</td>
<td>1,933</td>
<td>508,052</td>
</tr>
<tr>
<td>Rubber</td>
<td>900</td>
<td></td>
<td>32,016</td>
<td></td>
<td>327,463</td>
<td>360,379</td>
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<tr>
<td>Coconut</td>
<td>8,715</td>
<td>22,194</td>
<td></td>
<td>52,300</td>
<td>61,206</td>
<td>143,609</td>
<td>288,024</td>
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<tr>
<td>Mango</td>
<td>60,532</td>
<td>124,546</td>
<td>29,104</td>
<td>40,878</td>
<td>23,345</td>
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<td>278,405</td>
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<tr>
<td>Jute</td>
<td>1,312</td>
<td>168,405</td>
<td></td>
<td>6,710</td>
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<td></td>
<td>175,115</td>
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<tr>
<td>Mulberry</td>
<td></td>
<td>167,354</td>
<td></td>
<td></td>
<td>16</td>
<td></td>
<td>169,330</td>
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<tr>
<td>Soybean</td>
<td>112,943</td>
<td>29,650</td>
<td>139</td>
<td>6,364</td>
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<td>1,170</td>
<td>150,266</td>
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<tr>
<td>Mungbean</td>
<td>79,980</td>
<td>24,271</td>
<td>1,462</td>
<td>5,542</td>
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<td>3,816</td>
<td>5,810</td>
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<td>Sugarcane</td>
<td>12,923</td>
<td>22,258</td>
<td>1,604</td>
<td>11,543</td>
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<td>68,894</td>
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<td>Groundnut</td>
<td>38,110</td>
<td>56,658</td>
<td>671</td>
<td>5,834</td>
<td>2,523</td>
<td>3,350</td>
<td>107,146</td>
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<td>Longan</td>
<td>82,026</td>
<td>8,376</td>
<td></td>
<td>1,495</td>
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<td></td>
<td>91,897</td>
</tr>
<tr>
<td>Durian</td>
<td>530</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>53,156</td>
</tr>
<tr>
<td>Rambutan</td>
<td></td>
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<td></td>
<td>22,314</td>
<td>47,899</td>
<td>70,213</td>
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<tr>
<td>Covent</td>
<td>12,000</td>
<td>9,689</td>
<td></td>
<td>7,233</td>
<td>5,239</td>
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<td>34,161</td>
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<tr>
<td>Mangosteen</td>
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<td></td>
<td>10,575</td>
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<td>21,928</td>
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<tr>
<td>Coffee</td>
<td>1,538</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>28,570</td>
</tr>
<tr>
<td>Pineapple</td>
<td></td>
<td>747</td>
<td></td>
<td>7,727</td>
<td>15,308</td>
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<td>23,332</td>
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<tr>
<td>Sesame</td>
<td>13,556</td>
<td>6,099</td>
<td>10</td>
<td>1,493</td>
<td>1,222</td>
<td>211</td>
<td>22,601</td>
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<tr>
<td>Cashew</td>
<td></td>
<td>13,360</td>
<td></td>
<td></td>
<td>419</td>
<td>5,638</td>
<td>19,659</td>
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<tr>
<td>Sorgum</td>
<td>12,146</td>
<td>3,526</td>
<td></td>
<td>2023</td>
<td>1,352</td>
<td></td>
<td>19,332</td>
</tr>
<tr>
<td>Pomelo</td>
<td>3,188</td>
<td></td>
<td>2,586</td>
<td>2,612</td>
<td></td>
<td>12,183</td>
<td>15,873</td>
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<td>Lychee</td>
<td>8,190</td>
<td>745</td>
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<td>1,83</td>
<td></td>
<td>2,156</td>
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</tr>
<tr>
<td>Orange</td>
<td>3,650</td>
<td></td>
<td>4,218</td>
<td>1,529</td>
<td>673</td>
<td></td>
<td>549</td>
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<tr>
<td>Kapok</td>
<td>2,293</td>
<td>5,19</td>
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<td>1,384</td>
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<td></td>
<td>9,396</td>
</tr>
<tr>
<td>Oil palm</td>
<td></td>
<td></td>
<td></td>
<td>142</td>
<td>2,561</td>
<td>2,703</td>
<td></td>
</tr>
<tr>
<td>Cocoa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>608</td>
<td>608</td>
</tr>
</tbody>
</table>

Source: Agriculture Statistics Office
*Households may plant more than one crop species
Table 4. Major Crops and Percentage of Total Agricultural Land Area

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>73.56</td>
<td>73.90</td>
<td>74.19</td>
<td></td>
<td>49.46/23.11</td>
</tr>
<tr>
<td>Cassava</td>
<td>7.3</td>
<td>9.23</td>
<td>9.56</td>
<td></td>
<td>6.37/19.28</td>
</tr>
<tr>
<td>Coffee</td>
<td></td>
<td>0.27</td>
<td>0.51</td>
<td>0.52</td>
<td>0.34/0.16</td>
</tr>
<tr>
<td>Cotton</td>
<td>0.75</td>
<td>0.45</td>
<td>0.40</td>
<td>0.62</td>
<td>0.27/0.12</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>0.61</td>
<td>0.82</td>
<td>0.76</td>
<td>0.74</td>
<td>0.51/0.24</td>
</tr>
<tr>
<td>Jute</td>
<td>1.42</td>
<td>1.02</td>
<td>0.79</td>
<td>0.62</td>
<td>0.43/0.23</td>
</tr>
<tr>
<td>Maize</td>
<td>9.53</td>
<td>11.36</td>
<td>11.17</td>
<td>9.22</td>
<td>7.45/3.45</td>
</tr>
<tr>
<td>Mungbean</td>
<td>2.65</td>
<td>3.28</td>
<td>3.21</td>
<td>2.79</td>
<td>2.14/1.00</td>
</tr>
<tr>
<td>Sesame</td>
<td>0.23</td>
<td>0.23</td>
<td>0.33</td>
<td></td>
<td>0.22/0.10</td>
</tr>
<tr>
<td>Sorghum</td>
<td>1.18</td>
<td>1.84</td>
<td>1.17</td>
<td>1.33</td>
<td>0.78/0.36</td>
</tr>
<tr>
<td>Soybean</td>
<td>0.68</td>
<td>1.25</td>
<td>3.21</td>
<td>2.13</td>
<td>2.14/1.00</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>2.73</td>
<td>3.42</td>
<td>4.30</td>
<td>5.72</td>
<td>2.87/1.34</td>
</tr>
<tr>
<td>Tobacco</td>
<td>0.31</td>
<td>0.19</td>
<td>0.14</td>
<td></td>
<td>0.43/0.06</td>
</tr>
</tbody>
</table>

**Tree Crops:**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut</td>
<td>2.36</td>
<td>2.59</td>
<td>2.46</td>
<td></td>
<td>1.64/0.77</td>
</tr>
<tr>
<td>Oil Palm</td>
<td>0.23</td>
<td>0.51</td>
<td>0.47</td>
<td></td>
<td>0.31/0.15</td>
</tr>
<tr>
<td>Rubber</td>
<td>9.62</td>
<td>10.29</td>
<td>11.0</td>
<td></td>
<td>0.73/0.34</td>
</tr>
</tbody>
</table>

**Fish culture:**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(Pond only)</td>
<td>0.03</td>
<td>0.08</td>
<td>0.12</td>
<td></td>
<td>0.08/0.04</td>
</tr>
<tr>
<td>(Prawn culture)</td>
<td>0.16</td>
<td>0.25</td>
<td>0.41</td>
<td>0.78</td>
<td>0.27/0.13</td>
</tr>
</tbody>
</table>

Source: Agriculture Statistics, various years, Leungaramsri and Rajesh 1992

Units: million rai

*Based on an estimate of 150 million rai under cultivation

- Cash crop cultivation is done in independent and tenured small-scale farms, contract farms, and large-scale agri-business ventures. Monocropping is the most common pattern of land use although intercropping does exist. Agricultural systems for livestock production follow the same pattern. Aquaculture, particularly prawn farming, is mainly large-scale.

- Monocrop plantation is the cropping system most often used with tree species. Rubber and oil palm are the south's primary cash crops, although rubber has recently been extensively promoted in the eastern provinces as well. Eucalyptus cultivation has rapidly expanded in the northeast region under a reforestation program promoted by the Forestry Department. It is not, however, considered an agricultural crop by the government.

- Traditional farm systems can still be found throughout the country although they are usually not included in agricultural statistics because it is difficult to assess what and how much is being produced, or its value to the government.

- Alternative agriculture is practised under a wide variety of systems ranging from traditional to modern but all strive for ecological balance within a larger ecosystem. It is based on household self-sufficiency and steers away from intensive chemical input. Intercropping, rice-fish systems, organic agriculture, agroforestry, rubber forest, traditional home gardens are a few of the alternative agricultural systems which are appearing in small but growing numbers in the country.

Approximately 20,000 farming households are involved in this form of agriculture on about 6.6% of all arable land.

Factors Determining Land Use

- Topography and ecosystem
- Culture, formal and nonformal education

Biophysical...from page 105

are unsuitable for cultivated crops, except within the lower river drainage field.

- **Total area:** 106,027,680 rai.
- **Population:** more than 5M.
- **Crops:** (upland) tobacco, corn, peanuts, beans, sugar cane, vegetables, fruit trees and flowers. Cash crops, previously confined to the lowlands, are now being cultivated in mountainous areas, causing serious conflicts between lowland communities and upland hilltribes.

Northeast (more often referred to as Isan)

- **Main topographic feature:** the Khorat Plateau. It is bordered on the north and east by the powerful waters of the Maeklong River. The northern part of the region is hilly and varying levels of plateaus ranging from 300 to 1,200 meters above sea level.
  - **Most common soil types:** poorly drained entisols, inceptisols and ultisols. These are the most impoverished and eroded in the country. Salt layers, previously buried in sedimentary layers below the surface of the plateau, have leached to the surface, making some areas impossible to farm. More than 1M rai are saline.
  - **Total area:** 105,533,968 rai
  - **Population:** 18 M. This is one of the most migrant populations in the country, leaving for Bangkok in the dry season and returning before the rainy season. This is also the poorest sector in the country.
  - **Crops:** paddy (the most important), cassava, kenaf, corn, sugar cane, peanuts, oil seed crops, beans, mango, kapok. Eucalyptus is now competing for forest and agricultural land.

Central

- **Main topographic features:** Low hills and mountains from the borders of Burma and Cambodia reach into the eastern and westernmost provinces. The hills entering the eastern part of this region are the Banthat mountain range, a continuation of the Cardamom Mountain range from southwest Cambodia. To the west the mountains of the Tenasserim range run along the border between Burma and Thailand through to where the Thai peninsula is at its narrowest.
  - **Most common soil types:** inceptisols, altisols, and ultisols. Rich deposits of alluvial soil cover much of the region, brought by the convergence of rivers from the north, central and northeast into the delta. This is the most fertile
mountain ranges. These mountains vary in elevation from about 300 to 2,000 m. Flat or mildly sloping lands lie mainly along the east coast and in the Tapi river basin.

- **Most common soil types**: entisols, inceptisols and ultisols. Varying from lowland alluvial silts and coastal sandy loams to upland red laterite, these soils are rapidly exhausted once cleared for cash crop cultivation.

- **Total area**: 44,196,888 rai

### Population

- **Population**: n.a.

### Crops

- **Crops**: rubber, oil and coconut palm, coffee, fruits are the main crops grown due to the limited amount of flat lowland and high precipitation rates. Some paddy is grown in coastal areas. Traditionally, some upland rice was planted in the region but little remains of this. Intensive aquaculture farms have taken over much of the coastal mangrove areas, particularly in Surat Thani and Songkla provinces.

- **Traditional systems of claiming land, and kinship or community distribution of land resources**. (Traditional land use and holdings patterns, while recognized by local communities, were not recognized by the courts, as all land was owned by the king, as later, all forested land was declared state property, became belonged to the government. Communities that had existed in these areas for several generations became squatters under government law. Increasing privatization of land resources again changed options of land use.)

- **As populations increased**, and family lands were distributed among generations of offspring, land use intensified. Community resource holdings and private lands were held under different user rights and hence, different use patterns, as well.

- **Modern agriculture goals and practices** and the increasing price of land have had the greatest influence on land use decision making in recent years.

### National Policies

#### National Agriculture Development Framework

Most Asian nations have a long history of trade within the region dating back hundreds of years. Thai trade records indicate exchange of goods with coastal traders that plied the seas of Southeast Asia dating back to the Dhvaravati and Sriwijaya periods.

The development of modern export oriented agriculture in Thailand has its roots in the Bowring Treaty of 1855. The agreement with Britain broadened its exports to foreign markets, expanded commercial contacts abroad and began its full participation in the global market economy. (Leungaramsri and Rajesh 1992:80). Expansion of rice cultivation for export began in earnest in the late 1880s in response to this agreement. It was not until after World War II, however, with the introduction of cash crops in the 1950s, that commercial agriculture and Thailand’s involvement in global markets began to intensify in earnest. The expansion of non-rice crops has increased steadily since this time.

#### The 5-Year Plans

Since 1960, Thailand has relied on a system of 5-Year Plans for the country’s development, based on recommendations laid out in the World Bank study “Public Development Program for Thailand” in 1959. The World Bank study recommended a “modern” agricultural system with heavy fertilizer, pesticide, and machinery input, and the high yield crops that would be the front runners of the green revolution.

The First 5-Year Development Plan (1961-1973) saw the establishment of the National Economic and Social Development Board (NESDB). The NESDB at its inception and even now “perceives the challenge of development as rooted in a shortage of commercialization in the countryside...central to this view is the idea that large agri-business firms can act as a cardinal tool for speeding up commercialization” (Christensen 1992:5).

This First Plan focused on the development of cash crops and led to a trade boom. However, much of the income benefits went to the urban sector. It was this lopsided development which contributed to the October 1973 uprisings and ended in the severe student crackdown of October 1976. (The Fourth 5-Year Plan [1981-86] saw a repeat of this income disparity and the spread of severe poverty among small-scale farming households, particularly in the northeast.)

Agricultural development has been promoted by incentives created by the Board of Investments (BOI). As a result of the Investment Act of the early 1970s, agri-business, and hence farmers, were encouraged to add oilseed crops, horticulture, livestock and aquaculture to traditional food cash crops and rubber cultivation. When the Act was revised in 1977, it supported capital intensive processing technologies which favored the rapid growth of food processing industries (Christensen 1992).

To address growing problems in rural sector development, the World Bank again offered guidelines, this time stressing people’s participation in rural development activities to improve stability. Both the Sixth (1986-1990) and Seventh 5-Year Plans (1991-1995) follow NESDB thinking in support of agri-business. While the language of the Plans (and that of the World Bank recommendations) calls for participation and development of the rural sector, it did little to strengthen their decision making powers or increase farmers’ control over natural resources; instead, it gave top priority to agri-business (Siriphat 1987).

The current (Seventh-Year) Plan explicitly spells out infrastructure and financial assistance to agro-industry sectors in an effort to decentralize from the urban arena, with low interest loans as the primary support for farmers. Agri-business conglomerates have fared well with the support of the Bangkok...
Bank, the Bank of Thailand, and the Bank of Agriculture and Agricultural Cooperatives (BAAC). However, the emphasis on agro-industry and contract farming as the answer to agricultural problems in Thailand has only further encouraged dependence on chemical input and international market dictates in production methods, and further removed farmers from resource use decisions.

Incentives and Subsidies
- Agriculture development incentives have favored private agro-industry rather than small-scale farmers and sustainable agriculture practices.
- Banks provide easy access loans. Contract farms are a prime beneficiary of this incentive. However, contract farming is not always a successful venture for agri-business companies, least of all for the farmers in contract agreement with the company. Farmers who have to sign huge loan agreements under such a set-up bear the on-farm risks of crop failure and low farm prices, together with the risk of the co-signers' corporate failure. In 1992, more than 100 farmers were left to pay huge debts when the Wang Nam Fon Company failed to repay its loan to the Bangkok Bank. For the venture, the farmers had borrowed up to 900,000 to 1M baht to raise pigs for the company, with Wang Nam Fon acting as guarantor.
- The government provides access to land or water resources. Eucalyptus tree plantations, in particular, have been given both financial and physical resource support.
- Most agricultural products in Thailand receive some kind of incentive or support. Proof of this is the disparity between farm and market prices. Rice and rubber prices are bolstered by price support and stockpiling programs. Meanwhile, the government's rice bank programs, set up purportedly for farmers, earn a hefty profit for the government by buying rice from farmers at current market prices and selling when prices increase. For a number of crops government provides direct subsidies without which farmers would suffer severe losses and for which government bears a cash loss. For example, coffee prices which are guaranteed at 25.25 baht per kilo (1992) cost the government 8.13 baht per kilo on the open market. By keeping the price artificially high, government encourages farmers to plant coffee rather than look for alternative crops. White pepper is another crop supported entirely by subsidy.
- The influx of cheap imports, particularly of commodities like palm oil and pigs, is barred by protectionist measures. Special trade agreements with Japan, for instance, are aimed at protecting the country's livestock industry, particularly poultry.

AGRICULTURE SECTOR

Contribution to Economy
- In 1990 the agriculture sector contributed approximately 253 B baht, or about 12.41% of GDP.
- Agricultural production has been increasing annually yet its share of the economy has declined steadily since the 1980s.

Emerging Sustainability Issues

BIOLOGICAL LIMITS

Land Degradation
Deforestation
- Just 20 years ago 58% of the country was covered in healthy forest growth.
- Rapid expansion of agricultural land has occurred at the expense of forest land. The following table shows the decrease in forest area in the last 30 years. Reduction in forest area clearly corresponds to increases in agricultural land.

<table>
<thead>
<tr>
<th>Year</th>
<th>Forest Area (sq. km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>80,000</td>
</tr>
<tr>
<td>1985</td>
<td>65,000</td>
</tr>
<tr>
<td>2010</td>
<td>50,000</td>
</tr>
</tbody>
</table>
- Between 1950 and 1978, the cultivation of cassava, maize, sugarcane and other crops increased 618% at the expense of approximately 50,000 square kilometers of forest.
- In 1986, many provinces were reported to have no more than 5 to 11% remaining natural forest cover. And "today... perhaps 15% of [Thailand's] land area (or less than 80,000 sq. km.) remain to any reasonable degree naturally forested". (Larry Lohmann, "Ecologist")
- Considering all the general functions (of water storage, soil protection, etc), Professor Frederic Vester, a German biochemist, placed the value to the national economy of a single, fully grown tree at 92,500 baht annually. This does not even include its benefits as food and medicinal source.

Soil Erosion
- As early as 1983, almost 1/3 of the country's total land area, or more than 107 M rai, were reported to be moderately to
Severely eroded (Leuangaramsi and Rajesh 1992:88).

- In 1990, the Department of Land Development reported that “39 M rai of (agricultural land) suffer from severe to very severe erosion”. An earlier report had confirmed that soil structure and soil life have been damaged by chemical fertilizer, pesticide and herbicide input and that intensive cultivation practices have caused severe soil erosion in more than a quarter of the land (TDRI 1987:88).

- Soil erosion in Thailand is related to land use patterns. Between 1982 and 1988 alone, agriculture land expanded by more than 4.3 million rai. The rapid expansion of eucalyptus plantations in the same period bears some of the blame for the increasing rates of erosion, particularly because of its reliance on heavy machinery, such as bulldozers for land preparation.

**Table 5. Soil Erosion In Thailand**

<table>
<thead>
<tr>
<th>Level of Erosion</th>
<th>Topsoil loss (tons/rai)</th>
<th>Area (ml.rai)</th>
<th>Present Land Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very little</td>
<td>0.01-1.00</td>
<td>118.7</td>
<td>Forest, paddy</td>
</tr>
<tr>
<td>Little</td>
<td>0.01-5.00</td>
<td>90.3</td>
<td>Forest, rubber plantation, fruit tree plantation, paddy</td>
</tr>
<tr>
<td>Moderate</td>
<td>5.01-20.0</td>
<td>25.9</td>
<td>Rubber plantation, fruit tree plantation, field crops, forest plus field crops, shifting cultivation area</td>
</tr>
<tr>
<td>Severe</td>
<td>20.01-100.00</td>
<td>42.6</td>
<td>Rubber plantation, fruit tree plantation, field crops, forest plus field crops, shifting cultivation area</td>
</tr>
<tr>
<td>Very severe</td>
<td>100.01-966.65</td>
<td>39.2</td>
<td>Field crops, forest plus shifting cultivation area</td>
</tr>
<tr>
<td>Other</td>
<td>100.01-966.65</td>
<td>39.2</td>
<td>Shrimp farms, mangrove forest, beach</td>
</tr>
</tbody>
</table>


**Desertification and salinization**

- In the last five years serious droughts have affected parts of the country, mainly in the Northeast. Farmers, in all regions, have reported longer and hotter dry seasons in the last decade.

- In 1992 the government announced once again that “farmers [in irrigated areas] would have to stop planting second rice crops, vegetables, and cash crops during the months before the rainy season because there was barely enough water for cultivation” (Bangkok Post 11/18/92). Meanwhile, Thailand’s NESDB noted that water shortages in the Chao Phraya river basin “had been going on for years and were becoming more and more serious because water consumption in areas above the dams had increased” (Ibid). According to one survey, “Farmers grew about 2.5 M rai of second crop paddy in 1991 but approximately 1.2 M rai was destroyed and the rest partly damaged by water shortage” (Charasdamrong 6/21/92).

MOAC policy therefore limits cultivation to only half of the approximately 3 M rai of agricultural land covered by irrigation networks. The government is seeking to reduce rice planting area under irrigation by about 1 M rai, to 1.7 million rai, by 1997. It will begin by cutting 238,600 rai from rice areas, by “helping” farmers switch to other crops, such as soybean, mungbean, and maize (Bangkok Post 12/8/92). Farmers, caught in the debt cycle and facing the risk of having nothing to eat for the next season, are caught in the middle.

Farmers in the Northeast are worst affected by drought in both irrigated and rainfed areas; less than half of the region receives sufficient rain for agriculture. But in 1993 other regions have been equally affected. Rather than working to improve surface and ground water storage capabilities of soils,
These Trees Cause Floods

In 1988 and 1989 to this day plague the region as typhoons and heavy monsoon rains continue to batter the coast line yearly. This flooding prompted the logging ban in Thailand. Although some of the damage was caused by indiscriminate logging, the encroachment of rubber plantations into the mountains (and the large scale promotion of rubber plantation by the Ministry of Agriculture and Cooperatives, or MOAC) is as much to blame.

The assumption that rubber plantation, or any tree monocrop, is a suitable replacement for forests, particularly in fragile slope areas, has been proven wrong by the 1988 flood. Farmers, however, have known this all along.

Major surface runoff occurs in rubber plantations during the monsoon rains, particularly in November, the height of the rainy season. In contrast to areas under natural or mixed forest where little runoff is reported, water is observed to “pour off the surface” of rubber plantations (Levin 1990). Furthermore, because of extended rainy seasons in the South, latex collection in the mountainous areas of Suratthani and Nakorn Sri Thammarat is limited from three to less than five months of the year; the trees are also plagued by fungal diseases, making this crop a very poor choice for much of the region. If one takes into account the law which bans agricultural activities on steep slopes, for the very reason that the risk of major soil erosion and water loss is high, the logic of encouraging rubber plantation in the mountainous provinces of the south must be questioned.

To point the finger at small farmers is to miss the root of the problem. It is true that many farmers move to higher elevations in the mountains as pressure from lowland populations increases. However, a significant number of rubber plantations (and oil palm plantations) on steep slopes in the south belong not to farmers, but to large, private companies owned by influential figures who had “acquired” land deeds in reserve forest areas. These large plantations have been equally culpable in clearing watershed forests off the tops of many mountains.

More importantly, most farmers in the South think they have very little choice in crop selection. (The same is true of farmers in other regions.) Except for limited rice paddy areas, most agricultural land in the South is planted to cash crops like pineapple, rubber, fruit trees and oil palm, a pattern promoted by the MOAC. The Ministry has a record of promoting crops and cropping systems with little regard for environmental impact.

In fact, it often seems in direct opposition to policies of environmental protection set by the Forestry Department. Crop selection by the MOAC is influenced by a number of factors, including the domestic private sector, international markets and recommendations from development agencies, but the final choice for selection and promotion is made by the Ministry—from “Flooding in the South: What’s the operative logic of monocrop tree plantations?”

Age capacity, pumping from underground aquifers and siphoning from rivers, to supply irrigation to farmland. As a result, the government has had to oblige farmers to reduce second-harvest rice planting. Meanwhile, proposed plans to siphon water from the Mekhong River to refill the Bumiphol and Sirikit dams will have serious downstream consequences for neighboring Cambodia and Vietnam. Such strategies rely—precariously—on what has become an increasingly unpredictable rainfall.

In rainfed agricultural areas, 80 to 90% of natural rainfall can be lost as runoff, depending on ground cover conditions and the slope of the land. This, as well as the unpredictability of the rain, can be directly related to deforestation and conversion to row agriculture (both tree and ground crops).

Salinization has long been recognized as an agricultural constraint in the lowland areas of the Northeast. Origins of salted soils in the region are both natural and man-induced. Salts are present in the sedimentary strata of the uppermost Maha Sarakham formation of the Khorat Plateau which underlies most of the Northeast. “It is believed that widespread deforestation and rise of intensive agriculture land use of the past 30 years in Northeast Thailand has led to a general rise in local water tables and concomitant salt content of soils (Loffler and Kubiniek 1988)....Other [man-made] causes of salinization include construction of reservoirs and unlined canals and salt making operations” (MacLean, Saenjan and Kumurat 1992). Lowland areas in the Chao Phrya Basin below Bangkok have also suffered the same fate.

** Destruction of Crop Genetic Resource Base **

Thailand is included in Vivilov’s centers of highest biodiversity for Southeast Asia. While the country accounts for only 0.36% of the world’s land area, it maintains a wide variety of ecosystems, ranging from limestone mountains to plateaus, rich river deltas and coastal systems. The North is covered by teak and deciduous forests, the East by dipterocarp, and the South by tropical forests. Found in the Thal-Malay region are 10% of the world’s flowering species, 19% of rattan species, and 20% of the world’s bamboo species.

Thais have been using plant resources for food as far back as 3,500 BC (Liancharoent 1992: 64). Among pre-industrial farming communities, land ownership was often designated by the establishment of preferred tree species, usually food sources, within the forest or the borders of property, thereby increasing the natural productivity of the local forest. Species such as Areca catechu (beetle nut) are still commonly used...
property indicators (Levin 1990). Wild plants, with their diversity of flavors and unique healing properties, remain a valuable source of food and medicine and reliance on them has become part of Thailand’s culture.

Thailand’s forests have been an important source of the genetic stock for local and internationally known fruits and vegetables. Some have called the country a “paradise of tropical fruit”. Rambutan, pomelo, mangosteen, and durian are but few of the fruit species developed from Thailand’s forests.

Industrial agriculture has resulted in the loss of crop genetic resources and traditional agricultural systems developed by farmers over centuries. Modern agriculture relies on only a tiny pool of the entire genetic resources available to man. Ninety-five percent of our food comes from just 30 kinds of plants. A majority of the world relies on rice, wheat, and maize as a staple food, each of which has been bred and re-bred within this limited gene pool to produce food and food products. This extremely narrow base of genetic resource materials places the human population at great risk.

Indigenous rice varieties have been the focus of considerable attention in the discussion of genetic resource erosion in Asia. With the help of IRRI (International Rice Research Institute), CGIAR (Consultative Group on International Agricultural Research), and the IARCs (International Agriculture Research Centers) high yield varieties (HYV) have been actively promoted in Southeast Asia. Thailand is no exception. At present, HYVs are cultivated on more than 80% of total paddy land. Before the Green Revolution, there were more than 5,000 genetically distinct indigenous varieties of rice in the country. There are now slightly more than 10 remaining, grown on about 5% of the rice growing land in the country. One expert says that “the indigenous varieties of rice lost in the process [of HYV conversion] is believed to be in the tens of thousands” (Lianchamroon 1991).

A gene bank set up before the Second World War for the preservation of indigenous rice still exists. The bank had 6,765 varieties in 1950 to 1967. By 1981 the number had dropped to 4,765. The current collection of 20,000 rice varieties at the National Rice Germplasm Conservation Center faces the same risk of steadily losing its collection through poor storage conditions and management (Ibid). A major problem is that farmers do not have access to accessions of traditional varieties even if they want to return such varieties to communities for local consumption or to meet local environmental conditions.

Other plant species have been affected in the same manner. In the South of Thailand, many of the wild and indigenously developed species of durian have disappeared in less than one generation as a direct result of market forces and agriculture extension programs which encouraged cultivation of hybrid species. There are now only three varieties left on the domestic market, and 1 is rapidly on its way out. There is every indication that bananas, mangos and other fruits will befall the same fate. At a self-sufficiency level (or what some would consider “subsistence”), drastic changes in the environment have wiped out hundreds of wild edible and medici-

**Designer Genes, Anyone?**

Northern industry has spent considerable time determining how most to benefit from genetic resources growing in Third World countries. It is now attempting to copy genetic materials in the laboratory, thinking—wrongly—that if the genes exist in a laboratory it won’t be necessary to preserve the ecosystem from which they came in order to duplicate them. The people who live in those places are considered inconsequential.

Biotechnology, which brought us many of the “wonders” of the Green Revolution, has placed all of humanity at risk in another way. The impact of hundreds of laboratory designed organisms released into the environment has yet to be fully thought out.

For agriculture, this means the race for “the perfect food plants” and “magic medicines” is still on. These technological “advances” will then be sold back to us at a cost, while the agricultural innovation of farmers in the South, exploited freely by Northern industry, will remain unrecognized and uncompensated. At the science and industry led debates at the United Nations Conference on Environment and Development (UNCED), no credit was given to Southern farmers for their contribution to agriculture.

Thailand excels at plant tissue culture. Currently, much of it is duplicative work, ie cloning for agri-business. The technology has been used most predominantly in the orchid and fruit tree business, and recently with medicinal plants. The tissue culture industry has yet to venture into biotechnology and genetic engineering in the way that Northern industrial countries have done, but many companies in partnership with foreign transnational corporations (TNCs) are gearing up for research in this field with little consideration of the consequences to the environment or the farmers.
eral food resources which supplement the diets and incomes of farming families in all regions of the country.

- The majority of wild stores of plant genetic resources have disappeared due to agriculture expansion, deforestation and infrastructure building. Community forests, and hence local genetic resource stores, are often a target of development. Some of these plants are at risk simply because planners are unaware of their importance to local communities, or else consider the opinion of villagers about such resources of minimal importance to project planning. For example, a woman in her 70s reported that “after the [Army Engineering Corps] built a big road straight through our village to the next one, all of the plants which grew along the old trail, which I used in healing, were destroyed. Now I have to hire someone to gather them in the next village because I can not walk that far.” Many household taro patches, bamboo stands, and fruit and nut trees were lost in this encounter, as well. No alternatives were considered to save these plants because no one but the villagers thought they were important.

- The genetic stock of animals important on-farm in Thailand has declined as a result of international standards set for meat products - the perfect cow, the perfect pig, the perfect chicken, all of which come with a package of antibiotics, booster shots, and feeds to benefit agribusiness. Traditional pig varieties have disappeared in all but the remotest villages in the country, although cross-breeds are still common enough. Traditional chicken species are much more resistant to pressure for change because of the minimal cost of raising them and their contribution to household dietary needs, and because the local passion for cock fighting favors maintaining this breed stock.

Thai farmers who raise traditional cattle, which are naturally resistant to a number of local diseases and pests, as well as adapted to local weather and environmental conditions, are under great pressure to replace them with expensive Brahmin variety hybrids in order to comply with international market demands. Water buffaloes have made an expedient decline with the introduction of the “iron buffalo” and “improved agriculture” packages. Several indigenous buffalo varieties can be distinguished within the country but no study has assessed the impact of cross-breeding programs such as those at Khon Kaen University, as compared to locally selected breeding patterns. Freshwater fish, shellfish and shrimp species, found in paddy, streams, and coastal areas, have been reduced, or made inedible, by pollution and disruption in natural water resource flows.

Fertilizer Use and Effects
Fertilizer use in Thailand has been increasing steadily since the 1960s. In 1960, 4 kg. of fertilizer per rai were used to grow rice; in 1981 to 1987, 50 kg. per rai were needed. This volume is almost 10 times the global average for fertilizer consumption (Lianchamroon 1991).

Yet, a major concern for farmers, has been the declining efficiency of fertilizers in crop production. “At present, the stagnation of yields is the result of falling productivity on lands that were opened up in the 1970s... yields can only be sustained as long as the original productivity of the forest land lasts. This trend is evidenced most dramatically by cassava... the yield per rai dropped from 2,528 kg. per rai during 1980-84 to 2,258 during 1985-89, an 11% decline” (Tongpan et al. 1990: 3).

When new HYV rice varieties were used without nitrogen fertilizer they became weak and vulnerable to plant disease and insects. Consequently, rice farmers in Thailand have been forced to use high levels of chemical fertilizer to protect their crop.

Coupled with rising costs of chemical inputs and unpredictable paddy prices, most rice farmers in Thailand are barely breaking even, and are caught in debt cycles. Figure 3 confirms the declining efficacy of fertilizers in rice production.

In Chachaengsao province farmers have found out that “for the first [five] years, fertilizer use of 20 to 30 kg. per rai would yield 800 to 1,000 kg. of paddy per rai. However, the amount of fertilizer would be as much as 60 to 100 kg. for the same yield during the next [five] years” (Lianchamroon 1991). The Technology for Rural and Ecological Enrichment (TREC) organization reports that currently (1992) 1 ton of fertilizer equals only 2 tons of rice in Suphanburi province.

Pesticide Use and Effects
- Chemical pesticides are used on all cash crop products in the country. Spraying regimens were developed as a package with HYV seeds. High yield rice varieties have relied increasingly on more and more pesticides and herbicides for proper

![Figure 3. Increased Rice Productivity from 1 M tons of Fertilizer](image)

Source: Lianchamroon, 1991
growth. Herbicides were particularly needed as the new HYVs were short and could not rapidly outgrow weeds in the way traditional varieties could. The HYVs were also promoted along with the direct broadcasting method which is more susceptible to weeds than traditional transplanting (Lianchamroon 1991).

- Thailand's consumption of pesticides for agricultural production has increased by almost 45,000 tons in the last decade. An estimated 90% of this is imported from industrialized countries. The market is controlled by five TNGs.

**Figure 4. Agri-Chemical Usage in Thailand**

![Graph showing Agri-Chemical Usage in Thailand]

*Source: Lianchamroon 1992:34 from Department of Agricultural Research*

**Indiscriminate Extermination**

Pesticide use has increased as the insects developed immunity against pesticides. In the process, beneficial insects are killed. For example, in the early 1980s the bee population on Koh Samui, an island once famous for coconut production, was virtually wiped out due to intensive pesticide use. The island's fruit crops suffered, as well as the local honey production (Levin - field notes).

The residual effects of water insoluble sprays such as DDT affect bird populations which control insect pests. Insects, such as grasshoppers in the northeast, used to be part of the people's diet, but from the 1970s onward they have become increasingly unfit for human consumption.

- Surveys of chemical residues in soils in 1976 to 1979 and 1987 to 1988 found organochlorine present in 99.4% of all samples. Nearly 50% of water samples from rivers in the country show traces of toxic residues. Dieldrin had the highest concentration, at 4.62 ppm (Lianchamroon 1991).

**Non-Point Source Pollution**

One of the worst downstream affects of heavy fertilizer and pesticide use is what is called non-point source pollution, or, pollution without a single point of origin. Typically, this applies to much of agricultural land (and golf courses) under heavy chemical regimes. Non-point source pollution shows itself most obviously as contaminants in streams, rivers, marshes, and coastal waters which are natural drainage points for eroding soils. Leaching into groundwater sources is also common.

Toxic residues or heavy metals from overuse of pesticides can leave soils contaminated for generations. Even if subsequent crops are grown without chemical inputs they can show high levels of toxicity for years. Chemicals which are water insoluble show up in natural food chains as well.

Fertilizers produce another type of non-point source pollution, called nitrification or nitritification. Heavy nitrate concentrations can cause excessive growth of aquatic weeds which deplete oxygen levels in the water and choke ponds, marshes, and river systems. Along coastal areas, this can show up as heavy algae growth. If excessive, the algae can smother coral beds, killing off important fisheries habitat. For areas that rely on their coastal waters for tourist income, algae bloom can cause significant losses in income. Most of Thailand's waterways and coastal regions suffer some level of non-point source pollution. Visual images of the Gulf of Thailand show extensive erosion and pollution flows. In areas where intensive aquaculture is practiced, like in the South, non-point source pollution is a major concern for small inshore fishermen.

**Diseases from Non-Point Source Pollution**

Epizootic ulcerative syndrome, or EUS, an ulcerous fish disease, has shown up in Thailand in wild freshwater fish in inland waterways, rice paddies, and manmade ponds. According to researchers the disease appears to be connected to the increased presence of agrochemicals in the water, which lowers the fish immune system and opens the pathway for a number of infections to occur. "The potential social and economic impacts of a highly infectious disease affecting rice field fish in Asia are immense. It is estimated that 250M families in the region depend on rice as a main crop and much of the incidental fish harvests from these paddies are an important part of the families' diet" (Nation 10/9/92). Rice paddy fish are mainly harvested from September to February after the rice harvest, at a time when the disease is most prevalent.

The first outbreak in Thailand was reported in 1981 in the South where it had spread from Malaysia. Further major outbreaks occurred in late 1982 through early '83, late 1983 to early 1984, and late 1984 through early 1985. The second outbreak caused an estimated $8.7 M damage (Nation 10/9/92). Between 1981 and 1985, fish disease epedemics affected 52 provinces, resulting in an estimated loss of 106 M baht (Manasuta 1985). Another estimate suggests that the fish disease "has deprived Thailand of 500 to 700 M baht annually since 1979" (Lianchamroon 1991). The infections occurred in natural waterways and fish ponds, particularly among fish most popular for local consumption, such as snakehead fish (Ophicephalus striatus), eels, and the snake-skinned gourami. Since a significant portion of the protein in rural household
diets comes from fish, the outbreaks have severely affected household dietary self-sufficiency.

**Pest and Disease Outbreaks**

Over the past two decades a clear connection has been established between the use of rice HYVs developed by the IRRI and the advent of major crop damage by the brown plant hopper (BPH).

Thailand experienced an explosion of BPH infestation somewhat later than other countries in Southeast Asia. Thailand starting planting HYVs (Kor Khor 1 and 3) in 1969. In 1976, only 5% of Thailand’s cultivated paddy land were under the new hybrid varieties, compared to almost 40% in Malaysia, and 56% in the Philippines. Yet, as early as 1975 Thailand experienced its first major outbreak of the BPH.

It happened in the central region of the country, in Nakorn Pathom province. An estimated 666,796 rai of rice was destroyed. In 1981 520,769 rai were damaged, the area affected gradually decreasing in the years following.

The second outbreak has proved far more catastrophic for Thailand, lasting three consecutive farming seasons. In 1989 to 1990, the brown hopper struck 13 provinces in the central plains, damaging 937,816 rai. In the subsequent season, the number of affected provinces increased to 16, with a total of 845,050 rai reported damaged. By the 1990 to 1991 season, the hopper had spread to 29 provinces, bringing the total affected crop area to over 2,500,000 rai.

Latest survey reports reveal that the BPH has spread to 33 provinces throughout Thailand. Approximately 100,000 farming families have been severely affected by the continuing effects of the Green Revolution. The economic losses to the country are evident as well. The country lost no less than 2.5 M tons of rice, with an estimated value of 10 B batht (US$400 M).

The Thai government’s response was to allocate extra funds totaling 340 M batht (US$11.6 M), most of which was spent on pesticides and the rest on buying new HYV seed to be planted by the farmers.

Several processes contributed to the outbreak of the BPH in Thailand. The first was the low resistance of HYVs to pests and disease. Varieties developed had little or no immunity to a cycle of diseases and insect infestations. This cycle is illustrated in the following table:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR 8</td>
<td>succumbed to bacteria blight and rice tungro virus (RTV)</td>
</tr>
<tr>
<td>IR 20</td>
<td>developed to resist the blight and RTV, succumbed to brown plant hopper, carrier of grassy stunt virus</td>
</tr>
<tr>
<td>IR 26</td>
<td>resisted brown plant hopper for 3 years but succumbed to new breed of hopper (BHP Type II)</td>
</tr>
<tr>
<td>IR 36</td>
<td>resisted both types of brown hopper but later succumbed to a third generation of the pest (BHP Type III) and ragged stunt.</td>
</tr>
</tbody>
</table>

Thailand's Rice Research Station crossbred varieties supplied by IRRI and traditional, native rice varieties. Short and medium height rice varieties were 30% related to the IRRI varieties, thus creating weaknesses of their own. For example:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kor Khor 1</td>
<td>no resistance to bacterial leaf blight</td>
</tr>
<tr>
<td>Kor Khor 2</td>
<td>-</td>
</tr>
<tr>
<td>Kor Khor 3</td>
<td>-</td>
</tr>
<tr>
<td>Kor Khor 4</td>
<td>-</td>
</tr>
<tr>
<td>Kor Khor 5</td>
<td>no resistance to hopper and grassy stunt virus</td>
</tr>
<tr>
<td>Kor Khor 7</td>
<td>-</td>
</tr>
<tr>
<td>Kor Khor 23</td>
<td>no resistance to bacterial leaf blight and fungal orange leaf disease</td>
</tr>
<tr>
<td>Kor Khor 25</td>
<td>-</td>
</tr>
</tbody>
</table>

Any hope that a new hybrid might be resistant to both disease and pest infestation is belied by Dr. Praps Virapathay, a leading Thai researcher with more than 20 years experience. He stated that “The progress in plant improvement against pests is far from satisfactory as both the disease and the pest could quickly cope with any changes. The insect has the particular ability to adapt and survive, and to live on plants crossbred to resist them.” Large scale adoption of HYVs has transformed the central plains into a biological time bomb.

Secondly, only 5 rice varieties were planted on approximately 50% of the total area of land devoted to rice farming, thus facilitating the rapid spread of the insect.

A third reason for hopper outbreak was the promotion of HYVs as a symbol of the Green Revolution.

The Department of Public Welfare reported that [in 1993], more than 919,000 people (or over 77,000 families), covering 77 districts in 12 provinces in the North have no rice to eat due to failed harvests from rice diseases. The government will have to provide 50 batht per day per family to buy rice to eat for the next three months, after which time these families will return to subsistence food sources. The cost to the government is increasing as more and more farming households fall below the poverty line.

**Pesticide Related Diseases and Deaths Among Farmers**

In Thai, the word sukaphap means health but not just being “free from disease or starvation", but suk as in quan suk or contentment—a holistic meaning of health (Siriphat 1992). The quality of health of farmers and consumers in relation to agriculture has declined steadily alongside increases in chemi-
cal pesticide use.
A cursory study of pesticide poisoning in Asia in 1985 (Sim) reported 203 trademarked pesticides registered for sale in Thailand. All of the Dirty Dozen banned chemicals can still be found in agricultural supply stores, or through agriculture product salesmen. While the Poisonous Articles Acts, which govern registration, labelling and use of pesticides, have been strengthened somewhat since the early 1970s, many chemicals currently banned in Northern countries are still readily available in Thailand. More than 50% of all farmers would like to stop using chemical pesticides because of the many accompanying problems, but feel they have no other alternative (TREE 1991).

The use of pesticides in agriculture has resulted in serious health problems for farmers. Among the many symptoms of poisoning are vomiting, dizziness, nausea, headaches, heavy sweating, abdominal pains, chest tightness, difficulty in breathing, skin rash, loss of hair, and general weakness. Indeed one of the sadder downstream effects of the easy availability of chemicals for agricultural use, and the increasingly difficult life of rural farmers, has been the use of pesticides as the "method of choice" in suicide attempts.

An agricultural survey conducted in 1985 by researchers of Mahidol University, together with health and hospital officials in Rayong province (east of Bangkok), found in an agricultural community of 10,557 individuals (2,298 families) that 42.3% of the community handled pesticides on a regular basis as part of their occupation. Of this group, 19.5%, or 404 individuals, had suffered some degree of pesticide poisoning. Some researchers estimate that fatal and non-fatal poisonings are 10 times higher than official figures suggest due to the lack of serious surveys and the fact that many farmers do not go to a hospital for treatment. In the same study, only 2.4% spent any time in a hospital, making it very difficult to trace the effects of agricultural chemicals through hospital or public health records. Hospital physicians and nurses reported seeing from one to five cases of pesticide poisoning per month. Of the 44 cases of poisoning reported admitted to the provincial hospital in 1988, the majority of cases were female (68%) and suicidal (61%), although only 1 resulted in death. The report also made a statistical prediction, based on the initial survey group, that 8,268 pesticide poisoning incidents would occur in every 100,000 agricultural worker population, but that only 160 would show up at hospitals. (Wongphanich 1985:2.)

At present it is estimated that 10,000 to 40,000 people out of 400,000 to 2 M patients die each year from poisoning due to chemical substances used in agricultural production (Lianchamroon 1991). Again, available statistics are highly inaccurate. A report from the Agricultural Research Department shows higher figures of 9,654 poisonings and 490 deaths in 1987. Yet, a Public Health Statistics report shows only 8,050 cases of accidental poisoning from agricultural chemicals were out-patients in government health facilities. Insecticide poisoning increased from 3,213 cases, with 12 deaths in 1984, to 4,234 cases and 44 deaths in 1988. However, a countrywide figure from the same report shows more than 2.5 million cases of accidents, poisoning, and violence for the same year.

Consumer Health Hazards
Toxic residues in farm products can be as dangerous to consumers as the handling of chemicals is for the farmers. Surveys by various government agencies classify most vegetables on the market as unsafe. Data collected for more than 10 years showed that kale, cabbage, green pepper, fresh and dried chilli all have endrin and dieldrin residues present at higher than FAO and WHO safety standards (Lianchamroon 1991). It is commonly known that farmers do not eat the vegetables they grow for the market because of the heavy doses of chemicals required to keep them free of pests.

From 1982 through 1985 the Agriculture Toxicology Division of the Agriculture Department conducted tests on rice for sale and found that of a total of 606 specimens, 548 (approxi-

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**Warning: Growing Tobacco is Hazardous to Your Health**

Tobacco was one of the first popular cash crops to come to the north, along with a complete regimen of fertilizers and pesticides necessary to grow the plants according to market standards. Before growing tobacco, farmers are first required to kill off any grass with an herbicide. Then a special fungicide is put into each hole dug for seedlings. After that, they have to spray pesticides regularly to protect the tobacco from pests. After some 30 years of tobacco farming, Ban Saluangrai, a village of about 165 families, no longer questions the dangers of chemical pesticides.

Many of the villages have gone bald from the insecticides. The leaves are cut early in the morning when the plants are heavy with dew. The dew mixed with chemicals soaking through their scarves and stays in contact with the scalp for hours as they harvest the leaves. Many of the farmers get dizzy from spraying. One farmer fainted during his spraying routine and was almost paralysed by the level of toxins in his system. Besides the dangers to the farmers, the impact on the environment is also evident. Farmers relate that "birds die because they eat dead toads. The toads die because they dig holes and eat the fungi-killing chemicals. When cats or dogs eat those birds they also die. Its touch is deadly." The fish in their rice fields have also succumbed to EUS, the ulcerous fish disease that has spread across the country.

This is a common story in many villages in the north. Many older people succumb to a variety of kidney and lung diseases related to the toxic buildup in their systems. The heavy chemical contamination of soils and water has also led to disputes between upland and lowland resource users.

mately 90%) contained organochlorines, one of most persistent pesticides. A survey conducted by the NESDB in 1989 showed toxic residues of organochlorine and organophosphate in over 70% of more than 3,000 samples of vegetables, fruits, and animal meats, again, in amounts higher than FAO and WHO standards (Lianchanroon 1991).

Besides consumers other living things in the food chain, such as insects and insect larvae, bats, birds, frogs, crabs, fish, snails, snakes, and other organisms are similarly exposed to hazardous pesticides. This has serious implications especially for farmers in the Northeast who depend on these as a source of protein.

Farmers also point out one of the hidden uses of chemicals which pose serious risks to consumer health but for which there is little control. “Even when we use no chemicals to grow our products, vendors will soak vegetables (e.g. long beans) in a chemical solution which makes them look very green and fresh. One woman vendor who did this died after one year.” (Alternative Agriculture Conference 1992).

**Cropping Systems**

Under traditional cropping systems (with little population pressure and in a healthy ecosystem), topography and ecosystem played an important part in the design and size of the cropping system. Today in Thailand, in spite of a population problem and severe ecological problems, the government pays little attention to the landscape. In the Northern region, for example, it declared that about 36 M rai were suitable for agriculture, and of this 20 M rai were suitable for upland crops (TDRI 1987). However, a more detailed consideration of the geographic limits of the Northern region indicates a far more conservative figure. Based on the availability of flatlands, only 6.5 M rai were found to be suitable for lowland agriculture (Leungaramsi and Rajesh 1992: 91).

Major cropping systems practiced in the country also reflect this lack of awareness at the micro level of appropriate system size and form. Intensive agriculture cropping systems are best described under the format of contract farming, as they are the most structured. Independent farmers reflect similar cropping system practices under cash crops because they also have to meet market criteria for produce. One area which needs closer scrutiny is what is often called intercropping by development sectors. This typically involves large fields of alternating crops, not alternating rows or several rows. In this case it is more related to crop rotation systems than what one might call beneficial intercropping. Scale is a determining factor in enhancing the sustainable influences of intercropping; the bigger the stretches of a single crop per section, the less effective the system becomes.

**Contract farming**

Under this system the farmer is provided almost everything, from stocks, feeds, medicine, to technical assistance and loans for facilities (in the case of livestock). The contracting corporation also takes care of transport and marketing, essentially dictating the entire crop production process. The vertical ownership or control of all phases of production, from the raw material to finished products, leaves little room for small farmers to benefit from cash crop development.

The contract farm system tends to work in favor of large farms. They benefit from economies of scale in terms of purchasing inputs at lower prices and possibly extending terms of credit. There is also a tendency for large farms to cluster together in certain geographic locations as this practice cuts costs.

Others would argue that farmers benefit from the training and technical knowledge shared by the company during the contract. However, what technical assistance is provided them is incomplete and does not equip farmers to take over the production and marketing process. For example, farmers learn to grow only a particular crop; if they want to shift to another crop they would have to learn a new set of technology. They are also not provided with accurate product grading or marketing information as the company controls the sale of the crop. Indeed, farmers are often told their crop is below standard in order to keep prices low, but they are seldom told what determines the quality of the crop (Senaikhum nd.).

**Monocrop tree plantation**

Monocrop tree plantation, or *suan* agriculture, follows the format for intensive monocrop agriculture. Trees are planted in parallel rows, nullifying whatever soil protection benefits can be had from alternative planting patterns. Cropping patterns are designed for ease of access (e.g. cutting for rubber) or harvest (e.g. eucalyptus poles). Modern rubber plantations have replaced traditional rubber forest patterns and changed farmers’ lives entirely in the South. Because of its intensive promotion over the years, rubber has encroached into areas of steep slope which were traditionally left forested or farmed under a “rubber forest” system.

**Rubber Plantation**

A prime example of traditional systems which have been disrupted by intensive agricultural cropping systems is the case of farmers in the South of Thailand who have given up traditional home garden and “rubber forest” planting patterns and technologies (similar to home garden systems in Indonesia) in favor of cash crop agriculture. The effect is most noticeable in villages where traditional home gardens still exist alongside the new plantations.

Rubber was originally planted among other forest trees, while a wide variety of edible, medicinal and useful plants grew naturally in the understory. Other plants were added to the system as the household desired. Today, under modern plantation farmers are required to clear all plant species in order to grow rubber. INRO and the World Bank set the rules for plantation cultivation when they provide loans for the initial investment on seedlings, fertilizers, hormones, and pesticides. In the first 3 years annual or low-lying crops are allowed (pineapple has traditionally been suggested by INRO); after the third year they must be cleared. Alternative tree species are not allowed and farmers pay a fine for refusing to cut down those trees from the plantation. One farmer recalls, “We used to get 5,000 to 6,000 baht each year (collecting) *nian*
(Archidendron sp.) and *sawan* (*Parkia speciosa*) under [the] traditional rubber forest. Now, for seven years we have to [work as] hired labor while we wait to cut the rubber."

Not only cropping practices are changed but entire lifestyles. Rubber farmers rise at two or three in the morning in order to cut the trees and work until two or three in the afternoon pressing latex sheets. Very few rubber farming families have energy left to grow and maintain vegetable gardens. The unavailability of traditionally gathered wild plant food resources, inaccessible markets, rising prices of vegetables, and chemical residues in many agricultural products, have all undermined the health of farming families. Farmer grievances point to a lack of understanding among agriculture planners for the farmers' needs and lifestyles: "You came to our village and said let [the new rubber trees] go and the land will improve itself [in 10 years]. What am I supposed to eat until then?...the government has taken our forests, our water. We are as poor as Isan (referring to Northeast Thailand, the poorest region in the country). When we plant rubber we have to wait seven years before we can gather the latex for sale" (Alternative Agriculture Conference 1992).

**Eucalyptus Plantations**

Eucalyptus is designated as a "reforestation" tree despite the fact that it does not occur naturally in the country. Contracts for the use of land under the jurisdiction of the Forestry Department are awarded by the government to agri-business corporations. The process of contracting out land has, until recently, been highly controversial as contracts had reportedly been awarded in areas considered by villagers to be useful and healthy forest. At least one company in the Northeast region, the Suan Bah Kitt, owned by the Kaset Rong Huang company with which several members of parliament (MPs) have been implicated, has been brought to trial (to no avail) for invading healthy reserve forest in order to set up a eucalyptus plantation. At the Suan Bah Kitt plantation the land is prepared by first stripping it with a bulldozer so that no other plants interrupt the growing process. Any "degraded forest" which might have existed is wiped out completely. At harvest time, the land is again bulldozed to clear it for the next planting cycle. Trees are planted in seven to 10 year rotations.

Eucalyptus is grown primarily by large agri-business and few farmers see themselves benefiting from such plantations. Indeed, these trees have been observed to cause the same problems of erosion and water resource damage that other cash crops are infamous for. Farmers note that little grows under eucalyptus and where the leaves fall or where there is water run-off from the plantations, water resources become too tannic to sustain local fish.

**Aquaculture**

Tiger prawn farming is a modern system designed solely to function within the confines of ponds. Impacts on outside ecosystems are not considered. Farms typically use "dump and run" tactics: once a site is degraded beyond recovery, the company moves on to a new site, systematically ruining the Thai coast and then expanding into other countries to continue the same practices. One company has bragged that its practices are environmentally sound and non-polluting because it waits until high tide to release effluence from its ponds and pulls in fresh water to renew them. He added, "You never see the pollution coming from my farm."

Thailand’s mangroves have been the obvious casualty in the proliferation of aqua farms.

- In 1989 Thailand's mangrove forests covered 1.15 M rai.
- Between 1975 and 1989 this area was reduced by approximately 0.85 M rai
- The conversion of mangroves for aquaculture has been facilitated by a zoning system which classifies forested areas as conservation (A), economic (B), and degraded (C). Aquacultures are awarded concessions in healthy mangrove forests which should be protected, while degraded sites are often classified grade A.
- The area under prawn cultivation before 1980 was 162,725 rai. Between 1980 and 1986 this figure jumped by 536,395 rai, the total area rising to well over 1 M rai. As of 1988 more than 10,300 farms were producing over 90,000 tons of tiger prawns.

**Water Management**

The effects of changing agricultural technologies and cropping system practices on sustainable agriculture in Thailand must also include a discussion of water resource usage and changes in planting cycle calendars.

Modern water resource management patterns have been influenced by government and international policy. The need to "harness" local resources for large scale export-oriented agricultural production, and urban and industrial energy needs has led to the deforestation of important watersheds and the replacement of traditional irrigation systems, along with the rituals and natural calendars which govern them. For example, "a special programme creating jobs in [the North] has led to many wooden muang faai water barriers (traditional irrigation systems) being replaced with modern concrete structures which fail to duplicate the complex functions of the traditional system...in at least [one] village the agricultural year now begins with a meeting with the government bank for agriculture rather than with a ceremony for the faai spirit" (Tongdeeert and Lohmann 1991:105). The same is true of rubber planting communities in the South and rural farmers under contract farming and high-yield agriculture production schemes.

**Cropping Calendar Patterns - Irrigation vs. Electricity**

Cropping calendars can be severely affected by large scale development projects and the environmental damage which follows. For example, "experience has shown that irrigation advantages of large dams in Thailand have been limited, since the release of water from the dams is timed to suit the needs of EGAT (the Electricity Generating Authority of Thailand), which controls the dam[s], rather than the Royal Irrigation Department, or farmers, who have no say over when water is released" (Hirsch 1990:221).

Large irrigation and dam projects in the Tapi river basin of Southern Thailand have disrupted the natural flushing system...
and flow of the river. Saline intrusion in the estuary regions of the river and some of its tributaries has made crop irrigation from the lower parts of the Tapi a risk (personal communication, farmers 1992). Water from the Chiaw Larn dam on the upper reaches of the Tapi watershed area, which was intended for both electrical energy production and irrigation, is still so acidic more than eight years after its construction (due to limestone formations and the failure to remove timber before flooding) that it is unusable for most agricultural activities. In another example, Hirsch notes that in 1981, “such salt-water intrusion caused an estimated 600 M baht damage to coconut plantations in Samut Songkhram province. The farmers were not compensated, as EGAT denied responsibility and blamed the drought (using falsified rainfall statistics) for the damage” (Hirsch 1990:222).

SOCIAL LIMITS

- Total population: 56.68 M (Thai Development Research Institute, TDRI, 1992)
- Per capita income (1990): Baht 27,575 (25 baht to 1 US$), or about US$1,103
- More than 20.4 M people are employed in agriculture. This figure is 36% of the total population and 66.7% of those considered “economically active”. In 1990-91, farming households numbered approximately 6.46 M families.

The Debt-Price Squeeze

- In the 1970s farming households caught in the debt cycle in Thailand numbered 4.3 million; in 1990, there were 5 M such families, or 77.3% of the total number of households involved in cash crop farming—thus situated. Table 6 shows the number of debt-ridden farm households and average debt for the years 1978-79 to 1989-90.

Table 6. Number Of Farm Households In Debt And Average Debt Burden

<table>
<thead>
<tr>
<th></th>
<th>1978/79</th>
<th>80/81</th>
<th>82/83</th>
<th>89/90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total households (million)</td>
<td>4.3</td>
<td>4.4</td>
<td>4.7</td>
<td>5.0</td>
</tr>
<tr>
<td>Debt-ridden households (million)</td>
<td>1.9</td>
<td>1.1</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Debtor percentage</td>
<td>44</td>
<td>25</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>Average debt per household (baht)</td>
<td>9,078</td>
<td>3,496</td>
<td>4,911</td>
<td>4,775</td>
</tr>
</tbody>
</table>


- The government run Bank of Agriculture and Agricultural Cooperatives (BAAC) was set up 20 years ago purportedly to make credit available to farmers. However, many of the loans come in the form of fertilizer and machinery, and are generally available only to those with documents indicating ownership or user rights to land (TDSC 1990).

As a result, many farmers have had to resort to informal money lending sources, making these the more conventional source of loans for small farmers. Unfortunately for them, money lenders can charge from 10 to 20 % per month for loans and often take part of the harvest as payment, leaving little for the farmer to sell or for household consumption. With the increasing uncertainty of harvests, in many cases the debts can only be paid off by sending some of the family to work in the city as hired labor (TDSC 1990).

Issues of Land Tenure

- Since the mid-’70s the north has had the most serious problem with land leases for farmers, particularly in the highlands. The Farmland Lease Act for Rent issued by the government to help solve the problem did little to assist farmers as landlords collaborated with government officials to circumvent the law. A newly amended Land Reform Act in 1989 has attempted to solve land ownership problems. The Act limits the amount of land which can be held by an individual to 50 rai but so far government has scrupulously avoided applying the law to large private sector landholders.

- Currently, more than a quarter of farm households in Thailand owe loans to financial institutions and other forms of out-of-market loan sources. Loan repayment rates among farmers are low (as shown in Figure 5) due to rising costs of living, unstable crop prices, and prolonged cycles of drought and flood which have plagued the country for 7 of the past 10 years and appear to be getting worse (Lianchamroon 1991). At stake are most of the small-scale farmers of the country.
The Act was also widely criticized for “[stretching] the meaning of the word ‘farmers’ to include those who are not already farmers but intend to become one in the future. “With this dubious amendment, the government was accused of facilitating private sector ventures” (Thai Development Newsletter 1990).

Table 7 indicates that while the highest percentage of farmers in Thailand are small-scale landholders, they own only a very small portion of agricultural land and their control over such land is declining. Farmers with less than 5.9 rai accounted for 18.60% of landholders in 1960, and only 2.60% of area owned, this declining to 2.50% in 1978 (Onchan 1990). All forested land legally belongs to the government. Farmers on these public lands—what the government calls “squatters”—have no legal rights even though many communities have resided in such sites for generations.

Table 7, Distribution of Landholdings

<table>
<thead>
<tr>
<th>Size of holding (rai)</th>
<th>% of Owners 1966</th>
<th>% of Owners 1978</th>
<th>% of Area Owned 1966</th>
<th>% of Area Owned 1978</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5.9</td>
<td>18.60</td>
<td>15.90</td>
<td>2.60</td>
<td>2.30</td>
</tr>
<tr>
<td>6-14.9</td>
<td>24.90</td>
<td>27.40</td>
<td>13.00</td>
<td>11.40</td>
</tr>
<tr>
<td>15-29.9</td>
<td>27.50</td>
<td>29.00</td>
<td>16.50</td>
<td>25.70</td>
</tr>
<tr>
<td>30-44.9</td>
<td>13.10</td>
<td>11.50</td>
<td>21.60</td>
<td>16.30</td>
</tr>
<tr>
<td>45-59.9</td>
<td>6.00</td>
<td>9.990</td>
<td>14.10</td>
<td>20.00</td>
</tr>
<tr>
<td>Over 60</td>
<td>5.40</td>
<td>6.30</td>
<td>22.20</td>
<td>24.30</td>
</tr>
</tbody>
</table>


Figures for 1983 show the percentage of landless and near landless farmers averaging from 10 to 18%, and 7 to 8%, respectively, with the exception of the Upper North, where more than 30% of landholders belong in that category. Farms between 5 and 10 rai in size made up 7 to 10% of the total, except again in the Upper North where almost 28% of farms are of this size (TDRI 1987). In 1991, it was estimated that over 500,000 farmers were landless (Thai Development Newsletter 1991:7).

- Property rights have often been used as a rough indicator of the extent to which peasants have control over the production process. Panyakul states that “having legal control over land does not necessarily imply absolute control over land uses [in Thailand]” (1990:5). However, land documents issued by various government departments carry different levels of security, transfer rights and use for collateral (as shown in Table 9).
- Over half the agricultural land in Thailand is held by virtue of NS-3 and NS-3K (certificates of use) which do not provide adequate security for long-term household planning (Panyakul 1990). NS-4, or actual title deeds, are most common in urban areas while being virtually nonexistent in agricultural lands. In the mid-1980s an estimated 1 M households in forest reserves had no proper title to the land they occupied. Farmers in reserve forest areas are particularly vulnerable to “being resettled” under the notorious Kor Jor Kor program of the military.
- Attempts to give better opportunities to farmers in reserve lands, such as long term year leases (25 years) for teak growers, do not consider the function of culture in land ownership and use. Farmers can hardly be enticed to plant tree crops for their children’s benefit because the farmers know only too well that they would probably lose control of the land at the very time when their children will have been starting their own families, and hence would need those resources most. Furthermore, under this type of scheme the government maintains control over planting patterns, harvest and sale of teak.

- Even on land with full title deeds (NS-4), the type of crop planted can influence farmers’ control over decision making on their own land. For instance, rubber plantations remain heavily influenced by directives from the Rubber Estate Organization, which in turn follows the recommendations of international agencies. Planting methods are strictly controlled, from initial land preparation which requires the total clearing of all other plant species, throughout the life of the plantation.

- The terms of tenure on rented agricultural lands are also highly dependent on relationships between owners and cultivators, including kinship and by how poor the farmer is. For non-kin, land rental payment may be in the form of a percentage of the crop planted.

Labor
Control over labor has traditionally been held by the farming family. During a cropping cycle labor would often be exchanged between and within households during the cropping cycle. With the increasing commercialization of agriculture, farming households no longer find themselves in control of their time and energy. Labor input is dictated by the demands of the cash crop, or else by the contractor or buyer. Wage labor has also replaced much of the reciprocal labor in traditional communities as farmers have become displaced from their lands and as debts outstrip income from farming. Large landowners in villages where reciprocal labor still operates avoid the system by hiring someone to replace them (Panyakul 1990). Wage labor in agriculture has little control over wages. Minimum wages set by urban labor groups have little effect on increasing the wages of farmers. An average monthly wage for hired agricultural labor is about 1,500 baht, or 50 baht per day, compared to twice that for urban laborers.

Effects of Urban Migration
The NESDB forecasts that by the end of 1996 the agricultural work force will have shrunk to about 40% of the population. It has been reported that “up to 85% of Isan villagers earn less than they need to survive, so an average 2 million people leave their homes each year to work elsewhere...most are under 30 years old, Isan is a major source of labor for Bangkok factories” (Ekachai 1991:21). This seasonal migration results in even more hardships for those family members left at home.

Women in Agriculture
Women constitute more than 60% of the agricultural labor force, but have yet to be recognized as equal partners in agriculture by government or agro-industry. One study showed
## Table 8. Differences Among Various Land Documents

<table>
<thead>
<tr>
<th>Type</th>
<th>Right to Transfer (including sale)</th>
<th>Restriction on Transfer</th>
<th>Maximum Period of Legal Protection</th>
<th>Period of Right for Preemption</th>
<th>Acceptance as Loan Collateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS-4 (Title deed)</td>
<td>Yes, except case of non-transferable restriction</td>
<td>5-10 years</td>
<td>10 years</td>
<td>10 years</td>
<td>Yes</td>
</tr>
<tr>
<td>NS-3</td>
<td>Yes, except case of non-transferable restriction</td>
<td>5-10 years</td>
<td>1 year</td>
<td>5 years</td>
<td>Yes</td>
</tr>
<tr>
<td>NK-3</td>
<td>No, except through inheritance or to cooperatives</td>
<td>All the time</td>
<td>None</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>KSN-3</td>
<td>No, except through inheritance or to cooperatives</td>
<td>All the time</td>
<td>None</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>STK-1,2</td>
<td>No, except through inheritance</td>
<td>All the time</td>
<td>None</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>SPK-</td>
<td>No, except through inheritance or to Farmer's Organizations or ALRO</td>
<td>All the time</td>
<td>None</td>
<td>None</td>
<td>No</td>
</tr>
</tbody>
</table>

*Source: Onchan 1990:68*

That rural Thai women accomplish a significant portion of a variety of tasks:
- 65% of all rice farming work;
- 50% of other cash crop farming;
- 95% of kitchen work and vegetable gardening (for family consumption);
- 100% of the mulberry leaf growing;
- 10% of soil preparation;
- 30% of pest control;
- 70% of farm management;
- 50% of harvesting; and
- 90% of food preservation.

*(Thai Development Newsletter 1991:21)*

- The study also showed that men work only 2/3 of the time women farmers put in, yet receive more pay.
- Most programs assume women will benefit from development as part of the “farm household” and so neglect the improvement of social structures necessary to benefit women directly. Specific programs targeted at integrating women into development have not questioned the underlying assumptions in the male dominated social and development structure.

Since men are considered the household head they are often the beneficiaries/recipients of government sponsored training and credit programs. The assumption that the knowledge will be shared between husband and wife has proved false. Agricultural extension agents are typically male, while female extension agents are traditionally assigned the roles of home economist or youth development planner.

- One of the primary effects of current agricultural development models has been the disruption of the traditional economic reciprocity between men and women in agricultural activities. Women now have even less control over resource use decisions.

### Factors Determining Unsustainability

**GOVERNMENT POLICIES**

Agricultural development policy in Thailand has followed international recommendations in support of the growth of agro-industry. Under this policy the traditional (and sound) notion of producing “food” as food, of feeding oneself first and trading only the surplus, has been replaced by “food” as a commodity on the international market to be stockpiled for trade and profit. This orientation has led to deforestation, increasing displacement and marginalization of small-scale farmers, mismanagement of water resources and increasing risks to farmer and consumer health.

One of the harshest criticisms of government policy comes from Dr. Ammar Siamwalla (TDRI) who describes the government as being run by “macro oriented people who do not understand micro issues”. They view agriculture in a uniform fashion and so solutions have also been uniform. They also dismiss small-scale farmers (and sustainable agriculture) as
inefficient and unproductive.

The MOAC has begun to test sustainable agriculture practices in research and extension, and is making attempts to learn from the process of NGO/PO projects. Yet, even where MOAC has made efforts to explore sustainable agricultural technologies and processes, or support farmers organizations, there is a tendency to want to create a single solution for the whole country, and to take control of—and the credit for—the programs, technologies, designs, or the organizations themselves. It also does not perceive such technologies as appropriate for mainstream agriculture.

- Rational water policies which address ground water storage capabilities through sustainable agriculture practices have been given little serious thought by water resource management planners. Instead there is a continued reliance on siphoning off water from major rivers into man-made catchments, a drawing off process which will eventually affect river bank and end-point users of those rivers because of declining or increasingly unreliable water supplies and fish and shell fish yields. The guiding logic within the irrigation department can be gleaned from a statement made by a prominent irrigation expert who “suggested the construction of a dam to block water from the Pa Sak River from being wasted by running into the sea” (Bangkok Post 11/18/92). The statement not only demonstrates a short sighted view of sustainable water resource use, but an entirely uninformed understanding of the invaluable functions of naturally flowing rivers to the communities, ecosystems, and organisms which depend on them. This same attitude has forced the government (and farmers) to rely on continually more and more unpredictable natural rain fall and expensive cloud seeding programs—a reliance on technical rather then more cost-effective natural land building processes.

Guided by traditional thinking, government planners continue to create non-renewable, short term solutions to re-source shortage problems, rather than taking a critical assessment of current agriculture and industry policies and their effects on land, water, and other natural resources. Of critical importance is assessment of policy and programs which impact on the environment across ministries and departments, as well as within them. The biggest obstacles to eliminating conflicting resource use agendas are heavily political and volatile. They involve issues of jurisdiction, personal benefit, and power struggles between individuals, factions, departments, and ministries.

- Price controls on domestically sold agricultural commodities is a double edged sword for Thailand. Keeping domestic prices down benefits both urban and rural populations who must purchase agricultural goods rather than being able to produce them. This includes many farmers who are forced to buy back rice to eat when harvests are poor or crops fail. A significant percentage of low income populations in urban centers have recently come from the rural sector and belong to the non-skilled labor sector where wages are not enough to support price increases. Price ceilings exist for most agricultural commodities, such as rice, sugar, garlic, onions, etc. At the same time, the government sets a floor limit for agricultural products bought from the farmer. Where there are no controls, the middlemen, who purchase and transfer these products to consumers, benefit most. They take price controls out on farmers by paying them much lower prices for goods so that they can maintain their profit margins. Trade in rice is the clearest example.

- Aside from lopsided planning and legal provisions in favor of agro-industry, loopholes in laws meant to maintain standards in environmental protection are rarely enforced in the agricultural sector. Some examples are the Poisonous Chemicals Control Act which still allows pesticide products banned in many other countries to enter Thailand without thought to the risks posed to all sectors of society; laws

**Casualties of Migration**

*Working in Bangkok poses risks other than accidents or robbery.*

In Don Samran, a small village of only 40 families, mental casualties are high. The men work mainly as *tuk-tuk* drivers and poultry butchers in Bangkok during the dry season. Under demanding work conditions they have had to rely on stimulants they call “horse medicine” to keep them going.

"[Running on stimulants during the day], the workers [have difficulty getting to sleep at night. They need alcohol to shut down the working machine. Year after year, the cumulative effects on the mind of the alcohol, the drugs, or both, can be disastrous” (Ekachai 1990:33).

One man, aged 44, returned home mad. Another, aged 49, sits all day in front of his buffaloes, staring into space. He has been that way for 10 years since he came back from the city. Still another suffers from hallucinations and headaches. “But I have to go back to Bangkok again,” he says. “...I have to work to support my family.”

The village headman has this to say of the dilemma common among his fellow villagers: “No one wants to leave, but we simply have to...A lot of us have to pay off the cost of the fertilizers we borrowed for rice farming.” The village headman knows the price of urban migration. His younger brother, suffering from hallucinations and headaches, lost his way returning to the village from Bangkok and has not been found to this day.


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excluding monocrop tree plantation from agricultural activities disallowed in areas of steep slope; land ownership and zoning laws which are easily manipulated to accommodate private interests; the lack of Environmental Impact Assessments (EIAs) and pollution controls for agri-business; and “reforestation” activities (eucalyptus plantation under the Forestry Department) and the Green Isan project (a pseudonym for the Green Revolution under the jurisdiction of the army) being run by departments or political bodies outside the MOAC and so take an even broader leeway in interpreting environmental law and impact on rural communities.

**TRANSNATIONAL CORPORATIONS AND THAI MARKETING CARTELS**

Control over crop choice and production method no longer belongs to the farmer. The need for cash income forces farmers to follow market dictates for cash crops, which in turn determine the package of production technology which farmers must use. Many on-line (ultimate) agricultural product purchasing companies (transnational corporations, or TNCs) also control the seed, fertilizer and pesticide companies. Almost 50 international companies are involved in research to develop seeds dependent on a particular set of chemical inputs (Lianchamroon 1992).

On a global scale, 10 companies hold 50% of the pesticide market and 20 companies control seed markets. In Thailand 80% of the pesticide, and 60% of the seed markets, are controlled by large companies, the top five of which are TNCs (Lianchamroon 1992:27). In 1989 Giba-Geigy (German) controlled the largest share of the agricultural chemicals market in Thailand at 13.2%, Dupont (USA) 11.3%, Bayer (German) 8.88%, Monsanto (USA) 8.29%, Mayand-Baker 6.58%, and Shell (England and Netherlands) 5.42%, for a total 54% control of the market. In 1990, the Agriculture Department reported 5 major companies controlled Thai markets, namely; Dupont (11.6%), Bayer (11.5%), Giba-Geigy (10.3%), Shell (6.7%), and Monsanto (5.1%). Thai companies also buy the raw materials for production from TNCs, mix, and repackage them under domestic labels, making the TNCs’ actual share of the agricultural chemicals market in Thailand even higher.

Another issue affecting sustainable agriculture is the future of ownership of genetic resources. Current discussions at the global level show that the private sector and governments see this as the next market frontier for agriculture and other plant product markets, such as pharmaceuticals. Intellectual property rights (IPRs) over such materials will determine who takes the biggest share of the market. If TNCs force Southern governments to accept Northern legal notions of IPRs, the cost to farmers of seeds, technologies and chemical inputs will increase even further. The irony is that farmers will in effect be paying for the knowledge and innovations taken from them and repackaged for world market demands.

**THAI CARTELS**

In Thailand, less than 20 companies control most of the agricultural market (Table 9). A primary feature of these companies is their vertical integration so that they control the entire process from production of raw materials to the finished product. The agri-business sector was quick to develop a close association with local commercial banks (e.g. Bangkok Bank) which facilitated the rapid expansion of groups such as the Charoen Pokphand Company (CP) and Kaset Rungrueng (Leungaramsri and Rajesh 1992:85).

Thai agricultural cartels have a strong influence over policies governing the agriculture sector. Notable examples are the designation of conservation, degraded, and economic zone mangrove and forested areas. Some of the healthiest mangrove lands have been placed within economic zones and degraded sites are listed as conservation lands. This is primarily to benefit aquaculture development and the charcoal industry in the area (Yod Phon 1992). Forests have been classified as degraded to allow concessions to corporations for eucalyptus plantation and prawn farms. The Farm Council Bill before Parliament this year bears the stamp of agro-industry, particularly of the CP Group.

**Table 9. Some Companies in the Agro-Industry Business**

<table>
<thead>
<tr>
<th>Agri-business groups</th>
<th>No. of Agri- Companies</th>
<th>Type of Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charoen Pokphand</td>
<td>49</td>
<td>animal food, chicken, swine agri. prod., shrimp aquaculture</td>
</tr>
<tr>
<td>Metro</td>
<td>15</td>
<td>fertilizer, tapioca</td>
</tr>
<tr>
<td>Sun Hua Seng</td>
<td>18</td>
<td>rice, maize, tapioca, fertilizer</td>
</tr>
<tr>
<td>(Kaset Rungrueng)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laem Thong</td>
<td>16</td>
<td>animal food, chicken</td>
</tr>
<tr>
<td>Taiwa</td>
<td>12</td>
<td>tapioca, rice</td>
</tr>
<tr>
<td>Unicord</td>
<td>12</td>
<td>canned food</td>
</tr>
<tr>
<td>Maboonkorn</td>
<td>21</td>
<td>rice, shrimp, livestock, agri. prod.</td>
</tr>
<tr>
<td>Nanaphan</td>
<td>7</td>
<td>agri. prod. castor oil</td>
</tr>
<tr>
<td>Tekbi-an (OCBC)</td>
<td>5</td>
<td>rubber</td>
</tr>
<tr>
<td>Boon Rawd Brewery</td>
<td>9</td>
<td>beer</td>
</tr>
<tr>
<td>Hong Yia Seng</td>
<td>21</td>
<td>rice, maize, chicken, textiles</td>
</tr>
<tr>
<td>Thai Rungrueng</td>
<td>13</td>
<td>sugar</td>
</tr>
<tr>
<td>Kwang Soon Lee</td>
<td>17</td>
<td>sugar</td>
</tr>
<tr>
<td>Mitre Yong</td>
<td>9</td>
<td>sugar</td>
</tr>
</tbody>
</table>

* Types of Business are incomplete but list major activities.

While some would argue that farmers gain training in production methods, the technical information provided is incomplete. Farmers learn methods for growing produce but are trained in product grading or marketing, as the company controls the sale of the crop. Farmers are often told their crop is below standard in order to keep prices low, but are rarely informed of the standards used to determine the quality of their crop (Senakhum). Loans between farmers and contractors usually cost several hundred thousand baht, often putting the farmers’ land, their only real collateral, at risk.

Laws to control product standards favor agri-business over
The Almighty "CP"

One of the most influential car
tels in Thailand, the Charoen
Pokphand Company (CP) started as a
seed company called Chia Tai and has
since grown to a conglomerate of
more than 200 companies
(Dhanasethakorn and Limsa-
marnphun 12/14/92).

CP is known for two methods of
doing business: joint ventures and
contract farming. With agri-busi-
nesses in seed, fertilizers and chemi-
cals, livestock, animal feeds and
aquaculture, (not to mention inter-
est in telecommunications and pet-
rochemicals)

it's next step in Thailand is to create
a completely integrated fruits and
vegetable trading operation. It al-
ready has control over extensive or-
chards in 5 provinces in Thailand (Ibid).
The corporation is associated with
Arbor Acres, Oscar Myer, Kentucky
Fried Chicken, and 7-Eleven Com-
pany for food products. One of its
major foreign partners is Mitsubishi
Corporation of Japan, which helps
in the marketing of black tiger
prawns (Leungaramsri and Rajesh

CP is a TNC in its own right, with
business in Indonesia, China, Hong
Kong, Turkey, and is vying for mar-
kets in Cambodia, Laos, Vietnam
and China. It is currently conduct-
ing feasibility studies on joint ven-
tures in aquaculture in India, Iran,
Vietnam, Cambodia and Mexico.
The Mexican government plans to
allocate 3 M ha. of land to shrimp
farming for up to 50 years per plot
(Keeratipipatpong 10/26/92). It is
still not known how much of the
costal resources of Cambodia and
Vietnam will be made available to
the corporation.

Invitations to do business with the
company have been based on their
export sales performance, not on
their record of displacing coastal
fishing communities, the high risk
burdens placed on shrimp farmers
who sign contracts with the com-
pany, or environmental degradation,
including the serious pollution of
coastal waters and inshore fish
spawning grounds.

Contract farming, especially the
wage contract system, is CP's
method-of-choice in controlling crop
production in Thailand (Panyakul),
and is expected to be used in
neighboring countries when the com-
pany opens up there. The practice
ensures lower production costs and
company control of the product,
besides making the farmers carry all
the risks.

While CP has been successful in
poultry contracts it has failed many
times with rice farming. Aquaculture
contracts may cause farmers to lose
whether they make a profit or not.
Once the productivity of the ponds is
lost, the land is also irrecoverable for
further agricultural use.

farmers. For example, livestock (e.g. pig) slaughter laws ben-
et primarily the 3 major companies which control Thailand's
pig market (which is based on European and American breed
stock). Farmers who raise and sell pigs have to be members of
a pig association (sahagone). They are not allowed to slaugh-
ter the pigs themselves; instead, they must sell to the associa-
tion which then sells to the kian moo (swine slaughter house),
usually the same entity. If a farmer does not sell to the
association he can be arrested; the slaughter house/association
typically assists police in enforcing this law. (Kongkaew

PRACTICE AND INFLUENCE OF THE WORLD
BANK AND OTHER AGENCIES

Misplaced confidence in chemical farming and a deep-seated
skepticism about the potential of sustainable agriculture to
"feed the world" resonate in the policy statements of institu-
tions like the World Bank (WB), the Food and Agriculture
Organization (FAO), IRRI, the General Agreement on Trade
and Tariffs (GATT), the European Union, and increasingly,
the Thai government.

Farmers in the country are not preoccupied with feeding
themselves, but with supplying insatiable cartels and TNCs with
raw materials for industry, the revenues from which in turn line
the coffers of the government. The government isn't feeding
the people either, and the agenda of international aid organiza-
tions is not food security, but rather, community market security.

Particularly for farmers in the Northeast, it is easy to look
around at their own poverty and believe that the rest of the
world does not have enough to eat. Sesmou (a pseudonym),
a senior FAO official, points out: "Given that FAO was set up
to assure that the world is properly fed, one wonders how it can
justify committing the poorest and least well-fed countries of
the world to exporting the bulk of their agricultural product
to countries which, in many instances, have an embarrassing
surplus of food?"

Meanwhile, a number of international organizations have
influenced past and future planning for the management of
natural resources, SIDA (Sweden, FINNIDA (Finland), CIDA
(Canada), ODA (Japan), USAID (US), and the Asian Develop-
ment Bank (ADB) have been involved in funding the master
plans of several countries in the South, including Thailand.

In particular, FINNIDA has supplied financing, through the
United Nations Development Programme (UNDP) and Jaakko
Pyty, for Thailand's current Forestry Master Plan. Such part-
nership is promoted in the Tropical Forest Action Plan (TFAP),
a document published by the FAO, UNDP, and the WB, in
cooperation with World Resources Institute (WRI). These
large institutions have a direct influence on the formulation of
the master plans. "Of the 42 countries which have started on
national forest plans, none so far has planned to try to restore
tropical ecosystems so that the forests involved can serve their
full range of environmental functions." (Leungaramsri and
Rajesh 1992:61) Given this, the master plan is not expected to
ensure the protection of "environmental functions" and will
probably be focused on a continual stock of timber for local and world markets, with serious implications for water and soil conservation. The plan is, perhaps, one of the primary reasons that the planting of eucalyptus remains classified as reforestation rather than plantation agriculture. "The FAO is the main international agency which supports eucalyptus and other fast-growing tree plantations as a means of supplying wood to the industrial and public sector." (Ibid 1992:58-61)

RESEARCH BIAS IN AGRICULTURE

Research bias against sustainable agriculture exists on theoretical and practical levels:

- University curriculum in agriculture, more than 15 years after the effects of the Green Revolution have become well-known, still follows standard coursework, and is primarily directed by economics. The same is true of the forestry curriculum. Both remain a "production" science first and foremost. According to this orientation, sustainable agriculture is defined as a system that can produce continually high yields of a given crop.

  Few universities teach alternative concepts of sustainable agriculture and alternative technologies as required courses. Universities have not yet seriously questioned their own role as teachers in light of continuing effects of the Green Revolution and sustainable agriculture practices.

- The second research bias occurs between researchers and donor/owner institutions. The bulk of research comes from the government and is carried out by state institutions; only 9% of the funding came from the private sector in 1987. In either case, the direction of research continues to follow intensive agriculture goals. Meanwhile, much of the research in sustainable agriculture is carried out by NGOs and farmers.

- The third bias is the belief that farmers do not or cannot do research. This ignores the fact that up until World War II, the majority of innovations in agriculture have come from traditional farmers.

  The current trend in research in Thailand is to encourage universities to do research for agro-industry. At present, there is little interaction between the public research system and the private sector. In an assessment of research initiatives by universities in Thailand, a WB report states that "clearly, closer link between universities and industry is crucial for transferring the fruits of R&D [research and development] to production capability in private manufacturing firms. At the same time, practical R&D researchers in universities would be able to sense the direction dictated by world market forces" (World Bank 1991:81-83). In the entire report, there is no mention of the role research might play in changing the form or meaning of mainstream agriculture. The direction is for industry, not the rural public, and "practical problems" are assumed to be those of agri-business.

SCIENTIFIC PARADIGMS AND METHODOLOGY

Definitions of agriculture continue to reflect intensive agriculture biases. As a science, agriculture has been broken down into a study of soils, water resources, chemicals, crops, etc. which reduces and distances each part from the integrated whole in which they actually exist. The question of what is encompassed in an "agroecosystem" or what a "farm activity" is evokes different answers from research scientists with intensive, market-based agriculture orientations and traditional farmers. This immediately limits the possibilities of what agriculture can be within the scientific model. For example, the separation of agroforestry and agriculture as two distinct branches of science in Thailand is the opposite of traditional perceptions of what agriculture is and what an agroecosystem might encompass. Because of this, the community forest has virtually been ignored by government policy as a legitimate part of agricultural systems, a viable means of self-support, a source of hundreds of alternative small-scale crops for local markets with the potential for greater sustainability. Agricultural research fails to recognize wild plant resources as part of a wider community agroecosystem.

Agro-industry has transformed agriculture research to a "lab first-land second" trial system, a process much removed from the farm and its surrounding ecosystem, where farmers have experimented with agricultural innovations for hundreds of years. Fortunately, other researchers have returned to the land in search of the roots of sustainable agriculture. NGOs have benefited from these academics.

Mainstream agriculture, and agriculture development by mainstream organizations, such as the MOAC can be said to be primarily agro-industry centered. The search for perfect high yield plants, livestock, and cropping systems has been conducted with little consideration for externalities (social, cultural, political, or environmental). In order to understand why this has occurred, one might consider the framework in which such experiments are carried out.

On-farm research focuses on yield performance and reactions to inputs into the system: that is, results between input and plants (or animals), not between the farmer and the crop or cropping system. Measurement of environmental, social, cultural, political, and micro economic impact is excluded from end results.

Underscoring these on-farm trial methods is a map of the "farm" and the flows in and out. Fundamental to this "map" (or agroecosystem) is the need to limit what is "inside" and "outside", what flows into and out of the farm or the trial field, in order to control what goes on within the experiment. By simplifying the system, it becomes easier to predict, replace, and duplicate elements.

This very same argument is found in current biodiversity conservation debates (Sharp 12/10/92) and is used to justify the loss of natural ecosystems or parts of them because their functions do not appear visibly important to the system. When that system is observed through the lens of the market, it also rationalizes that as long as genetic stocks exist in zoos, herbariums, and labs, loss in the wild is acceptable. Yet, some scientists have warned that we are simplifying the system before we understand all the elements and interrelationships of the original "farm" (Shiva 1992).
MARGINALIZATION OF INDIGENOUS KNOWLEDGE AND PRACTICES

As recently as 10 or 20 years ago many rural Thai villages considered forest lands as part of their community and household agroecosystem. Ramitanonhd writes, "Forests provided more than food and building materials for villagers. The collecting of forest products was also an occupation for farmers [an integral part of agriculture]" (1989:24). Maintaining forest sectors within or near the community also protected water and soil resources, and provided a store of genetic materials for traditional food and medicine crops, some of which could only be grown and harvested under a forest (Levin 1990). A complex web of ritual and indigenous knowledge kept forest functions within the village system healthy and highly valued. Today, some villagers still think of forests as part of their community agroecosystem, although they often have no legal rights to such land (Levin 1990, Lohmann 1991, Siwanasak 1992). This balanced structure of land use has only recently broken down.

Knowledge of a broader system of agriculture as a way of life rather than an occupation is being lost to a number of factors. Population pressures and urbanization have changed the pattern and structure of land use in Thailand. The commodification of forests for timber, and the land they rest on for agricultural development have made it extremely difficult for villagers to assert generational rights over such resources, particularly when the legal system does not recognize such communal rights. Formal and informal education has also played a role in changing relationships with the environment and in the loss of indigenous knowledge. Secondary education curriculum provides little incentive for the continuity of indigenous knowledge and skills necessary for balanced community survival. Many children find it difficult to return to the village or have little interest in the collective knowledge of their communities.

In all of this, a primary factor contributing to the marginalization of traditional farming systems, traditional crops, indigenous knowledge, and the practices which maintained those systems has been the introduction and expansion of intensive agriculture and agro-industry. Farmers who engage in cash crop farming must change the way they relate with the environment. Many examples of this change have been cited but basic to all of them is the removal of all the plants, which normally sustain people’s lives, in the area to be sown with cash crops. Perhaps, the most extreme example is that of rubber farmers. Also, traditional cycles and calendars of agricultural activities no longer have any bearing on the present rubber plantation system—night has become day.

Tongdeelert and Lohmann (1991) describe production methods developed by the Green Revolution and agro-industry as a continuing attempt to subdue the earth and rural people and force them into continual and rapid outputs to meet consumption demands over and above man’s needs; in contrast, traditional farming systems were “connected to rituals and beliefs which reflected villagers’ submission to, respect for, and friendship with, nature, rather than an attempt to master it” (1991:103).

The marginalization of traditional agriculture and its practitioners will make it harder and will take longer to recover such technologies for sustainable agriculture. Moreover, it consigns indigenous people as holders of knowledge—as teachers—to the periphery of science, agriculture, and policy decision making.

Sustainable Agriculture Initiatives

NGO INVOLVEMENT AND CONTRIBUTIONS

- Extent of NGO involvement: over 50 NGOs and numerous POs

- Rate of adoption among farmers: only a very small proportion of the national farming population—0.4%, or approximately 20,000 households out of a total 5M. However, this number does not include the few traditional farmers found in most communities.

- Origin: The sustainable agriculture movement in Thailand began in the mid-1980s as a search among farmers and local NGOs for alternatives to mainstream (chemical) agriculture which has trapped Thai farmers in a vicious circle of debt and disease. Some farmers decided to diversify production to reduce their dependence on the market. Others opted for organic farming methods to reduce chemical use on their farms. Still others returned to traditional agriculture systems, giving first priority to feeding their own families.

NGO workers from the Appropriate Technology Association (ATA) were among the first to popularize the concept of sustainable agriculture in Thailand. NGOs involved in alternative agriculture. Though differing in practice and methods, these farms were found to have one thing in common: aspiration for self-reliance and a striving for chemical-free crop production.

In response to the rapidly growing interest in sustainable agriculture among the NGO community, a loose network of NGOs was formed in 1984. This network, which later evolved into the Alternative Agriculture Group (AAG), has been a major forum for the sharing of experience and discussion among NGOs involved in alternative agriculture in Thailand.

- Vision of NGO sustainable agriculture advocates: The term “alternative agriculture”, as defined by the AAG, refers to “agricultural production and peasant livelihood that contributes to the rehabilitation and maintenance of ecological balance and the environment, with just economic returns, promoting a better quality of life for farmers and consumers, and fostering the development of local institutions for the benefit and the survival of all human kind” (from the AAG publication prepared for the first annual Alternative Agriculture Forum held on November 10 to 14, 1992).

Self-reliance and farmers’ control over the production process are central to the AAG definition, and reflect the 2 important beliefs prevailing in the Thai NGO community. One is confidence in farmers’ contribution to ecological
enhancement. The other is the conviction that farmers' economic autonomy is necessary to overcome market domination and exploitation. From this it is clear that the alternative agriculture promoted by Thai NGOs is not simply a set of environmentally sound production techniques, but rather a distinct philosophical concept and political platform derived from the concern for social justice and ecological enhancement.

- **Promotion strategies adopted by Thai NGOs:**
  1. Model-building. Thai NGOs believe that by demonstrating the success of alternative agriculture ventures, many more farmers will follow suit. Hence, NGO activities tend to center around organizing farm visit tours. This approach, however, has so far had limited success.

  2. Policy advocacy. This is done mainly by documenting and publishing selected case studies, but Thai NGOs have also been involved in policy advocacy campaigns, such as the one launched by the AAG to block the passing of the National Agricultural Council bill. (This bill has been criticized for favoring agri-business over small farmer sector development.)

  Another success for policy advocacy is the inclusion of the term “integrated farming” in the Seventh National Economic and Social Development Plan (1992-1996). Similar mention is found in a recent policy statement presented to the Thai parliament on October 21, 1992 by the government under Prime Minister Chuan Leek Pai.

  However, in both policy papers, alternative agriculture is merely a token target as there are no concrete policy measures for the plan to materialize. In particular, the essence of agricultural planning in both statements is to foster the development of agri-business and agro-industries, rather than to pursue any genuine sustainable agricultural development program.

- **Issues and Constraints in NGO Promotion of Sustainable Agriculture:**
  1. Lack of a basic, common definition of sustainable agriculture. Thai NGOs recognize several orientations within their own movement, with various groups using different—and often mixed—philosophies and approaches. Some see sustainable agriculture as a package of appropriate technologies, tools, seeds, and processes. For others, it is a manifestation of the democratization happening in the countryside, indication of a conscientized and politicized peasantry seeking self-determination. Sustainable agriculture is also thought to incorporate an entire lifestyle. For many, it fits well with Buddhist theology and the search by many people in present day society for something which is missing in their lives—connectedness with the environment. For this last group, sustainable agriculture begins with a thought process and evolves into practice.

  2. The slow growth of the Sustainable Agriculture Movement. Frustration with the slow growth of the movement for sustainable agriculture has prompted some NGO groups to consider the need for increased economic incentives (i.e. alternative markets). By first creating the market for sustainable agriculture products, these NGOs believe that more farmers will be emboldened to let go of conventional market linkages and try alternative options. There is some disagreement about this approach, however. Opposing groups feel that internalization through education of the concepts of sustainable agriculture must come first. Perhaps the two approaches can be done simultaneously.

  To date the AAG has had little experience in developing alternative markets, and will continue to look to successful trials in other countries for guidance and direction.

### Lessons Learned and Insights

#### STUMBLING BLOCKS

Despite NGO efforts to promote Alternative Agriculture (AA) for almost a decade, AA continues to be confined within a rather small circle of leading farmers. From field experiences, there are at least four factors that keep prospective farmers from switching to alternative practices, namely: economics, techniques, psychological and market opportunities. Unless these stumbling blocks are removed, a mass AA movement will remain an unreachable dream for local farmers and NGOs.

### Economic factors

One of a farmer's prime concerns is income. In the context of rural Thailand, where full scale commercialization is in progress, the sale of cash crops is the only source of income which farmers can rely on to provide for their families livelihood, education, and health needs, besides other expenses. The double cost-price squeeze not only keeps farmers below the "poverty line", but serves as the main mechanism to transfer surplus products from rural agricultural sectors to urban industrial sectors.

Given these unfavorable circumstances, it is often not feasible for farmers to adopt AA because it requires a certain amount of capital for physical improvement of the land (e.g. pond digging, drainage). Farmers will also have to provide for their and their family's subsistence while the trees are too young to bear fruit. It is generally believed that farmers would need at least two to three (sometimes four to six) years before trees reach fruit-bearing age and soil is rehabilitated to the extent that adequate fruit is produced on the land. For many indebted farmers, it is not possible to wait that long, as the interest and capital on loans must be repaid promptly. Finally, the security of land ownership, or rather the lack of it, has serious implications for farmers' decisions in the production plan.

As long as these immediate economic constraints remain unattacked, a large number of resource poor farmers will be barred from adopting AA. Some may argue that AA can help cut down production costs by almost half and improve farm productivity in the long-term, but how many farmers can afford to pay off current debts and wait to reap such benefits? Supplementary means which provide solutions to farmers' immediate problems must accompany AA information and technology transfer and policy advocacy.
Production techniques
AA production technology is much more complicated than chemical intensive farming. Planting trees and "letting nature look after them" is not really sustainable agriculture. Sustainable farming requires serious attention and determination from the farmers who have to put abstract principles into practice. As farming environments vary from one place to another (just as the farmers own socio-economic circumstances do), AA farmers must develop their own farming techniques to fit such constraints.

Local wisdom in farming began to disappear when chemical farming and an export-oriented market system were introduced into village economy. Farming culture, the reflection of indigenous farming knowledge, eroded. Revitalization of traditional farming culture needs time, knowledge, and support from all people within and outside the community. Especially farmers themselves must be willing to re-learn agriculture. Initially, AA requires intensive labour input, as farmers must pay extra effort and attention to improving and developing farming techniques.

NGO efforts to promote AA emphasize basic principles and core production techniques of sustainable agriculture. These techniques are simple, and may not be of great use to all farmers. Farmers thus feel reluctant to accept such ideas as they are still caught up with chemical myths. Those who decide to try the new techniques will have to try them out and improve on them according to their particular circumstances before they can begin intensive farming.

Stability and productivity are the main concerns for farmers in adopting new innovations. On the brink of economic bankruptcy, they cannot afford to fail anymore.

Technological research and development for AA receives little support from research institutions in Thailand. Indigenous knowledge remains unrecognized and unrecorded. Information services are lacking. Even those among the NGO community concerned with AA, technical staff are inadequate. Therefore, a change in priority is in order: more attention must be given to staff training and information center development, before AA technology is taken up by local farmers.

Cultural factors
Peasant tradition, which emphasizes self-reliance, independence, mutual self-help systems, and simple living, is, for some, a thing of the past. Cultural changes in peasant society make it harder for the adoption of AA practices. Even when prospective farmers begin to experiment with AA, they often express concern about farm productivity. For them, farming without chemical control of weeds and pest infestation is an alien, if not stupid, concept; for the last 30 years, chemical pesticides have served, for most of them, as an insurance policy against the uncertainties of farming.

It is interesting to consider briefly how AA farmer leaders overcome this chemical farming culture. From our preliminary survey, it was found that all these leaders had learned from their direct experience with chemical farming, either from their own analysis or with the assistance and encouragement of NGOs. These leaders then decided to change their cultivation methods. However, in the initial period, most of the AA farmer leaders were quite reluctant to adopt full-scale sustainable practices as they were still unconvinced about farm productivity. Besides, the other farmers in the village dismissed non-chemical farming methods as unworkable. With this kind of pressure, the farmer leaders found themselves at a point of no return: if they failed, they would lose face. As a result, they become even more determined to succeed.

It is important, however, to note that these leaders came from distinctly different backgrounds (education, social, and even economic) compared to other farmers. Some of them had had Buddhist training; others had been indoctrinated by NGOs. A good number of them had also received financial and/or moral support from rural development NGOs.

The limited success of AA promotion (and perhaps also for community development efforts) can be to cultural factors. Farming is not just an economic activity, but rather a part of the rural way of life. Changes in farming patterns will never succeed and be sustained unless "cultural battles" are won. It is this challenge that calls for a serious consideration by all concerned groups, especially the sustainable agriculture movement.

Market outlets
Market structures for agricultural products are dominated by buyers, except in the case of consumers markets. Merchants, either those travelling to collect produce from the field or those waiting at their warehouses, have more influence on agricultural price setting than farmers. Therefore, merchants are able to make huge profits while at the same time
pushing the burden of price fluctuations onto farmers' shoulders.

Marketing problems of agricultural products are not of their own, but related to, national policy structure. With the adoption of export-oriented industrialization as the national development goal, the agriculture sector has been geared towards providing cheap food sources for urban residents and generating foreign exchange earnings (to finance industrialization programs). Structural relationships between industrial-urban and agricultural-rural sectors are therefore unequal. Market mechanisms are one of the main channels by which surplus products and resources are transferred out of rural sectors to subsidize industrial development and urban consumption. In addition, within the structure of the global market system where Thailand, as well as other Third World countries, are compelled to trade raw materials and agricultural products for manufactured goods under deteriorating terms of trade, surplus products are plundered for the wealth accumulation of the industrial world.

Under unfair trade regimes at national and international levels, those at the bottom of this exploitative trade pyramid are small farmers. Over the past 30 years, local farmers have become ever poorer in the process of their integration into this global market system. Many of them given up on market-oriented farming and turned to self-reliant alternative agriculture.

However, only a few farmers are really able to cut market linkages. Many marginal farmers interested in AA need to earn cash income to pay off debts and necessary expenses. This calls for an alternative market system with fair prices for rural products. Until this alternative market is firmly established, the adoption of sustainable agriculture will be limited to a small group of farmer leaders.

Future Directions and Plans for NGOs

Policy recommendations for sustainable agriculture in Thailand

So far agricultural development plans have been based on centralized planning by the state, aiming at increasing land productivity and exports. Such planning encourages the rapid growth of the private sector, at the expense of the rural economy and environment.

For agriculture to develop sustainably, the centralization of development planning must be reversed and farmers given the opportunities to participate in the decision making and development process. These include research and development programs, recognition of farmers rights to genetic resources, in situ genetic conservation, small-scale water resource management programs, chemical policies, and the processing and marketing of chemical-free products.

The following policy recommendations are summarized from an article entitled Alternative Agriculture for the Enhance-ment of the Agriculture Sector and Natural Resources prepared by Day-Cha Siriputhra and Witoon Lianchanrnon, as a seminar paper for the 1993 National Forum held at the Parliament House in Bangkok on February 11-12, 1993 as part of a discussion on “Community Rights: Decentralization of Natural Resource Management”.

Advisory Body for Agricultural Development Policy

An advisory body must be truly a farmers organization. Representatives of the council should not include those from the business sector and bureaucracy, as suggested by the draft bill for a National Agriculture Council. Otherwise, the council will be dominated by business interests, rather than farmers.

The establishment of such a council by no means can ensure fair representation of farmers' concerns. The role of such a body is to facilitate the [incorporation of farmers' input] into policy planning.

The success of this council, thus, depends upon the strength of autonomous farmers' groups at grass-roots and regional levels. Therefore, it is perhaps more crucial for the government to give higher priority to strengthening local farmers' organizations, instead of forming a puppet agricultural council.

Education for Small-Scale Farmers and Alternative Agriculture

Agricultural Studies for Farmers

The national education system must be geared towards helping farmers to meet their end needs, rather than aiming for maximum economic growth. Obsessing with increasing farm productivity, agricultural studies in higher education institutions blindly follow western academics. Such studies are totally inappropriate to the reality of local farmers who have access to a small plot of non-irrigated land.

Agricultural studies must give due recognition to the contribution of local farmers' wisdom and knowledge. Regional colleges should play a more important role in the development of local knowledge systems and their extension.

Beyond Chemical Farming

Agricultural studies in all higher education institutions continue to be dominated by the reliance on chemical and external inputs for farming. This is not only unsustainable economically, but also responsible for the deterioration of the local ecosystem [and perpetuation of the kind of thinking which continues to rely on the same chemical and market dependent solutions used over the past 30 years].

Alternative agriculture can provide a solution to the current environmental crisis, and thus should be taken up seriously by academic institutions. Even the sustainable agriculture popularized in the North now is derived from the Southern experience.

NGOs have been working to promote and develop alternative agriculture for over a decade. Their expertise needs only to be tapped by academics for future research and development for the benefit of all local farmers.
Research and Development (R&D) in Agriculture Technology

R&D by Farmers

Local wisdom on sustainable agriculture is an accumulation of long trial and error experiences of farmers. Such wisdom can provide a solid ground for R&D on appropriate sustainable agriculture technology. Unfortunately, it has been overlooked by local academics. Despite this domestic ignorance, foreign researchers have tapped into this wisdom and make effective use of it. For instance, the Japanese have learned a great deal about local herbs for medicinal and farming purposes and the Australians about fruit tree gardening.

The attitudes of national researchers, especially towards farmers wisdom, must be changed. Farmers must be given opportunity to participate in the research setting, right from research formation to analysis and evaluation, as well as extension of research findings.

Research Aims: For a Better Life and Enhanced Environment

Research must be re-oriented towards improving the living conditions of peasants, strengthening local communities, enhancing the environment and reducing agriculture pollution. Future R&D must comprise the following three basic components:

- Thorough evaluation of the Green Revolution. So far, very few academics are willing to accept the failures of the Green Revolution, let alone its impacts on farmers' economy and social system, as well as ecology. The Agriculture Department should be made to recognize its mistakes before a genuine re-orientation of agricultural research can be achieved.

- Basic research to survey the stage of local wisdom and knowledge on sustainable agriculture. Priority and emphasis should be given to knowledge on integrated fruit gardening, non-chemical pest control, and small-scale water management.

- R&D on alternative agriculture technology. By applying modern sciences and knowledge, R&D on traditional alternative techniques can help to improve them for broadscale extension.

Land Policy

No matter how well development programs are planned, the agriculture sector will remain under-developed unless farmers have tenurial security. Unless the present situation (where farmers are treated as “tenants” or seen as “encroachers” of reserve forest) is reversed, farmers will continue to be unwilling to invest in land improvement. Land reform and redistribution can provide a solution to these problems. However, for such land reform to succeed, farmers must be given the chance to participate in the decision making and implementing process.

AA can also ensure the success of land reform. This is because it helps to strengthen farmers’ economic base, making them self-reliant and thus reducing the chance of land loss. Moreover, AA can help enhance local ecology. From experience, it is found that “agroforestry” has been successful in different ecosystems (e.g. watershed, slope, and denuded forest) and in different types of forest (e.g. rainforest). The expertise of leading farmers must be tapped (to set up models for land reform).

Water Resource Management Policy

Water and conservation

Water resource management is an inseparable part of environmental conservation efforts. Construction of large scale dams inevitably damages forests. Large scale dams and reservoirs are not sustainable water management. They are short term measures for quick benefits.

Water resource management and farming

The state sponsored water resource management programs tend to be large scale, suitable for large scale monoculture farms. Irrigation systems appropriate for sustainable agriculture must provide a continuous flow of water for diversified crops throughout the year, not depending on the discretion of the Irrigation Department or the Electricity Generating Authority.

Household and farm irrigation

Irrigation should [be adapted to local ecology and to the requirements of peasants]. There exist several examples of household and farm irrigation systems appropriate to sustainable farming, such as fish ponds and small canals in rice fields, small earth dams, pond digging in slope areas. These local water resource and irrigation systems are efficient and even have an 80-200% higher annual return than large-scale irrigation projects implemented by the government.

In household and farm irrigation systems, farmers should play a central role in design and management so that they are responsive to the needs of their farms.

Water resource management research

Thai farmers have long experience with water resource management. Muang faai, traditional irrigation weirs, in the northern region and water resource management systems in the salinated areas of Thoung Kula Ronghai are some examples of appropriate local wisdom in water resource management.

These irrigation systems are cheap, easy to handle, require little external input and fit well within the local ecology. Unfortunately, national academics have overlooked this indigenous wisdom. Extensive research on this can provide a good starting ground for the development of appropriate irrigation systems for sustainable agriculture.

Genetic Resources Policy

Genetic erosion in the agricultural sector can be attributed to two important factors; the state's agriculture development programs and unequal relationships between the North and the South. Neo-colonization, especially in the form of patent laws, is a very real threat to genetic diversity in Third World countries.
Support for in situ conservation efforts by local farmers
A vast pool of genetic resources disappears from peasants’ farms and local communities. The loss is due mainly to the state’s own policies, such as rice seed exchange programs, monoculture of rubber plantation, and large scale dam projects. AA can help to conserve genetic resources. [However], the government should set aside and provide budget support so that AA farmers can continue their in situ genetic conservation.

Recognition of farmers and community’s rights to genetic resources
The government should enact legislation to give due recognition of the rights of farmers and their communities to genetic resources in community forests and on farms. Farmers’ rights differ from TNG sponsored “patent rights” as the latter aim solely to secure profits from genetic commercialization.

In particular, the government should encourage a closer cooperation between Third World countries, especially those in Southeast Asia where a large proportion of the World’s genetic resources are located. This cooperation can give them a stronger bargaining position vis-à-vis industrialized nations for international recognition of “farmers rights to genetic resources”.

Self-reliance in seed production and biotechnology
Seed markets in Thailand are controlled by five major seed trading companies; 80% of vegetable seeds and 60% of agronomy seeds. Thailand thus has a low self-reliance in seed production. This is particularly true if there is no seed production by public agencies. However, these agencies rely upon foreign funding and their production is too centralized. Such centralization in seed production causes several other problems. Among them is the responsibility taken by these agencies which makes them unable to undertake other more important or urgent work, especially technology research and development. Another problem is the failure to transfer seed production technology to farmers as farmers’ stage of knowledge is inadequate to take over production responsibility.

There is a strong tendency for government to privatize seed production. If this continues, national seed security will be under threat. Therefore, it is perhaps more appropriate to improve farmers capacity in seed improvement and production. Also, farmers’ organizations and small indigenous companies should be encouraged to take up part of this responsibility. It is crucial for public agencies to launch concrete measures to support local initiatives, especially in regards to research and development.

Stop Patent Laws
The Patent Act B.E. 2522 (AD 1979) allows patent registration for biotechnology, but not animals, plants, or micro-organisms.

Under increasing pressure from the U.S., the Thai government is likely to bow to demands for tighter patent laws. However, there are several issues that should be taken into consideration before the decision is made whether life forms should be under patent law. These are 1) the spirit of Thai patent law is to allow public accessibility to scientific technology; 2) [with] domestic seed production [already] in the hands of TNGs, patent rights will further benefit these companies. In particular, strict patent laws on seed will increase financial costs to farmers by 10-30%, or more; 3) the patent system proposed by the U.S. has profound implications, to the extent that it has patent rights over genes; until now many countries disagree with the U.S. proposal; 4) a tight patent system is inappropriate to Thailand where the stage of her national development is at the imitation and development level. Patent law would prevent Thailand’s access to advanced knowledge and technology; 5) know-how over seed production and micro-organism techniques can be kept secret by commercial measures; 6) patent systems on living things is a moral issue. If a patent is given to all life forms, humans will soon be patented, too.

Chemical Policy
Although the [Seventh] National Economic and Social Development Plan (1992-1996) has set a target to reduce pesticide use, it is widely expected that this target will never be realized. This is because public agencies (e.g. Agricultural Extension Department, Bank of Agriculture and Agricultural Cooperatives, Organization for Agricultural Market, Agricultural Cooperative Club) have been responsible for the distribution of more than half of domestic pesticides. Therefore, it is crucial that the government should ban these agencies from pesticide distribution. In addition, existing pesticide subsidy budgets should be curtailed and diverted to sponsor more research in non-chemical pest control.

The government should tighten up its monitoring over the import and production of the banned 23 dangerous chemicals. Also, the government should consider banning other hazardous chemicals already banned by other industrialized countries. To discourage pesticide use, public advertisement of pesticides should be barred in the same manner that cigarette advertisements are.

Alternative Market for Chemical-Free Produce
Alternative markets for chemical-free products provide a strong incentive for farmers to take up non-chemical farming. A few small alternative markets already exist, [thanks to] the efforts of producers’ and consumers’ groups.

The government can support these initiatives (but not dominate them) by providing credit facilities and tax [breaks] to such enterprises. Publicity and provision of venues for direct producer-consumer fairs featuring non-chemical products are other ways that the government can help.

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From Integrated Farming to Natural Farming: The Story of Samrit Boonsuk

Background
Khun Samrit Boonsuk was born in 1930 in Ban Tatain, Sawai district of Surin province, Northeast Thailand. The second youngest child, Samrit completed primary school and attended a few years of secondary education until 1948 when he returned home to work in the family farm. For the next 5 years, Samrit grew paddy. At age 20 he was ordained a monk at Wat Samakkhiri. Three years later he went back home and resumed work in the family farm.

In 1957 the village headman of Ban Tatain resigned and Samrit took his place. His concern for the welfare of the community grew during this time. Sometime before his resignation as village headman, the Kaeyal Farmers' Group was established (mid-1974). At the same time a farmers’ group formed earlier by the government to help farmers get subsidies from government agencies was abolished. This prompted the farmers to come together as a single, united group. The Kaeyal group has received several awards for its activities and performance in farm production in the years 1984, 1987, and 1991. Its present turnover is 100,000 baht per year. Khun Samrit is one of those behind the success of this group.

Process/Strategy
The Kaeyal Farmers’ Group, which started out with 40 members, was formed in accordance with Revolutionary Orders 140 and 141 which allow “farmers to join as a group, to assist each other [in activities not related to politics] and to tackle the problems farmers are confronted with” (Surin Farmer Support Project, nd.). The creation of the group was facilitated by the district agriculture officer who thought that an association of farmers would have better access to government subsidies and financial assistance.

Initially the group’s activities focused on providing cheap fertilizer to its members. Other activities, such as running a community cooperative, were turned down by the group for fear that they might not be able to bear the expenses, support from government notwithstanding.

The group established local level farmers’ groups in accordance with state policy. However, mutual distrust nearly led to the dissolution of the organization; the election of a chairman acceptable to all forestalled it. A few difficulties did come up between 1976 and 1981 when a number of expenditures could not be satisfactorily accounted for by the committee. This was eventually resolved by dividing the responsibility for accounting among the members of the organization. In 1981, Khun Samrit was elected head of the group; he stayed in that position for 10 years.

Says Khun Samrit: “When I first joined the group, the government was promoting high yield varieties of rice and publicizing excessive yields that could have led to overproduction.” However, the group’s rice yield fell short of projections and what had promised to be a profit turned out to be a loss. He continues: “We bought rice from the members at 30 satang lower per kg. than prevailing market prices. We would have made a profit had we

"[W]hen the province held a meeting on integrated farming sponsored by the Green Northeast Development Project, I was invited to speak as a resource person. On hearing about my farm, everyone refused to believe in its practicability. Some said that the model [seemed good] in theory, but [would] require a lot of capital investment. But then I [told them that the only investment I made was my own sweat and labor]..."
shipped the harvest ourselves; unfortunately, we hired trucks from the rice mills and so incurred a loss exceeding 10,000 baht.

"The rice we bought had to be piled to dry in the sun because we had no storage facilities. As a result the quality of the rice suffered, giving the rice traders a chance to bargain us down."  

The group's attempts to sell chemical fertilizer were more successful than the rice venture. The group would purchase fertilizer, on deposit, from the Thai Central Chemical Co., Ltd. Later, fertilizer was bought directly from the Marketing Organization for Farmers (MOP). With the MOP, payment could be made in installments; the group would then distribute the fertilizer to its members, who promptly repaid the group at the end of the harvest. From selling rice and from discounts given by the MOP for early loan repayment, the group earned substantial profits.

After some time the group began to attract attention and won some recognition. It has received several awards for its performance at the provincial level, and for its participation in the Public Warehouse Organization's Paddy Processing Project.

Later the group started to purchase paddy for the rice mills. From commissions it earned almost 200,000 baht. The members were convinced that difficult times were over, and that the committee could already be trusted. Indeed, no abuse of authority had been observed and decision-making was transparent and democratic.

As the group progressively built up capital there was talk of paying dividends to the members. However, the Kaeyai group was cautious and pragmatic. No dividends were disbursed; instead, all profits were saved and reinvested. Indeed, despite accumulated savings of 1.4 M baht the group did not offer loan assistance to its members. All the scrumping paid off, however. The group soon gained financial stability and credibility. Moreover, dividends were eventually paid to the members, at an average of almost 100,000 baht per year.

In 1985 a rice bank was formed, independent of the farmers' group, to help out needy members of the organization. With financial support from the sub-district council, it provided seed for cultivation. The committee collected 2 to 3 bags of rice in return. Paddy was also collected within the community, both from members and non-members. For example, Tord Phar Par Kaew, a form of merit-making practiced by Buddhists, where one offers paddy instead of the traditional robes to monks, was held by students who came to the community under a summer voluntary work camp project.

Following a tour of Petchaboon and Loei provinces, Khun Samrit collaborated with several farmers to establish the Integrated Farming Club in 1984. The methods and techniques adopted by Khun Samrit in the practice of integrated cultivation differed from those of other leading farmers, particularly his technique in raising fish in rice fields.

Samrit relates that after the study tour I began to dig ponds. At first, I did it manually with the help of hired labor. Later, I decided to use a bulldozer. Had I persisted in digging the ponds on my own it would have taken me 10 years to complete the task.

Samrit had earlier attended a training organized by the Appropriate Technology Association in 1984 but didn't get the chance to experiment until after the study tour. Today, his farm serves as a study site for many farmers and development workers. His fields are planted with paddy but have the added feature of small scale aquaculture being done in irrigation canals converted into ponds. Fruit trees, perennials, and vegetables are also planted along the ponds' edge.

At first, however, other farmers were skeptical about Samrit's experiment. "In 1987," he says, "when the province held a meeting on integrated farming sponsored by the Green Northeast Development Project, I was invited to speak as a resource person. On hearing about my farm, everyone refused to believe in its practicability. Some said that the model seemed good in theory, but would require a lot of capital investment. But then I told them that the only investment I made was my own sweat and labor," "Then you build a house," I asked them, "can you construct it overnight? If it's a [matter] of planting only one mango tree, couldn't [you] do that? If you plant one mango tree a day, in a few hundred days, a few hundred mango [trees] will be planted."  

Samrit has continued to modify his farm by visiting people, reading technical materials, and sharing experiences. After studying literature provided by the Santi Asoke Group (a Buddhist group promoting natu-
Sowing the Seeds for Our Future

Natural farming. Samrit experimented with a farming system which dispenses with plowing, weeding, and the use of chemical fertilizers and pesticides.

Accomplishments and Constraints
Green rice farming, which requires less labor and less expenses, has now gained adherents among many farmers. In 1992, 85 families in seven sub-districts in Surin province organized a Natural Agricultural Group (NAG), with Khun Samrit as its chair. All the executive committee members are farmers practicing natural rice farming. The advisory board is made up of a monk, a district agricultural extension agent, a provincial public health officer, and some NGOs. The NAG farms cover an area of about 263 rai, with an expected rice yield this year of 47 tons. So far, the average yield of rice under natural farming in the Northeast region has stood at about 240 kg. per rai, with much lower production costs than conventional H'V cultivation.

Most of the NAG farmers are still in the trial phase, although most of them have been practicing natural farming for a few years. Most experiment with natural farming in a designated part of their rice field, comparing the results with chemical farming. In the last cropping for 1992, NAG members encountered some problems in their farms because of the drought and delays in rainfall. Some of the broadcast rice seedlings dried up and the late rainfall caused a proliferation of weeds, resulting in the low survival rate of rice plants. The root systems of some of the plants were also damaged by insects and rats because the fields could not be flooded in time. Some farmers are still unfamiliar with the broadcast system of planting and make the areas too dense or scattered. Unlike natural farmers elsewhere, many of the Surin NAG members continue to plow their fields before broadcasting. These problems have shaken the confidence of some of the new farmers in the effectiveness of natural farming.

Their difficulties notwithstanding, the Surin NAG remains perhaps the largest natural farming group in Thailand. It has produced almost 50 tons of chemical-free rice. The success in production, however, will be worth little unless efforts are devoted to helping farmers with marketing their produce. Hence, the NAG, NGOs working with the group, and the Surin Farmer Support Project have formed a trading arm to market the produce. They agree to pay a higher price for organic rice (5 baht per kg., compared to 4.2 baht in the local market). They have also contracted a farmer controlled, medium-size rice mill to process the organic rice and pack it into packages of 2 and 5 kg. At the end of January 1993 the group had more than a 40-ton order and expected more in the coming months. Part of the produce is sold in Surin through the hospital network which one of the NAG's advisory board members assisted in linking up with the group. The rest is sold in Bangkok and overseas through alternative trading agencies.

While it might be too early to assess the success of the NAG, the emerging links between production, processing, and marketing of chemical-free food are worth watching. The close integration of these activities, managed by the farmers' group, will assure the long-term viability of the project. If one part of the process fails, it will cause serious drawbacks for other activities. The challenge for the alternative agriculture movement in Thailand is how to forge the vertical integration of cooperative farmers' business activities.
Overview Papers
NEPAL

PROFILE OF AGRICULTURAL SECTOR
- Nepal's extremely rugged topography and widely scattered settlement pattern pose enormous difficulties for building basic infrastructure and providing essential services and education. The terai, the country's primary agricultural resource and originally the most sparsely inhabited region, is now the most densely populated, having attracted large numbers of migrants from the Hills and Mountains due to worsening food deficits in these areas.
- Although agriculture's contribution to Gross Domestic Product (GDP) is declining over time, it still dominates the Nepalese economy. Since the mid-1970s, however, yields of the most important crops have stagnated and growth in food production has, on average, been lower than the rise in population. To reverse these trends, the government will adopt an agricultural strategy that takes adequate account of the major constraints facing agricultural development, i.e. the difficult physical environment, high population pressure, limited productive land resources, and a weak implementation capacity in the public sector.

Sectoral Performance
- Agricultural trade balance is deteriorating steadily over time. In 1974/75, agricultural trade had a surplus of Rs. 251 M but the trade balance was negative at Rs. 1,178 M by 1988-89. A major reason for this is that per capita agricultural production declined more rapidly than per capita domestic consumption of agricultural produce. The area under major crops has been increasing, but overall productivity has remained stagnant. Although terai crop yields have slowly improved as a result of irrigation development and increased availability of inputs, average yields in the Hills have declined due to excessive cultivation of traditional terrace and valley bottom lands and increased dependence on marginal land on the higher slopes.
- Moreover, agricultural production remains largely dependent on the vagaries of the monsoon leading to wide variations in year to year real agricultural growth rates, which have ranged from -4.8% to 10.4% over the period of 1974-75 to 1988-89. The unsatisfactory performance of the agricultural sector has persisted despite the important share given to the sector in the HMG/N's development budget. Price and trade policies are generally favorable or neutral to agricultural producers. The sector has been favoured by subsidies on fertilizer (both price and transport), subsidies, irrigation water charges, and institutional interest rates. The government also intended to provide incentives to foodgrain producers through a price support programme, but this programme was largely ineffective because of lack of funding and the absence of a suitable procurement mechanism. In any case, the open border has made implementation of an independent price policy for tradable goods impractical and has placed severe restrictions on Nepal's opportunities for using price and subsidy incentives.

EMERGING SUSTAINABILITY ISSUES
- Adequate and effective measures have not been initiated to arrest environmental degradation in the hills and mountains; suitable technologies are not being developed for sustainable development in these areas.
- Little effort has been made to bring about changes in land use in the hills to simultaneously encourage environmental protection and improve rural incomes.
- Not much priority has been given to adaptive research on pasture improvement and silvipasture in the hills. There is a dearth of related and relevant information on development models to be followed by farmer groups leasing degraded forest areas.
- Inadequate irrigation facilities have in the main impeded agricultural patterns of production in Nepal. Government-managed irrigation systems have been constructed to serve a net command area of 265,000 ha. out of a total net irrigable area of 1,743,400 ha. but only 65% of this commanded area is being irrigated in summer and 25% in winter. The major causes for poor performance are (1) deficient system design neglecting the tertiary and farm-level irrigation networks, and often relying on vulnerable sources of water, and as a result, a water supply inadequate for the nominal command area, (2) lack of beneficiary involvement in design, construction and operation, and (3) unsatisfactory system management reflecting the preoccupation of management with—and concentration of resources on—construction activities.
- Research on hill crops and livestock has so far received low priority. Although some efforts have been made in recent years to introduce a farming systems perspective, commodity-specific research still dominates which largely ignores the close linkages among crop production, livestock, and forestry. There is a need for shifting emphasis towards outreach programmes that will generate technology suited to diverse locations.
- The major economic constraints restricting diversification and intensification of farming, such as inadequate institutional credit, poor input availability, non-adoption or partial adoption of improved technologies, lack of marketing facilities, tradition-oriented outlook of farmers and an outdated land tenure system have to be dismantled in order to introduce and encourage sustainable agriculture systems among farmers.
- Interdisciplinary and integrated efforts accorded high priority are needed to manage and develop watersheds both in the hilly and plain lands of the entire region to restore the ecological base of the country. Watershed development, scientific land use planning and identification of an

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appropriate farming system for each agro-ecological situation are quite urgent to achieve the objectives of higher food production without disturbing the ecological bases of the entire region. These activities are still lacking in Nepal.

The foregoing was excerpted from the Overview Paper prepared by Shanta Lall Mutmi for the Second Asian Development Forum.
Vietnam

Profile of Agriculture Sector

DOMINANT BIO-PHYSICAL ENDOWMENTS LAND USE

Description of major crops and cropping systems
- 80% of the land area is hilly and mountainous.
- Main export crop: paddy
- Other export crops: rubber, coffee, beans, fresh vegetables
- Other crops grown: fruits, mulberry
- Cropping system: upland, lowland (rained and irrigated); aquaculture

Factors determining land use

To promote agro-ecology, i.e. agriculture based on topographical/ ecological conditions, Vietnam's agricultural scientists have divided the country into seven agro-economic zones: The red river delta (zone 1) and the Mekong delta (zone 7) have superior rice growing capability. The midland and mountainous zone (zone 2), the central highland (zone 5) and the eastern part of the south (zone 6) are suitable for growing perennial trees (such as tea, rubber, coffee), pineapple, and fruit trees. The northern part of the central coastal zone (zone 3) and the central coastal zone (zone 4) are good for growing paddy and subsidiary crops.

National policy
- While paddy cultivation has traditionally occupied most of Vietnam's arable land, the national policy has recently tended towards intensifying the growing of paddy on less land, and diversifying to other crops.
- Programs:
  (1) Programs are underway to orient land use and cropping system according to such factors as population density and local “agro-ecological” conditions. Besides crop diversification in densely populated zones as the Red river delta, the government is trying out "sustainable agriculture models" such as combining paddy growing and shrimp rearing; a pineapple-shrimp model for the coastal zone; and double paddy-one raied crop (e.g. beans) where soil is fertile and fresh water is available.

Together with the United Nations Development Programme (UNDP) and the Food and Agriculture Organization (FAO), the Vietnamese government has launched its Food Security Programme in every zone. Under this program, peasants are encouraged to produce crops/products suited to the agro-ecological conditions in their area.

Economic considerations
- Food production has not been able to keep pace with rapid population growth. From 1980 to 1992, per capita food has increased only slightly every year (from 268 kg. in 1980 to 340 kg. in 1992). Consequently, marginalized sectors of Vietnamese society have done what they can to cope. Upland forests have been cleared to plant crops. Even mangroves in the coastal areas have been destroyed to make way for paddy growing.

AGRICULTURE SECTOR

National development framework
- National policy on sector development: Orient agricultural production to world market requirements/demands, with the rural household as the basic production unit.
- All land still belongs to the state, although holdings have been allocated to the peasants for long-term use.
- Strategy: expansion of cultivable land; agro-ecological land use planning; development of the food industry.

Contribution to the economy
- In 1980, 14.4 M tons of food products were produced. In 1992, production increased 1.66 times to 24 M tons. This makes for an average annual growth rate of 5.5% per annum.
- Since 1989 Vietnam has been exporting 1.4 to 1.9 M tons of rice every year.
- However, agriculture in the country is still considered small scale and low-yielding compared with that of other countries in the Asian region. Slow progress in the agricultural sector has been attributed to the high incidence of natural calamities and a marginal food and livestock industry.
- Of a total 67.7 M population (1991), 46.7M, or 70% earn their livelihood from agricultural production.

Emerging Sustainability Issues

BIOLOGICAL LIMITS

Land degradation
Soil erosion
- Of the 6.99 M ha. currently under cultivation, many areas have been badly eroded due to intensive use of chemical fertilizers, insecticides and weed killers.
- Soils in upland crop areas have grown thinner; 50% of soils in hilly and mountainous areas (which make up 80% of total land area) are degraded; 40% of paddy land is seriously gleyed, and in areas where two to three paddy crops are grown each year, soils have become saline; skeletal eroded soils now affect 500,000 ha. of the land. Some areas are so degraded that they can hardly be reclaimed for cultivation.
- The rate of evaporation has rapidly increased, especially in the dry season.
Deforestation

Table 1. Area under forest

<table>
<thead>
<tr>
<th>Year</th>
<th>Forested Area ('000 ha)</th>
<th>Decrease compared to previous year ('000 ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>13,450</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>9,768</td>
<td>526/year</td>
</tr>
<tr>
<td>1989</td>
<td>9,315</td>
<td>113/year</td>
</tr>
</tbody>
</table>

- Two main causes of deforestation: clearing of forests to expand cropping area; firewood collection.
- 80% of Vietnam’s land area is hilly and mountainous, but of this 13.5M ha. have become bare and idly by 1992. A program to rehabilitate these areas is now one of the first priorities of government.
- A mere 7-9% of total land area (mostly hilly and mountainous) has vegetal cover.

Pesticide use
- Pesticide use: 0.3-0.4 kg./ha./year.
- 70% of total pesticides used goes to paddy growing.
- "Harmful effect of pesticides is due to improper use."
- Pest and disease outbreaks have been occurring more frequently. Brown plant hopper infestation/outbreaks in the Mekong delta, where intensive (two to three crops per year) and monoculture cropping is the norm, have become more frequent and severe.

SOCIAL LIMITS
- Average per capita share of land is a mere 1,032 m², the lowest in the world.
- 70% of the population earn their livelihood from agricultural production.

The foregoing was excerpted from the Overview Paper prepared by Dr. Vu Nang Dung (for the Center for Agricultural Extension Volunteers) for the Second Asian Development Forum.
Regional Papers
The Global Political Economy and Sustainable Agriculture

The Global Political Economy: Promise and Pitfalls
At the end of the Second World War, a bold attempt was made at Brettonwoods to create a new world by recasting the global economy. The economic policies of the 1930s had proved disastrous for countries worldwide. Between 1929 and 1938 world trade was down 65% in value and 25% in volume. Protectionism, competitive devaluation, and deflation had taken their toll and countries were sunk deep in unemployment and its attendant social and political dislocations.

To restructure the global economy, it was decided that “nationalized” policies on trade would have to be replaced by international rules, implemented and enforced by international institutions. The International Monetary Fund (IMF) and the World Bank (WB) thus emerged as the guardians of the new world economic order.

The Brettonwoods system worked fairly well for nearly 25 years, from 1948 to the early ’70s. For over two decades, the industrialized countries maintained steady growth at 5% and higher, enjoying full employment and low inflation, with only a few balance of payments problems. Rising US investments, the strong recovery of exports, and balance of payments surpluses in Europe and Japan further boosted this worldwide steamroller growth. World trade expanded even faster than Gross National Products (GNPs); Europe moved towards a Common Market; and protectionist barriers were kept at a minimum.

Developing countries also benefitted from the Brettonwoods formula. Growth in production and exports helped them maintain high aggregate growth rates. The birth of the development aid concept also coincided with this "propitious" period, and from 1948 to 1952 developing countries were the recipients of largesse in aid of development.

Not long after, the Brettonwoods system, that engine of growth which had propped up developing country economies up until the early ’70s began to sputter then violently change gear. Events in 1973 — not least the Yom Kippur War and the breaking of a major oil supply line — led to an almost tenfold increase in the price of oil. From 1970 to 1974 it had soared from US$1.30 to US$11.00 a barrel. The organization of oil and petroleum exporting countries (OPEC) took immediate advantage of their new control of supply, and the income of Saudi Arabia, Kuwait and other oil-exporting countries rose dramatically.

But OPEC countries could not absorb the huge new-found incomes at home; they had neither the infrastructure nor the expertise. They turned to the Western banking system and invested huge sums of money there. Developing countries were, meanwhile, feeling the effects of a rapid increase in oil prices. They could no longer afford the machinery or fuel for high technology expansion; they began to borrow heavily, not only for oil imports, but also for prestige projects, arms, and food imports. Inevitably, they turned to Western banks for substantial loans.

Awash with petro dollars, the banks were only all too eager to oblige. The low — sometimes negative — albeit floating, interest rates were too good to pass up on, and so it was that the developing countries took their first big plunge into debt. Meanwhile, boom had turned to bust in the overheated economies of the west, and recession quickly set in. The growing US budget deficit caused interest rates to soar from 4% to more than 18% in 1981. Furthermore, world reces-

Excerpted from the paper prepared by the Association of Voluntary Agencies in Rural Development (AVARD) and Mr. Laxmi C. Jain for the Second Asian Development Forum held on 22-26 February 1993 in Cagayan de Oro, Philippines.
tion had reduced the demand for most developing country exports, causing commodity prices to plummet. The debtor countries found themselves trapped. The term “debt trap” which became current in the 1980s is an apt description for what happened in this decade of lost opportunity.

The IMF and WB, guardians of the new economic order, were nowhere on hand to cushion, if not forestall, its collapse. Actually, these institutions and their creators had long since betrayed their true agenda. For instance, an urgent concern in the Brettonwoods talks was to arrest the fall in primary commodity prices. To do this, an international trade organization (ITO), apart from the IMF and the WB, was proposed. The ITO was negotiated and agreed to in Havana, but the Havana charter did not make it past the US Congress. Instead, some of the intended functions of the ITO were transferred to the General Agreement on Trade and Tariffs (GATT), a watered down version of the ITO. The provision for commodity price stabilization was summarily thrown out. The GATT also took out the trade policy chapter from the Havana document, as well as the provisions on employment, development, and restrictive business practices. From the outset, the GATT failed to consider and make provisions for the special problems of developing countries. The Special Fund for aid to developing countries, for instance, was still-born.

All this further weakened the United Nations (UN) in its relations with the First World. What started at Brettonwoods as a quest for a brave new world got derailed into making a rich new world for only a few countries. Instead of unifying the world, it split it into three pieces: the first, second, and third worlds. Political power shifted from the UN to the hands of First World countries.

Subsequent efforts to make up for the failed ITO and to restore command in the UN failed, as evidenced by the UN Conference on Trade and Development (UNCTAD). Though the General System of Preferences (GSP) may be considered more useful to developing countries than trade liberalization policies under the GATT, any gains under the GSP were largely offset by restrictions outside the GATT, such as those under the Multi-Fibre Arrangement (MFA) and the so-called “voluntary” export restraints.

Meanwhile, the IMF-WB never became the central bank of the world, as many countries hoped it might. In fact, its policies and programmes clearly show that it is the hand-maiden of the industrialized First World. It imposes no enforceable obligations on surplus countries but subjects deficit countries to severe surveillance. There is a conspicuous difference in its treatment of surplus and deficit countries, recipient and non-recipient countries. (Lord Keynes’ idea that surplus countries assume responsibility for transferring real resources to deficit countries was rejected outright in negotiations for the IMF’s establishment.)

The IMF-WB and other major financial institutions seem to be indifferent or oblivious to the diversity among its Third World clients, serving a standard horse-mixture for all, on standard terms and for standard timeframes.

“The Bank has been uncasingly propagating a type of development strategy that can be characterized as a transnationalized model of accumulation. Such a strategy has the following distinct features:

- It [lacks] a genuine concern for equity and social justice, sound environment and ecology;
- It focuses on reliance on external markets as the major source of growth, hence encouraging the national economy’s full and unconditional integration into the world capitalist system;
- It does not care for the development of the internal market, lacks a genuine concern for fair income distribution and empowerment of the people, for their initiatives and indigenous knowledge systems.”

These institutions also betray an unmistakable partiality. As institutions they are international in constitution, but they have so far been unable to keep the “big ones” from bullying the weak. Protecting the banks is not an objectionable act, but collaborating with them to twist the arms of the weak and to push them deeper into the debt trap, is.

Asks Mike Fabre: “Who can doubt that the IMF-led strategy for dealing with Third World external debt since 1982 has been a brilliant success?”

“The International Financial System has been saved and strengthened.

No major bank has collapsed as a result of its excessive Third World lending. Most have managed to improve their capital to asset ratios – from 3.3% to 7.8% on average in the United States and from 6.4% to 8.4% in the U.K. – while at the same time increasing their dividends.

[Meanwhile, the] triumph of debt management from the creditors’ standpoint spells disaster in lost development for most of the debtors. For large sections of the populations
of Latin America, living standards have fallen by 15%. And for large sections of the populations of sub-Saharan Africa, the [de- cline] has been 25%.

More and more Third World governments will be forced to write into their laws provisions which [allow] transnational corporations free and unregulated operation in their countries.

At a time when international conditions have become hostile to development, especially in the debtor nations, the bastions of financial power in the industrialized countries as well as the leading financial institutions continue to espouse a neo-liberal ideology which preaches all-out market integration as the secret of sustained growth. A notable demonstration of this thinking is the formulation of the GATT Uruguay Round and its new emphasis on the regulation of the agricultural sector.

Rich vs. Poor, GATT After GATT

Since the start of the GATT, successive rounds of multilateral trade negotiations have, by and large, not covered agricultural products, and agricultural trade remained subject to somewhat looser disciplines than industrial products. This situation has been due primarily to the fact that at the outset a number of countries made it a precondition for their acceptance of the General Agreement that special provisions be included to cover existing agricultural policies, such as the maintenance of quantitative restrictions on imports and the use of production and export subsidies. The result has been that agriculture was essentially taken out of the GATT. The priority of domestic policy objectives in agriculture (national food security, social goals, and the need to counter market instability) has been asserted in order to avoid the application of GATT disciplines to this sector. Uncertainty regarding agricultural trade has further been aggravated by widely differing national norms and regulations related to animal, plant, and human health and safety, which have the effect of protectionist barriers.

In recent years, however, because of mounting budgetary costs to governments of agricultural support policies associated particularly with surplus production of certain products, and because of the ever-increasing friction and disputes regarding trade in agricultural products among the major GATT members (due to intensified competition for export markets through the use of export subsidies), a consensus has developed that some remedial action must be taken.

Hence, in September 1986, for the first time in the long history of trade negotiations in GATT, negotiations on agriculture were given a central role. Moreover, the focus of these negotiations was not limited to traditionally defined trade policies, but encompassed all policies affecting agricultural trade, including domestic agricultural policies.

In April 1989, it was agreed that the objective is to establish a fair and market-oriented agricultural trading system and to provide for substantial progressive reductions in agricultural support and protection sustained over a period to be agreed upon in order to correct and prevent restrictions and distortions in world agricultural markets. In the short-term, in the remaining period of the Uruguay Round negotiations it was agreed that current domestic and export support and protection levels in the agricultural sector are not to be exceeded. In particular, tariff and non-tariff barriers are not to be intensified and not to be extended to additional products, while support prices to producers are not to be raised.

The Development Dimension of Agriculture

Some developing countries have stressed in the negotiations the close linkage between agriculture and the development process in most developing countries. They explained that the special nature and role of agriculture in developing countries is evidenced by the high share of agriculture in the Gross Domestic Product (GDP), high percentage of the population deriving their livelihood from agriculture, predominance of small and uneconomic (sub-sistence) holdings, and high proportion of foodstuffs in the allocation of household budgets. For developing countries with large segments of the population at subsistence level, price fluctuations of agricultural commodities can have extremely serious social and political repercussions. These special features of developing countries necessitate government intervention both to promote agricultural development and to maintain social welfare.

In their view, special and different treatment for developing countries should be incorporated as an integral element in any agreement on agriculture, recognizing the right of developing countries to maintain incentive systems to protect and develop their agricultural sectors. In this context, they pointed out that governmental assistance by developing countries to their agricultural sector does not generate structural surpluses. Accordingly, developing countries' assistance to agriculture should be exempted from reduction commitments in so far as it does not lead to structural surpluses.

On border protection, developing countries emphasized that their commitments should be commensurate with their trade, development and financial needs. In particular, they said they
should have the option to resort to measures consistent with the present provisions of GATT Article XVIII for balance of payments reasons.

The current status of the negotiations on agriculture indicates that the special concerns of developing countries regarding the development dimension of agriculture in their societies have yet to be addressed concretely in the light of the Mid-Term Review decision.

The Heads of State or Government of Non-Aligned Countries, meeting in Jakarta last 1-6 September 1992, declared that the international economic situation has not been conducive to development, particularly of the developing countries:

"Most of the developing countries are no better off today than they were in the 1980s. These countries are still saddled with debilitating debt burdens, strapped for development finance, denied fair access to technology and markets of the developed countries and frustrated by a secular decline in commodity prices. A significant number of developing countries had carried out structural adjustment processes and opened their economies, with a view of putting them in line with the new conditions for investment and world commerce. But there was a lack of reciprocity in the developed countries. While there was a widespread movement for trade liberalisation in the developing countries, the commitment of the developed countries to free trade continued to weaken. Few, if any, steps have been taken by the developed countries to reduce the range of non-tariff barriers and the relatively high tariffs that face a large proportion of the exports of developing countries."

Meanwhile former director-general of UNTAD, Gamani Corea, cites three phenomena worth pinpointing in the present trading situation:

"One is the tendency for protectionist trends to increase rather than to decrease, despite the Uruguay Round and all the rhetoric about trade liberalisation. This constrains the ability of the developing countries to give a stimulus to their development through world trade."

"The second phenomenon is the pathetic collapse of commodity markets. There was some slight indication of recovery early in the second half of the eighties, but these hopes have been dashed. Today, most commodity markets are languishing and the developing countries dependent on the export of commodities for the resources needed for development are suffering grievously. But the interest of most developing countries in the liberalisation of agricultural trade is limited because what is at issue is essentially the liberalisation of trade in temperate products. Most of the agricultural commodities exported from Africa and Asia do not encounter protectionist barriers because they are generally supplied in raw form. There are seldom duties on tea, rubber, coconuts, cocoa, or coffee in unprocessed form in the markets of the North. It is in respect of the later stages of the processing of these products that we begin to encounter barriers. But these are not the subject of the negotiations on agricultural protectionism."

"Writing on the impact of economic liberalization and structural adjustment on the food security situation in India, Utsa Patnaik and Subhasini Ali have this to say, particularly of the Dunkel proposals on agriculture:

"The Dunkel draft on agriculture talks significantly of restrictions on the internal policies not only of the primary products exporting nations but also of those countries which do not export, or of those commodities which are not yet exported. The nature of the proposals make it very clear that from the viewpoint of developing countries like India, there is a familiar dual agenda involved: firstly, the phased removal of all support for the maintenance of internal self-sufficiency in food production and the opening up of the economy to unrestricted imports and exports of primary products; and, secondly, the attempted monopolization of the fruits of research by the scientifically more advanced North (using the genetic materials embodied in the tropical biodiversity which the North itself lacks) through a set of patent laws relating to intellectual property rights."

"There should be no illusion that because the provisions are applicable to all countries, the developing countries can get any positive benefit out of them; equal provisions under unequal situations perpetuate inequality. Thus under the "market access" provisions, India would be first required to replace quantitative restrictions by tariffs, and then lower and finally remove tariffs. (The loss of tariff autonomy has been the first requirement historically imposed by Northern colonisers, whether in the Unequal Treaties that China was obliged to sign after defeat in the Opium Wars or the similar Unequal Treaties Japan had to sign with the leading European nations in 1854. The basic logic in operation then continues to operate today: free trade at a given point in time benefits those who already have a headstart in raising productivity and lowering unit costs on the basis of centuries of previous protectionism of their economies.) It should also be noted that the North can enforce discipline on the South for
violation of GATT but the converse is not true: the South cannot enforce any discipline on the economically more powerful North for their internal measures aimed at circumventing and thus effectively violating the agreements reached in such international fora.

"The provisions regarding reduction of the level of support to farmers cover both crop-specific measures like procurement prices and the prices of productive input in agriculture including fertilizers, pesticides, electricity and diesel. These prices would, if the Dinkel proposals go through, no longer be adjusted by the Government in India on the basis of considerations of maintaining food security or redressing the balance between different crops. They would be decided on the totally irrelevant criterion, from the developmental point of view, of whether the domestic price support calculated as the difference between the domestic and international price, exceeds 10% of output value. The criterion of the acceptability of policies should be whether they are people-friendly, not whether they are ‘market-friendly’, where the ‘market’ is a floating signifier of all measures benefiting the advanced countries. The provision of guaranteed market access’ says that developing countries must import at least 3.5% of domestic output, and tariffs cannot be used to reduce imports below this level. The provision regarding procurement says that government can buy foodgrains only at ‘market rate’ and cannot operate a general public distribution system except for ‘nutritionally targeted’ groups. The last may sound reasonable in theory, but the enormous practical problems of ‘nutritional targeting’ means that a lot of very poor and nutritionally deprived people would get left out."

Patents to Invade Plant Genetic Resources

Attempts to strengthen intellectual property protection globally have been underway for more than a decade. "Potentially more far-ranging in its effect is that intellectual property consideration are included as one of 15 negotiating subjects in the current Uruguay round of the GATT. A negotiating group on Trade Related Aspects of Intellectual Property (TRIPS), including Trade in Counterfeit Goods, was established at the insistence of the US, with support from Japan and the EC and is considered one of the top priorities by the US. By bringing intellectual property protection issues into the GATT discussion, industrialized countries can pressure developing countries to strengthen their intellectual property protections. Although no country would have to sign any final GATT agreement, there may be strong pressures, and clear benefits in other areas, to do so.

"Within these discussions, very little attention has been focused on property protection as related to living organisms. Far from calming fears, this fact underlines the danger that patent protection applicable to living organisms will be adopted on a very wide scale as an almost incidental part of a much larger trade deal. It is very likely that the profound and far-reaching questions raised by this issue will not even be evaluated before the decision is taken."


"Patent legislation was not designed for living organisms. The limits are being set by the courts using laws written before the invention of genetic engineering techniques. The resulting decisions are inconsistent, and the implications of patents on living things are not known. It is clear, however, that there are serious technical and ethical issues that need to be addressed. The repercussions for developing countries may be even more serious than for the developed countries."


"If the GATT negotiations result in the strengthening of intellectual property rights (IPRs) within developing nations, this in turn, might result in both the adoption of plant variety protection systems and the patenting of plants, animals, and the genetic materials that are contained in them. In previous Dialogue reports, the Dialogue group expressed strong concern about the imposition of IPRs for plant genetic resources (PGRs) through the GATT or bilateral trade negotiations. Every country has the right to decide whether and to what extent they adopt IPRs for PGRs. No country should be pressed to do so. To date, the issue has received little attention and discussions by the GATT negotiators. The Dialogue group strongly recommends that the implications of IPRs for PGRs be given adequate discussion and evaluation by the negotiators, with input from national experts and other entities involved with PGR, before any GATT action is taken."

"The impact of IPRs on PGRs must be reviewed locally before IPRs are extended to PGRs. Although IPRs may have important value to stimulate innovation in certain market conditions, when applied to PGRs they could have a negative impact on the farmer-breeders who still actively maintain important genetic diversity as part of their traditional activities. Developing countries choosing to implement a Plant Breeder’s Rights system should retain provisions allowing farmer plantback of protected varieties. This is especially important in developing countries where farmers cannot afford to buy seed every year or are not consistently reached by a seed distribution infrastructure and must therefore rely on seed saved from the previous season."


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Revolutions of the Rich
Scientific Critique of the Green Revolution and the New Agricultural Biotechnologies

The "miracle" seeds of the Green Revolution were spread worldwide because they were "high-yielding". Productivity was their main justification.

But were they indeed inherently superior and "advanced" compared to the indigenous crops and varieties they displaced?

The miracle of the new seeds has most often been communicated through the term "high-yielding varieties". However, contrary to what the term suggests, there is no neutral nor objective measure of "yield" by which cropping systems based on miracle seeds can be shown to be higher yielding than the cropping systems they replace. Even in the most rigorous of scientific disciplines such as physics, there are no neutral observational terms. All terms are theory laden.

The term HYV is no different. Its meaning and measure are determined by the theory and paradigm of the Green Revolution. And this meaning cannot easily and directly be translated for comparison with the agricultural concepts of indigenous farming systems for a number of reasons, primary among which is that the HYV concept is a reductionist one: It decontextualizes the properties of both the native and the new varieties. Through the process of decontextualization, costs and impact are externalized and systemic comparison with alternatives is precluded.

Cropping systems, in general, involve an interaction between soil, water and plant genetic resources. In indigenous agriculture, for example, cropping includes a symbiotic relationship between soil, water, farm animals, and plants. Green Revolution agriculture replaces this integration at the level of the farm with the integration of input such as seeds and chemicals. The seed/chemical package sets up its own interactions with soils and water systems, which are, however, not taken into account in the assessment of yields.

The measurement of yields and productivity in the Green Revolution paradigm is divorced from seeing how the processes of increasing output affect the processes that sustain the condition for agricultural production. While these reductionist categories of yield and productivity allow a higher measurement of yields, they exclude the measurement of the ecological destruction that affects future yields.

The Whole Is the Sum of its Parts
A fallacy which has gone into making the myth of the Green Revolution involves substituting the farming system by a fragment or a part of it, and falsely treating the increase in the part as an increase in the whole.

The HYV concept reduces farming systems to individual crops and parts of crops. As a result, the Green Revolution strategy increases not the total yield, but the yield of one part (the grain) of one crop.

Without counting losses in other crop components and the resulting increases in external input, such a measure is biased to make the new varieties "high yielding" even when at the systems level they may not be.

Traditional farming systems are based on mixed and rotational cropping systems, of cereals, pulses, oilseeds with diverse varieties of each crop, while the Green Revolution package is based on genetically uniform monocultures. No realistic assessments are ever made of the yield of the diverse crop output in the mixed and rotational systems; usually the yield of a single crop like wheat or maize is singled out and compared to yields of the new varieties. But even if the yields of all the crops were included, it would be difficult to convert a measure of pulse into an equivalent measure of HYV wheat, for example, because in the diet and in the ecosystem, they have distinctive functions. The protein value of pulses and the caloric value of cereals are both essential for a balanced diet.
but in different ways; one cannot replace the other.

Despite this, entire crops which have nourished people using very low input have been displaced by Green Revolution agriculture technologies that have pushed rice, wheat, and maize as the only food grains. Among the nutritious crops that are threatened with extinction are the millets. The area under small millets, leaving out finger millet, has declined from 5.6 M ha in 1954-55 to 3.6 M ha. in 1983-84. Today, these hardy and nutritious crops can only be found in pockets in the drylands and mountainous regions, where some groups are working to conserve them.

Considered marginal crops, the millets are invaluable to the people's diet because they give stable yields inspite of environmental stress. In fact, if productivity of foodgrains were to be truly scientifically measured as nutrition produced per unit use of natural resources, then these so-called marginal crops would prove to be the most efficient for addressing hunger.

In the mountain regions near Dehra Dun, peasants grow a rich mixture of Barnaja (Twelve seeds) of which the main crops are mandus (eleusine coracana) and marsha (amaranth). The associate crops are phepura, bhat, lobia, moong, gahat, rajma, jakhia, navrangli, jowar, and urad. This rich mixture is now being replaced by soyabean through agricultural extension programmes. Not only is the soya a mere fraction of the barnaja mixture, it is also centrally processed, and the oilcake is sent to Europe for cattle feed. The cattle in Europe get fattened, while the ecosystems and people of Garwals get impoverished.

The measurement of output is also biased by restricting it to the marketable part of crops. However, in a country like India, crops have traditionally been bred and cultivated to produce not just food for man but fodder for animals, and organic fertilizer for the soils.

According to A.K. Yegna Narayan Alayer, a leading authority on agriculture, “As an important fodder for cattle and in fact as the sole fodder in many tracts, the quantity of straw obtainable per acre is important in this country. Some varieties which are good yielders of grain suffer from the drawback of being low in respect to straw.”

In different regions of India wherever we have measured the total yields of all crops and parts of crops in mixed cultivation and compared it a Green Revolution monoculture, the overall biomass production is higher in traditional mixed farming, and much lower in the Green Revolution package.

Under the Green Revolution, multiple uses of plant biomass seem to have been consciously sacrificed to attain the desired increase in marketable output through non-sustainable consumption of water and fertilizer.

The reproduction of output biomass was probably not considered a serious cost since chemical fertilizers were viewed as a total substitute for organic manure, and mechanisation was viewed as a substitute to animal power.

In effect, the Green Revolution package has become an instrument of dispossession by selectively removing those plants or parts of plants that do not serve the commercial interest but are nonetheless essential for the survival of nature and people. “Improvement” of a selected characteristic in a plant is also a selection against other characteristics which are useful to nature, or for local consumption. Improvement is not a class or gender neutral concept. Improvement of partitioning efficiency is based on the “enhancement of the yield of a desired product at the expense of unwanted plant parts”. The desired product is, however, not the same for rich people and poor people, or rich countries and poor countries, nor is efficiency. On the input side, richer people and richer countries are short of labor and poorer people are short of capital and land. Most agricultural development, however, increases capital input while displacing labor, thus destroying livelihoods. On the output side, which parts of a farming system of a plant will be treated as "unwanted" for the better off may be the wanted part for the poor. The plants or "plant parts" which serve the poor are the ones whose supply is squeezed by the normal priorities of improvement in response to commercial forces.

High-Yielding or High-Response?
The reductionist concept of HYVs also precludes perception of how the Green Revolution package and traditional cropping systems differ in terms of input.

As Dr. Palmer concluded in the United Nations Research Institute for Social Development’s 15 nation study of the impact of seeds, the term “high yielding varieties” is a misnomer, because it implies that the new seeds are high-yielding in and of themselves. The distinguishing feature of the seeds, however, is that they are highly responsive to certain key inputs like such as fertilizers and irrigation. Palmer therefore suggested the term “high-responsive varieties” (HRVs) in place of HYVs. In the absence of additional input of fertilizers and irrigation, the new seeds perform worse than indigenous varieties. With the additional input, the gain in output is insignificant compared to the increase in input.

On the other hand, the poor response of native seeds to chemicals was treated as an intrinsic low yielding characteristic of the seeds.

As a spokesman of the Ford Foundation put it, “The programme revealed the urgent need for improved crop varieties as it was found that the native varieties (the only ones available during these early years) responded very poorly
The term “high yielding varieties” is a misnomer, because it implies that the new seeds are high-yielding in and of themselves...

[However, in] the absence of additional input of fertilizers and irrigation, the new seeds perform worse than indigenous varieties. With the additional input, the gain in output is insignificant compared to the increase in input.

Yegna Narayan Aiyer reports:

The possibility of obtaining phenomenal and almost unbelievably high yields of paddy in India has been established as the result of crop competitions organized by the Central Government and in every state. Thus, even the lowest yield in these competitions has been about 5,300 lb./acre, 6,200 lb./acre in West Bengal, 6,100, 7,950, and 8,258 lb./acre in Thirunelveli, 6,368 and 7,666 lb./ha. in South Arcot, 11,000 lb./acre in Coorg and 12,000 lb./acre in Salem.

The Research Foundation for Science, Technology and Natural Resource Policy has been conserving and evaluating native seeds through a programme called Navdanya. Our evaluations show that many local varieties give higher yields than the Green Revolution varieties.

Mixtures and multiple production from individual crops do not merely produce more; they also provide more jobs. In contrast, chemicals and monocultures displace jobs. When it takes two man days to produce the same food in the US as it takes 400 man days in Asia, US agriculture is seen as being more productive. But it is actually less productive because it uses more energy than it produces. Traditional agriculture uses 1/2 cal. to produce 1 cal. food while industrial agriculture uses 10 cal. to produce 1 cal. The use of these “energy slaves” wastes resources and wastes people whose livelihoods are snatched by a less productive agriculture. When
rural people lose livelihoods in agriculture, they go hungry. A system of agriculture that builds up surpluses of certain commodities while uprooting people from agriculture, creates a crisis of hunger and deprivation.

Hunger is also created by a waste of resources. Green Revolution varieties do not just need more chemicals but also much more water than native varieties. Their productivity in terms of water use is less than half even in the limited context of grain production. Dams are therefore required which displace people; reservoir tubewells turn fertile regions into deserts as water is mined to feed an unproductive agriculture.

The Green Revolution has depleted both people and resources, and sown the seeds of scarcity and hunger. It turned out to be a war against the hungry, not a war against hunger.

**The New Biotechnologies: An Extension of the Green Revolution Logic**

Now that the Green Revolution miracle is fading, new agricultural biotechnology is being offered as a new miracle. An advertisement of Monsanto asks “Will it take a miracle to solve the world’s hunger problems?” then offers the miracle of biotechnology.

However, the new biotechnologies deepen the reductionism that started with the Green Revolution. While the Green Revolution restricted and reduced farming systems to grain components of a few selected crops such as wheat and rice, the new biotechnology further reduced farming systems to individual traits in parts of individual crops. The biological is reduced to chemical.

The Green Revolution was based on a second order reductionism:

- System of crops → one crop → one part of crop (rice grain)

In comparison, the new biotechnologies are based on third order reductionism:

- System of crops → one crop → one part of crop → one property of one part of crop

They further fragmented the farming system into plant characteristics such as the lysine content of corn or the oleic acid content of sunflower. Increasing the yields of a part of a part of part is in no way equal to increasing the yields of a system as a whole. In this fragmented increase, biotechnology shares the ideology of the Green Revolution of excluding crops or crop components as “unwanted” because they are not profitable to industry, even though they are needed by local farm communities.

Like the Green Revolution, new agricultural biotechnologies are a response to the needs of industry rather than the needs of poor peasants. Even though biotechnology is offered as an alternative to chemical intensive farming, it will actually aggravate chemical use. Biotechnology will not reduce the use of farm chemicals but increase them since breeding for pesticide and herbicide resistance is the dominant focus of biotechnology research in agricultural crops. For the seed-chemical multinationals, this makes commercial sense especially in the short run, since it is cheaper to adapt the plant to the chemical than to adapt the chemical to the plant. The cost of developing a new crop variety herbicide exceeds US$40 M. Herbicide and pesticide resistance will also increase the integration of seeds/chemicals and the control of multinational corporations (MNCs) in agriculture. A number of major agro-chemical companies are developing plants with resistance to their brand of herbicides. Soyabeanse have been made resistant to Ciba-Geigy’s Arrazine herbicides, and this has increased annual sales of the herbicide by US$120 M. Research is also being done to develop crop plants resistant to other herbicides such as DuPont’s “Gist” and “Glean”, and Monsanto’s “Round-up” which are lethal to most herbaceous plants and thus cannot be applied directly to crops. The successful development and sale of crop plants resistant to brand name herbicides will result in further economic concentration of the agro-industry market, increasing the market power of transnational companies.

**The Emerging Gene Revolution**

Biotechnology, like the Green Revolution, aims at making agriculture a market for transnational corporations (TNCs). While the Green Revolution focused on chemical input, with public breeding programs aimed at producing seeds that need more chemicals, the biotech focus is on the seed itself as a market. This is why intellectual property right protection is essential for TNCs, since patented seed cannot be reused by farmers. The exclusion of farmers rights at this level was not part of the Green Revolution but is at the heart of the gene revolution.
From Commons to Commodities

The ultimate expression of privatization of biotechnology is the desperate urge by TNCs, operating through the US Trade Representative, World Bank, the General Agreement on Trade and Tariffs (GATT) and WIPO, to have a uniform patents system that allows them to own all life on this planet as their private property.

Patents in the context of agriculture and food production involve ownership over life forms and life processes. Monopoly ownership of life creates an unprecedented crisis for agricultural and food security by transforming biological resources from commons into commodities. It also generates a crisis of values and ends which guide social organization, technological change, and development priorities.

The corporate demand to change a common heritage into a commodity and to treat profits generated through this transformation as a property right will lead to erosion not just at the ethical and cultural level, but also at the economic level for Third World farmers. The Third World farmer has a three-level relationship with the corporations demanding a monopoly of life forms and life processes. Firstly, the farmer is a supplier of germ plasm to TNCs. Secondly, the farmer is a competitor in terms of innovation and rights to genetic resources. Finally, the Third World farmer is a consumer of the technological and industrial products of TNCs. Patent protection displaces the farmer as a competitor, transforms him into a supplier of free raw material, and makes him totally dependent on industrial supplies for vital input like seed. Above all, the frantic cry for patent protection in agriculture is for protection from farmers, who are the original breeders and developers of biological resources in agriculture. However, it is essential only for innovation that brings profits to corporate business. Farmers have carried out innovations over centuries and public institutions have carried out innovations over decades without any property rights or patent protection.

Further, unlike plant breeders rights (PBR), the new utility patents are very broad based, allowing monopoly rights over individual genes and even characteristics. PBR is not an ownership over germplasm in the seeds; it gives only a monopoly right for the selling and marketing of a specific variety. The monopoly rights of industrial patents go much further. They allow for multiple claims that can cover not only whole plants but plant parts and processes as well. So, according to lawyer Anthony Diepenbrock: "You could file for protection of a few varieties of crops, their macroparts (flowers, fruits, seeds, etc.), their micro parts (cells, genes, plasmids, and the like) and whatever novel processes you develop to work with these parts, all using multiple claims.

The first big legal monopoly has been established through the broad based patent for all genetically engineered cotton products granted to Agracetus of Madison, Wisconsin.

Patent protection implies the exclusion of farmers' rights over resources having these genes and characteristics. This will undermine the very foundation of agriculture in India. For example, a patent has recently been granted to Sungena for a sunflower variety with very high oleic acid content. The claim allowed was for the characteristic itself (i.e. high oleic acid), and not just the genes producing the characteristic. Sungena has notified others involved in sunflower breeding that the development of any variety high in oleic acid will be considered an infringement.

In the 1989 judgment in Ex parte Hibberd, Molecular Genetics scientist Kenneth Hibberd and his co-inventors were granted patents on tissue culture seed and whole plant of a corn line selected from tissue culture. The Hibberd application included over 260 separate claims, which give the Molecular Genetics scientists the right to exclude others from the use of all 260 aspects. While apparently Hibberd provides a new legal context for corporate competition, the most profound impact will be felt in the competition between farmers and the seed industry. As Kloppenberg has indicated, with Hibberd, a judicial framework is now in place that may allow the seed industry to realize one of its longest held and most cherished goals: to force all farmers into dependence on the companies every year. Industrial patents allow the right to use the product, not to make it. Since seed makes itself, a strong utility patent for seed implies that a farmer purchasing seed would have the right to use (to grow) the seed, but not the right to make seed (to save and replant). The farmer who saves and replants seed of a patented plant variety will be in violation of the law.

These processes of outlawing the original custodians of plant genetic resources will happen slowly. But patent protection is central to transnational agricultural interest, which makes quite clear that it is their monopoly on markets rather than the development of farmers of the South that is at issue.

Biosafety

A major difference between the Green Revolution and genetic engineering is the higher ecological and health risks associated with the new biotechnologies. There is, however, a consistent attempt to diffuse this difference between conventional breeding and genetic engineering.

Thus, the National Research Council Framework of Field Testing Genetically Modified Organisms (GMOs) states:

Crops modified by molecular and cellular methods should pose risks no different from those modified by classical genetic methods for similar traits. As the molecular methods are more specific, users of these methods will be more certain about the traits they introduce into the plants.

Similarly, the World Bank International Service for National Agricultural Research report on Biosafety states that the "regulatory review should focus on the characteristics and identified risks of the biotechnology product, not the process by which it is created".

The lesson the Green Revolution should have taught us is that processes do determine the ecological impact of agricultural technologies. Since the new biotechnologies create evolutionary shortcuts and break evolutionary boundaries in the agricultural scale of time, it would be wrong to assume that the new biotechnologies are the same as conventional breeding of the Green Revolution, and both are the same as
A judicial framework is now in place that may allow the seed industry to realize one of its longest held and most cherished goals: to force all farmers into dependence on the companies every year.

Farmer based breeding strategies in terms of ecological risks.

Strategies for genetic engineering for herbicide resistance which are destroying useful species of plants can also end up creating superweeds. There is an intimate relationship between weeds and crops, especially in the tropics where weedy and cultivated varieties have genetically interacted over centuries and hybridized freely to produce new varieties. Genes for herbicide tolerance, pest resistance, stress tolerance that genetic engineers are striving to introduce into crop plants may be transferred to neighboring weeds as a result of naturally occurring gene transfers. (Wheele and McNally, 1988, p. 172)

The hazards of gene transfer to wild relatives are higher in the Third World, because these regions are home to most of the world's biodiversity. As the MNC guide to "Field Testing Genetically Modified Organisms" states:

Temperate North America, especially the United States, includes the home ranges for very few crops, as U.S. Agriculture is based largely on crops of foreign origin. This paucity of crops derived from North-American sources means there will be relatively few opportunities for hybridization between crops and wild relatives in the U.S. The incidence of hybridization between genetically modified crops and wild relatives can be expected to be lower here than in Asia Minor, Southeast Asia, the Indian subcontinent, and South America, and greater care may be needed in the introduction of genetically modified crops in those regions.

The native biodiversity richness of the Third World thus increases the environmental risks of introducing genetically modified species. While the Third World derives very few benefits from the new technologies, it pays high costs for their development. Higher environmental costs have already been referred to. The Third World will also bear disproportionately economic costs for biotechnology development.

Article 19.5 of the Biodiversity Convention has recommended a protocol on biosafety. This is an issue that sustainable agriculture activists and practitioners need to explore and work on, especially in the light of the U.S.'s refusal to sign the biodiversity convention and to block all initiatives to develop a biotechnology and biosafety protocol to the convention.

As I have argued in my book on the Green Revolution the U.S. government considers the transnationals' lack of patent protection as unfair trading practice. It does not consider the destruction of regulation for public safety and environmental protection as unethical and unfair for the citizens of the Third World. The U.S. wants to limit and localize laws for the protection of people and universalize laws for the protection of profits. The people of India want the reverse—a universalization of the safety regulations protecting people's right to life and livelihood and a localization of laws relating to intellectual property and private profits.

All life is precious. It is equally precious to the rich and the poor, white and black, men and women. Universalization of the protection of life is an ecological imperative. On the other hand, private property and private profits are culturally and socio-economically legitimized constructs holding only for some groups. They do not hold for all societies and all cultures. Laws for the protection of private property rights, especially as related to life forms, cannot and should not be imposed globally. They need to be restrained.

Double standards also exist in the shift from private gain to social responsibility for environmental costs. When the patenting of life is at issue, arguments from "novelty" are used. Novelty requires that the subject matter of a patent be new, that it be the result of an inventive step, and not something existing in nature. On the other hand, when it comes to legislative safeguards, the argument shifts to "similarity", to establishing that biotechnology products and genetically engineered organisms differ little from parent organisms.

To have one law for environmental responsibility and another for proprietary rights and profits is an expression of double standards. Double standards are ethically unjustified and illegitimate, especially when they deal with life itself. However, double standards are consistent with and necessary for the defence of private property rights. It is these double standards which allow the life and livelihoods of the people and the planet to be sacrificed for the protection of profits.

Design for Dispensability

The capital intensive inputs of the Green Revolution became a mechanism for displacement of small peasants in Asia. However, the displacement of peasants was not an explicit objective of the Green Revolution.

Displacement of Third World producers is an explicit objective of the new biotechnologies. One of the areas of application of the new biotechnologies is the substitution of biological products and agricultural commodities supplied by the Third World. This will have severe impact on the national economy and employment. Plant tissue culture offers increased possibilities of substituting agricultural specialties with industrially produced inputs. Many high value plant-derived products used for
pharmaceuticals, dyes, flowerings and fragrances are vulnerable to displacement as a result of current research.

The impact of successful production of substitutes will be felt most by countries which have, in an earlier international division of labour, been made dependent upon exports of the natural products concerned.

These technological shifts imply economic losses for the Third World. The case of vanilla is a good example of the potential of biotechnology to displace or eliminate traditional botanical exports, and to transfer agricultural production from the South to labs and factories in the industrialised world. 98% of vanilla supplies have come from four island nations: Madagascar, Reunion, the Comoros and Indonesia; with Madagascar accounting for 75% of the supply, with 70,000 small farmers involved in production.

The substitution of vanilla production will seriously affect the livelihoods of the producers, and the economics of the countries which depend on vanilla exports for foreign exchange earnings.

Pyrethrum is another plant that will be displaced with biotechnology substitures. Pyrethrum flowers are cultivated by thousands of farmers in East Africa, India and Central America. In East Africa, alone, 195,000 farmers cultivate the flowers for export as a source of a natural pesticide called pyrethines. Pyrethines are now to be biotechnologically manufactured by AgriDyne Technologies, Inc. raising a genetically engineered microbe containing a plant gene from the chrysanthemum flower.

Biotechnology based cocoa butter substitutes are also being developed. This will displace the small-scale producers of Africa, as well as tribal women of countries like India, who have been employed in the collection of sal-seed from which earlier substitutes to cocoa were made.

These are some examples of developments being made to deliberately substitute supplies that currently come from the Third World. Sugar from sugar-cane is another major product; it was first intro-
duced into the Third World as a cash crop, and is now being displaced by new plant derived sweetness such as thaumatin.

Calgene has bioengineered a canola oil rich in Pauric acid that can be produced in U.S. to replace the $300 M tropical oils imported annually to make detergents, soaps and shampoos. So far the major commercial sources of leuric acid have been coconut and palm oils. In the Philippines, 700,000 small farmers depend on coconut cultivation. Kerala State in India derives its name from coconut. Coconut is mostly grown in the homesteads and small farms in Kerala. There are about 2.5 M holdings, with an estimated total of 170 M coconut palms. About 10 M people in India depend directly or indirectly on coconut culture and industry for their livelihoods.

Single cell protein culture for cattle feeds can have major impact on exports of soybeans and cassava from the Third World. Imports of animal feed in the European Community amount to 50 M tons per year. In Northeast Thailand, 700,000 farm families earn their livelihood through cassava cultivation. In Thailand as a whole, an estimated 5 to 6 M people depend on the production, processing and maeleting of cassava. Suddenly substitution of cassava imports for cattle feed can disrupt these millions of lives.

The impact of successful production of substitutes will be felt most by countries which have, in an earlier international division of labour, been made dependent upon exports of the natural products concerned. This will particularly be destructive to economies in Africa which depend entirely on single crops for most of their export earnings. While historically Africa has grown crops needed for Europe, in the emerging world order based on new biotechnologies, Africa will become dispensable as the North finds biotech substitutes for African crops.

When factories close in the North, compensation is given to workers. When crops first introduced by global agribusiness are displaced by technologies developed by agribusiness, the small peasant and agricultural worker are left to fend for themselves, as are their countries. The South needs to develop an agenda for compensation which is based on a notion of historical justice and which can be tabled before the full deployment of the new biotechnologies which are being developed to reduce dependence on the Third World. (Hobelink, 1991, Fowler et al., 1988)

Third World agriculture will not just be affected by substitution of export products by the concentration of agricultural production in the hands of a few multinationals. As Roger Salquist of Calgene has stated:

"The major thing that's going to happen in terms of biotechnology in agriculture, I believe, the single most startling thing is a strategic restructuring of the industry to vertical integration...Historically the processors of products from agriculture have purchased them on the commodity markets. What's going to happen with biotechnology is that you're creating proprietary products out of commodities."

This creation of proprietary products in agriculture is the biggest threat to the Third World where agriculture is still a major source of livelihoods.

Movements need to prepare to
spond to this restructuring if our farmers and our societies are to survive.

Intellectual property rights and patents are in the area of life forms, and living processes are an enclosure of the intellectual commons. Unlike mechanical artifacts, innovation and knowledge related to utilization of living resources has been a highly evolved tradition in all cultures. Innovation for which patents are being given often only build on prior knowledge and use of biological systems for food and medicine. Instead of stimulating research and knowledge generation, patents stifle creativity and communication. In the Third World where privatization is not the norm, most knowledge generation takes place in the public domain, either in the formal or the informal sector. The formal sector includes all public sector research institutions, the informal sector includes communities which maintain and generate knowledge related to biodiversity. IPRs as formulated in GATT will undermine knowledge generation and creativity in both these sectors.

IPRs, particularly in the form that they are being imposed worldwide through GATT, are a restricting category at three levels:

The first restriction is the shift from common rights to private rights. As the preamble of the TRIPs agreement states, intellectual property rights are recognized only as private rights. This excludes all kinds of knowledge, ideas, and innovations that take place in the "intellectual commons" — in villages among farmers, in forests among tribals and even in universities among scientists. TRIPs is therefore a mechanism for the privatization of the intellectual commons, and a de-intellectualisation of civil society, so that the mind becomes a corporate monopoly.

The second restriction of intellectual property rights is that they are recognized only when knowledge and innovation generates profits, not when it meets social needs. Article 27.1 of TRIPs refers to the condition that to be recognized as an IPR, innovation has to be capable of industrial application. This immediately excludes all sectors that produce and innovate outside the industrial mode of organization of production. Profits and capital accumulation through industrialization are recognized as the only ends to which creativity should be put. The social good is no longer recognized. TRIPs, therefore, becomes a mechanism for industrialization of all aspects of life under corporate control, and a "de-industrialisation" of production in the small scale and in the informal sectors of society.

The most significant restriction posed by TRIPs is achieved by the prefix "trade related." Since most innovation in the public domain is for domestic, local, and public use, not for international trade, and only multinational corporations (MNCs) innovate for the sole purpose of increasing their share in global markets and international trade, TRIPs in MTO will only be an enforcement of the rights of MNCs to monopolize all production — all distribution and all profits at the cost of all citizens, and small producers worldwide, and Third World countries.

Both the informal as well as the formal sectors are affected negatively through the intellectual enclosures en-gendered by patents. The informal sector innovation is destroyed by non-recognition. For example when ethno botanists transfer knowledge from traditional healers to pharmaceutical firms, and when genetic resource conservationists transfer knowledge from farmers to seed corporations, the IPRs go to the corporations, not to the farmers and healers. Over time, this appropriation of knowledge kills the original socio-cultural context of knowledge generation.

The formal sector of innovation and knowledge is destroyed by restricting free access to scientific knowledge due to patent restrictions. The broad patents on scientific processes, and on life forms block free exchange of ideas and materials, which have in the first place been taken freely from the informal sector in the biodiversity rich Third World. Patents thus block a free flow of knowledge from the formal sector of the North to the formal sector of the South while maintaining a free flow from the informal sector of the South to the formal sector of the North. Patents also block a free flow of knowledge between the formal and informal sectors of the South since research is systematically privatized and transnationalized, breaking the vital umbilical cord of links between science and society which is the only sustainable source for the nurturance of creativity.

Biodiversity, and knowledge about its utilization, therefore, gets steadily eroded in the public domain, causing both ecological and economic impoverishment in the Third World.

The imperative of biodiversity conservation, and its just and sustainable utilization demands other principles for ownership of living resources and knowledge about them than the limited and impoverishing structures of patents and intellectual property rights being pushed on the Third World through GATT.

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158 THE SECOND ASIAN DEVELOPMENT FORUM
The Seven Dimensions of Sustainable Agriculture

The Green Revolution paradigm has collapsed. There is global recognition that intensification of agricultural production with the use of pesticides, chemical fertilizers, and related technologies is a dead-end approach. This recognition is widespread in academic, scientific, and policy circles.

Many are calling for a more sustainable agriculture. At the recent UN Conference on Environment and Development (UNCED), Chapter 14 of Agenda 21 called for a more sustainable approach to agriculture and rural development. Over 140 countries around the world signed their approval of Agenda 21, the global agenda for the 21st Century.

The Consultative Group on International Agricultural Research (CGIAR), a network of international agricultural research centers (IARCs) launched the Green Revolution. CGIAR too is calling for more sustainable forms of agriculture. CGIAR includes Asian IARCs like the International Rice Research Institute (IRRI), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and International Irrigation Management Institute (IIMI).

The problem, however, is that different proponents understand and use the term differently. Green Revolution proponents continue their advocacy of high-tech, chemical agriculture yet they now feel comfortable in joining the sustainable agriculture bandwagon. Even within the NGO community, the term "sustainable agriculture" evokes different understandings, different visions, different operational concepts. There is a need to articulate a far broader and comprehensive understanding of sustainability. Otherwise, "wolves" will appear in "sheep's clothing" and the destruction of nature and communities will continue unabated under the banner of "sustainable agriculture".

To be sustainable, agricultural systems must have the following attributes:

Based on an Integrative and Holistic Science

Despite relatively advanced thinking by NGOs and government representatives, two thresholds were not crossed at UNCED: holistic science and total human development.

These thresholds presented apparently difficult frontiers not only for the participants at UNCED and the parallel international forum of NGOs and social movements. They also present almost unattainable new beginnings for many NGOs in Asia, not to mention the situation with government officials, academics, and other key sectors of society.

The Achilles Heel of NGOs: Fixation on Social Factors

The first threshold concerns the very nature of science itself and how it "understands" nature. This limitation is exemplified clearly by the glaring lack of understanding for the blindness of conventional science among both technocrats and, perhaps surprisingly to many, among NGOs themselves.

Technocrats, especially those from capitalist economies, predictably propose technological solutions to complex social problems. If the problem is feeding an increasing population, the answer is more science and technology along the lines of the Green Revolution. We can call this attitude "technological fixation".

Surprisingly, many NGOs display a similar naivete regarding scientific and technological issues. The perfect example is the attitude of NGOs towards biotechnology. A significant number of NGOs are mesmerized by the promises of biotechnology. Like their technocratic opposites, NGOs are anxious about the potential environmental "side effects" of biotechnology. However, they sincerely believe that these environmental and other side effects of biotechnology will be minimized or done away with if NGOs and people's organizations (POs) control the technology. So they talk about community-based or village-level environmentally sound use of biotechnology.

By redirecting the goals of biotechnology research to make it fit the people's agenda, NGOs mistakenly believe that
explained by material and physical causes and processes. We can all call this reductionist stance as covert, metaphysical, or materialist reductionism. Or, for short, we can simply call this type of reductionism as materialism.

Environmental Impacts of Reductionist Science and Technology: The Example of Pesticides
The heavy, almost addictive use of pesticides in modern agriculture provides a classic example of how a one-sided science and its techno-projection can create large-scale environmental destruction.

Today, from many quarters, we hear the cry to “modernize” agriculture. The proponents of hi-tech agriculture say we need to provide more food, on less land, for an ever increasing population on the way to becoming a Newly Industrialized Country or NIC-hood.

To modernize agriculture inevitably means, for hi-tech proponents, to use insecticides. Since insects attack plants, they say that farmers need insecticides. And, during the scientific research process which creates insecticides, only very narrow questions are asked, those ones that deal directly with the insecticide.

Scientists, for example, do not ask what the impact of chemical fertilizers may be on the emergence of insect pests. Nor do they inquire as to how monoculture, the practice of growing genetically similar crops in large areas, may induce insect pests to proliferate. Nor is there any interest to explore how irrigation, distancing, and plant architecture may actually encourage the multiplication of insect pests.

Instead, scientists prefer to slice up reality and “reduce” their “scientific” questions to simply asking how to kill insects. No one asks how insect pests arise in the first place and how insecticides impact other forms of life in addition to the insects.

Such a procedure erringly produces “side effects”. Apologists for insecticides say such effects are “unintended”. But the very scientific reductionism and the technological fix orientation guarantees that “side effects” will manifest.

The brown planthopper in rice is a prominent example of a devastating insect pest created by the proper use of reductionist science as embodied in the insecticide techno-fix.

During its early days until recently, the International Rice Research Institute (IRRI) and the University of the Philippines at Los Banos (UPLB) scientists recommended massive spraying of insecticides to control the stemborer. The insecticides partially killed off the stemborer which today remain a serious pest in rice.

But the insecticides wiped out most of the beneficial organisms in the farm. These beneficials, among others, controlled the population of the brown planthopper. When the beneficials were killed by the insecticides, the brown planthopper rapidly increased in number and has become one of the most serious pests in rice.

Throughout the years since insecticides enabled it to become a major pest, brown planthoppers have eaten their way through hundreds of thousands of hectares of rice fields. Their attacks have resulted in the loss of millions of metric

The “agenda”, the “inner logic” of conventional science is to fragment complex natural and social reality, make a caricature out of it, and ultimately bind it to a mere illusory material and physical existence. Science relies on its alter-ego, Technology, to turn this nightmare vision into reality. And Science and Technology will do this no matter who is in “control”, no matter what social structure exists.
tons of rice worth hundreds of millions of dollars.

Alternatives to Reductionist and Materialist Science

It is abundantly clear that science is a major dimension of sustainability. But what type of science?

Horizontal Integration or Holism: Artificial Systems

The "easiest" alternative to reductionist science is to integrate the fragments that have fallen apart during the period of analysis or reduction.

In the case of plant resistance, for example, instead of relying solely on gene transfer to confer resistance to pests, scientists could look at how the genetic endowment of crops together with cultural practices, environmental conditions, the state of soil's fertility, and other factors all contribute to the final pest resistance "capacity" in plants.

Similarly, integration can also occur across disciplines. In the regulation of biotechnology, the government can require applicants to pass through several "screens": a science screen, an ecological screen, an alternative screen, a social screen, an ethical screen, an economic screen, an effectiveness screen.

The science screen will look at the validity of the scientific assumptions of the proposed biotech application. The ecological screen will require an assessment of the environmental and ecological impacts of the biotech product. The alternatives screen will ensure that society need not be unnecessarily exposed to biotech products if much safer and proven alternatives are already existing. If the alternative screen exists, for example, biotech bovine growth hormone (Bgh) will fail the test because rotational grazing outperforms Bgh as a way to economically increase milk production. The social screen will require proponents to project the social impact of their biotech product. And so on with the ethical, economic, and effectiveness screens.

At this stage the integration can be termed "horizontal". All reality, biophysical or social, is still presumed to be physical and material. Science is not able to arise above its materialist epistem.

Thus "horizontal integration or holism" in science can only reach a certain point. Integrative or holistic science on the "horizontal level" still cannot fully grasp reality even if a "systems" perspective is employed. If from the beginning non-physical realities are excluded by definition, then how can one integrate back the banished element when it is dogmatically assumed not to be there.

A simple exercise or "thought-experiment" as Einstein would put it shows this inability quite directly.

Take a man-made object, say a chair, and try to think about its function or concept. Without difficulty, one easily arrives at the "concept" of the chair to give support for sitting.

For the next part of the experiment, try to take an object from nature. A stone, or a leaf, or a fruit will do. Then try to think about the "concept" or "function" of the stone. Without adequate training, one notices that one's thinking cannot penetrate into the "concept" or "idea" (larger integration of concepts) of the natural object.

If one cannot know the "ideas" of nature, how can one "know" that after fragmenting nature, as is normally done with present day scientific approaches, one has put nature back in the proper way. How does one know that an authentic whole has been cognized? How does one avoid constructing an "artificial whole"?

Who truly knows the "idea" of nature? The beginning of an answer has emerged in our age. But to appreciate it, we need to look at a second level of integration, the "vertical".

Vertical Integration or Holism: The Second Scientific Revolution

The materialist worldview, which limits the full success of horizontal integrative or holistic science, can be termed the First Scientific Revolution. This is a scientific heritage which goes back 400 years to the birth of modern science.

[Today] the scientific community itself is recognizing that the inorganic, fragmented approach to Nature is one-sided and inadequate for the study of living phenomena.

Scientists are also abandoning the illusion that the human spirit can be quantitatively captured in a chemical resort.

A Second Scientific Revolution has emerged, i.e.:

• Quantum physicists have now produced experimental evidence that reality is non-local. Substances and processes of the universe are intimately connected with each other even though they are physically tens of millions of miles apart from each other.

• Biologists have evidence that non-physical, "morphogenetic fields", not DNA, govern the emergence of form in living organisms. The past forms of organisms transmit their influences to other organisms in the present and the future by means which transcend normal space-time conditions.

The Second Scientific Revolution rescues "qualities" that have been methodologically stigmatized as "subjective" and "unreal" by the First Scientific Revolution. It is now scientifically respectable to consider life, consciousness, and spirit as causative agents in their own right and different from material processes although these "qualities" interact with matter. The Second Scientific Revolution sees nature as alive and ensouled. It also recognizes mind and spirit as operative in the universe.

The Second Scientific Revolution thus provides the "vertical" dimension necessary for a "deeper", more comprehensive, and truer integration of science fragmented and reduced by a dogmatic, materialist frame of mind.

As more research is undertaken on the new science, farmers can truly move in the direction of working in partnership with nature.

However, vertical holism is not enough. The "vertical" holistic scientist still remains in the same level of consciousness that created materialistic science. The difference is that the new scientists are truer to the ideals of science. The true scientist does not redefine his reality. He is continually open to new possibilities even if this would shatter old assumptions, including possibly long years of indoctrination in the practice of materialistic science. Because of this open attitude, the "vertical" scientist obtains new intuitions and insights about nature, human beings and societies.

The new science merely points to the existence of supersensible forces, processes, and realities. It does not yet expe-
rience these supersensible, non-material realities directly.

Hence, while the new science points the way to the answer, it is still unable to solve the problem: Who can truly know the ideas of Nature?

Radical Integration or Holism: The Science of Anthroposophy

A very important element is not observed in the normal practice of science, whether of the materialist, horizontal, or vertical variety. Scientists in all three traditions do not observe or notice their own cognitive activity while doing science.

What happens if scientists take notice and strengthen the cognitive faculties of the human being? He will discover that his own thinking activity becomes an organ for "seeing" the Ideas of Nature.

Rudolf Steiner, founder of a new science of the spirit, posits that human consciousness can be strengthened to achieve a true spiritual knowledge of nature with the same clarity of understanding that one achieves with mathematics. He briefly describes what the experience would be like.

"In that case, we would not just see a re-created version of the outer world or an abstract mathematical picture, but we would have something formed in an entirely different manner. We would have gained something with the full character of reality, but obtained similarly to the way we obtain mathematical pictures. We would then have before us spiritually a reality that shines out toward us in the same way that the outer sense-perceptible world streams toward us... [T]hrough strengthening our mathematical capacity, we would attain an inner experience, like the mathematical experience but with the character of spiritual reality."

Anthroposophy constitutes a Third Scientific Revolution. The Second Scientific Revolution points to the existence of spirit and spiritual processes, even if sometimes vague or inadequate manner. Anthroposophy actually investigates the laws and processes of non-material and spiritual forces through the disciplined schooling of superconscious cognitive faculties slumbering in every human being.

Anthroposophy can thus be called "radical holism" because no facet of reality remains outside its reach. The mighty "Ideas" of Nature are transparent before it. In addition, its radical holism can embrace materialism as well as horizontal and vertical holism in their true meaning and elevate them to the fullness of reality.

Anthroposophy is not a theoretical fantasy land. Its practicality lies in the fact that it is able to fully penetrate the "Idea" of nature, human beings, and society. This practicality is clearly visible in tremendous help Anthroposophy has provided worldwide as expressed in the renewal of agriculture, education, organizational development, medicine, architecture, art, mathematics, banking, rehabilitation of drug victims, and a range of other disciplines including science itself.

Supportive of the Development of Human Potentials

The discussion on holistic science already points to the next dimension of sustainability: human development, that other threshold that was not crossed at UNCED. For who does the science? Human beings, of course. But what if our leading scientists are only able to come up to a certain level of understanding? Worse, what if our leading scientists fall prey to the allure of profit? Then our scientists help trigger a chain of events, with many sectors of society participating, that ultimately label as environmental and social problems.

Thus, to be sustainable, especially socially, agriculture must conform with the realities of human nature. Science must not debase human nature. Human beings must not be reduced to mere quantities that can figure in the statistical calculations of scientists and policymakers. Otherwise, social chaos will ensue.

The Three-fold Nature of the Human Being

It is obvious and self-evident that the human being has a physical body... It is so dominant a reality that modern science has become fixated with it.

The presence of the physical body is so strong in the West that scientists have all but forgotten about an element of human nature that is able to interiorize what is external to it. Behavioral psychology, for example, is actually a science that systematically excludes its subject matter, the "psyche". Everything is reduced to external stimulus and response...

Yet our inner experience tells us we have a "psyche" or in older language, a "soul". Our psyche or soul is the arena of subjective feelings and thoughts. It is the "location" of often impulsive associational thoughts and feelings.

We also recognize the existence of the "spirit", [without which] we would be continually caught up in the unpredictable, inner dynamics of the soul. Without our "spirit" we lose all possibility to cognize and know the world intentionally and consciously. We cannot even formulate a scientific theory or hypothesis. We would not be able to learn anything new. Our reality is always finished, littered with past thoughts and feelings which have their own inner logic.

Active thinking is the bridge between spirit and soul... We would never, for instance, be able to practice mathematics if we did not have this active thinking. We easily recall from our school experience that to solve a mathematical formula one cannot be distracted by associational thoughts and feelings. Even when we have experienced a death in the family and our souls are heavily burdened, we have a force in us that temporarily suspends the mourning so that we solve the mathematical problem. At that instant when this "force" is active, the Presence of our Witness or Spirit and its active thinking is making itself tangible.

But active thinking can be imprisoned by the energies of associational feeling and thought. This can be experienced directly when we have a feeling or thought "fixation" and we cannot free ourselves from it...

The different types of "fixations"—technological, social, economic, etc.—all have their roots in the fettered area of the soul, in the arena of past, finished thoughts and feelings. And these fixations, we have seen, impose a one-sided picture on the world and create a dis-
What "paradigm" is for the scientist, "ideology" is for the NGO worker. Both need to transcend "fixed" ideas which are not capable of addressing and working with new realities. This constitutes the immediate human development task for the NGO activist.

Scientists: To Break Free from Compelling Paradigms

To engage in the various types of holistic science, scientists need to bother their capacities to practice holistic science.

Most university education and research institutions do not bother to examine that most important scientific tool: human consciousness. They invest in very sophisticated instrumentation and equipment which merely extends, albeit erratically, the perceptual reach of the human mind. But these machines can never replace the cognitive activity which finds meaning in the thousands of isolated facts and data and which directs the direction and process of experimentation itself.

To develop their full scientific potential, scientists initially need to recognize and take hold of their biases and blinders (paradigms). For a start they should recognize that they have access to at least two types of thinking: one that fragments and the other which integrates. They should recognize that their scientific training imparted to them certain biases and predispositions in the way they view and work with the world, that is, they have been educated to fragment and "reduce" the world.

And should these "fixed" ideas be compelling, they should find the strength within to rise up to the real ideals of the scientific method: To find truth no matter what the personal costs may be. When they are able to initially do this, then they start the process of scientific empowerment by, at the very least, integrating horizontally the different facts and discoveries in their own and related fields.

NGO Activists: To Transcend Ideologies

If there is something vaguely familiar for NGOs in the discussion concerning human development in the scientific community, there is a reason. What "paradigm" is for the scientist, "ideology" is for the NGO worker. Both need to transcend "fixed" ideas which are not capable of addressing and working with new realities. This constitutes the immediate human development task for the NGO activist.

Most people who work with NGOs have a "socialist" temperament. That is, they reach out and care for others. They want to help out. They want to improve the well-being of the impoverished and get rid of oppressing conditions. This compassion is what lives in their inner world.

Now it so happens that they encounter a worldview, an ideology which, for where they were, gave them a "handle" on the social world. It served to clarify certain patterns in society which "reproduced" the inequity and destruction they so much want to stop.

Now many of these social paradigms or ideologies were conceived at the height of the materialism of the 19th century. As with any thought-structure that is frozen and contracted when it comes into contact with materialism, many of these ideologies emulated and imported the concept of natural law into their systems of thought. And this is where the problem began.

With the collapse of ideological materialism in our time, ideologies are now vulnerable to many radical revisions.

Again, an important thing to note. There are variant theories of human consciousness coming from many schools of thought. However, they converge in their assumption that once somebody belongs to a specific class or culture (corporate, bureaucratic, etc.) that person will articulate the values of that class or culture.

There are variant theories of human consciousness coming from many schools of thought. However, they converge in their assumption that once somebody belongs to a specific class or culture (corporate, bureaucratic, etc.) that person will articulate the values of that class or culture.

Now, if all the contents of human consciousness were purely of an associational nature, they would be right on target. In fact in situations where human consciousness is de facto associational, people do not transcend their class or "cultural" consciousness. In this situation, these ideologies would hold true.

However, not all of human consciousness is determined by associational thoughts and feelings. There is a presence in the depths of human consciousness that enable individuals to break free, at any time, at any place, from all past thoughts, from all determined contents of consciousness, including class consciousness, that have been instilled into them since birth.

This reality gives advocacy work in sustainable agriculture a certain complexity. Many ideologies contain a "them" versus "us" analysis. How do we now respond if some of the "them" starts thinking in a way that brings the "them" closer to the "us"?

NGO activists can recall vivid instances in the past when they were able to break free from the expectations of their friends, the wishes of their parents, and other external sources of intention to pursue their own goals and objectives. The very phenomenon of the emergence of the NGO testifies to the reality that many of us have transcended our own social conditioning.

Now, if this can happen to NGO activists, why should it not happen again to them now that new realities are telling them that they most probably need to outgrow the constraints of their ideol-
ogy? If NGOs can do this, why cannot this liberation happen to other individuals who are embedded in government bureaucracies, corporations, scientific centers, and other institutions viewed by NGOs to be inimical to their interests? Is freedom from structures of past consciousness, ideologies, paradigms a special province reserved only for NGOs?

There is an interesting global phenomenon which lends support to what we have been discussing. This phenomenon is occurring among the ranks of those who are often perceived by NGOs to be their enemies. This global phenomenon is feared most by tyrants in institutions. Because there is no permanent response to it. Not even violence will stop it. It will keep on surfacing in one form or another. This global phenomenon is a symptom of what we have been discussing.

This phenomenon is aptly called "whistleblowing" and the individual who does it, a "whistleblower". Individuals in institutions expose the shortcomings and even machinations within the very institutions they have worked with for a long time. They behave in a manner analogous to a referee in a basketball game who blows his whistle if a player is violating the rules.

Whistleblowers do their protest in many forms. Some are dramatic and effective as in some known examples where senior officials, after working with a business or government institution for a long time, resign in front of national TV, attacking the hypocrisy of the dominant power within the institution. Others are very quiet, releasing damaging information to the press.

If one takes seriously the freedom of human consciousness, then this will have influence not only with the way we deal with our ideologies. The reality and unpredictability of human freedom also raises profound questions regarding the strategies or methods that NGOs use to obtain societal change.

NGOs know that many changes need to happen with regard to government policies, business practices, and scientific research to make all these supportive of sustainable agriculture. But is this to be achieved through confrontation or through critical dialogue?

The answer to this question constitutes another area of human development particularly relevant for NGO activists.

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[What do we do with the whistleblowers?] Do we ignore them even though they have goals and aspirations very close to ours? Or do we empower them so that they receive reinforcement in what they are doing and given them a stronger hand against their superiors inside the institution?

By entering into a dialogue, we can actually increase the propensity for "whistleblowing" within the target social structure or institution. Paradoxically, by apparently decreasing the "outward" contradiction between "us" and "them" through dialogue, we actually increase the "internal" contradiction within the social structure. This "internal" contradiction would be more difficult for the social structure to deal with just as its is more difficult for us to deal with our own contradictions.

Critical dialogue is not just a nice idea. It works in practice. It is impactful proven to be powerful.

In the Philippines, the Sustainable Agriculture Coalition (SAC) and the Center for Alternative Development Initiatives (CADI) have managed to turn around the pesticide establishment. SAC and CADI systematically identified the whistleblowers working inside various institutions that had a role to play in the fate of pesticides in Philippine agriculture. These institutions included the Fertilizer and Pesticide Authority (FPA), the pesticide regulatory agency, the Department of Agriculture, the national and international agricultural science communities, media and even United Nations agencies connected with food and agriculture. In the past and even today, all these institutions have been responsible for the promotion of pesticides in agriculture.

SAC and CADI worked with the various whistleblowers with the conscious intent to ban the more hazardous pesticides from use in Philippine agriculture. The strategy of critical dialogue worked. SAC and CADI convinced the FPA to ban four widely used pesticides, a ban which affected 60% of the pesticide market in the Philippines.

In summary, NGO activists can hasten the emergence of new policies and infrastructures supportive of sustainable agriculture in two ways. First they engage in an inner struggle to free themselves from whatever ideology which is proving to be limited and constricitive. Part of

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The International Rice Research Institute (IRRI) is hard pressed to create a cropping system where five economic species are growing at the same time. The Hanunoos of Mindoro, however, are acquainted with 430 crops and think nothing of multiple cropping as many as 40 species at the same time throughout the year.
this freeing from ideological clutter consists in recognizing that other people, in “hostile camps,” can also free themselves from their own ideological blinders. This would open the possibility for a critical dialogue to take place, a dialogue that can result important support for sustainable agriculture.

People’s Empowerment, A New Meaning
To truly empower farmers and, hence, advance their human development means to empower from within. We do not mean by this statement to belittle the important efforts that are being done to empower farmers by giving them access to resources (land, credit, and so on), technologies, and allowing them to participate in the political processes which determine their fate.

Empowering from within means to complement the more external forms of empowerment. It means to awaken the spiritual faculties that slumber within the farmer.

This can be partially achieved by evocative forms of training. Trainors often transfer knowledge and information as if one were putting water into an empty cup. Instead the trainor can draw out the wisdom that is within the vast range of agricultural experience that the farmer has by asking questions and truly be open to what the farmer has to say. By asking questions the trainor encourages “active thinking” to awaken within the inner life of farmers.

Active thinking is especially essential in ecological agriculture. No two agricultural sites are the same. One can never totally transfer proven eco-farming techniques in one site to another site. Ecological agriculture is site-specific. The more vulnerable a crop is, like vegetables, the more one has to arrive at an understanding of the underlying principles so that one can freely create new approaches. This is impossible if active thinking is not active within the consciousness of the farmer.

Consumers and Proper Nutrition
Human development is, of course, not just concerned with the non-physical dimension of the human being. It is also important to see to it that our physical bodies receive the proper nutrition they deserve.

It is against this backdrop that efforts of influential institutions like the Asian Development Bank (ADB) and the Food and Agriculture Organization (FAO) of the United Nations need to be criticized.

Food policy specialists and agricultural scientists generally give priority to calories sufficiency which they consider to be a more basic food requirement than protein sufficiency. However, the model does not consider “regulating” foods including vitamins and minerals... Regulating foods do not need to be present in large quantities like calories. Nevertheless they play a very important role in the physiology and health of human beings.

The neglect of “regulating” foods in so-called “sustainable carrying capacity” policy studies can lead to serious national health problems. Illusory sustainable population carrying capacity figures will be generated but may not actually be supported. Meanwhile, national productivity will be impaired because of increasing health problems among a large segment of the country’s population.

Culturally Sensitive
When the Green Revolution, conceived in the North, was implemented in the South, it displaced existing indigenous systems of agriculture and food consumption and nutrition patterns. Technological displacement ultimately resulted in cultural displacement. Indigenous cultural communities and peasants felt out of place and were actually displaced by the advancing mechanization and chemicalization of agriculture. They lost their spiritual center because reductionist science belittled their knowledge as “primitive,” a creation of “illiterates” and therefore valueless.

This spiritual displacement ultimately resulted in massive dehumanization and alienation as peasants and indigenous peoples passively awaited the next wave of reductionist technological innovations that further marginalized their knowledge and their culture.

Agriculture is clearly unsustainable under such set of circumstances. For agriculture to be sustainable, it must be more sensitive to the culture and knowledge of people it is supposed to serve. Cultural sensitivity primarily concerns itself with the incorporation of the set of values and knowledge specific to a culture.

Indigenous Knowledge Systems
Tribal communities are the cultural bearers of what has come to be increasingly known and respected in the academic and development communities as Indigenous Knowledge Systems (IKS). The tremendous scope of their tacit science and knowledge can be seen from the following examples.

The International Rice Research Institute (IRRI) is hard pressed to create a cropping system where five economic species are growing at the same time. The Hamunoo of Mindoro, however, are acquainted with 450 crops and think nothing of multiple cropping as many as 40 species at the same time throughout the year. Their multitiered cropping system is so finely attuned to ecological factors that some consider these complex farming systems as one of the modern wonders of the world.

These indigenous multitiered cropping systems can achieve, at minimal costs, yields that are far ahead of intensive rice farming. The geographer Clawson did a study of a multitiered cropping system in Quezon City, Philippines. He discovered that the peasant farmer harvested an equivalent of more than 49 tons of edible biomass per hectare. This is far superior to the 18-20 tons of irrigated rice yields per hectare assuming three crops of rice per year at top yields. Equally significant, the polyculture yield was achieved under RAINFEDE conditions!

Oral Consciousness
The consciousness which produced indigenous knowledge and culture is quite different from the consciousness that produced the Green Revolution.

During the later part of this century, cultural and descriptive linguistics, al-
Sowing the Seeds for our Future

lied with new directions in literary studies, presented very strong research results pointing to the existence of an "oral" mentality. "Orality", or verbal expression, is used to distinguish it from "illiteracy", a consciousness expressing itself in the written word. The Green Revolution is the product of a "literate" consciousness.

This epoch making discovery is currently altering the way scientists and development agencies are dealing with "oral" cultures.

Oral consciousness, at minimum, has the following properties.

Concrete Thinking
Oral consciousness does not think in abstractions. The concept "tree" is an abstraction of concrete mangoes, avocados, citrus, and so on. Oral language often does not have abstract categories so common in literate language.

Thus, geometric figures are understood only in terms of the concrete. A "circle" can be a plate or a ball. A striking example from ancient Greek literature is the word "blameless". In the oral consciousness of ancient Greeks, the word "blameless" meant "beautiful-in-the-way-a-warrior-ready-to-fight-is-beautiful." 12

Tacit, Holistic Logic
Oral cultures have a tacit logic which does not operate according to the rules of formal logic inaugurated by Aristotle. This tacit logic also operates practically. It is always associated with the concrete.

In one study, an "illiterate" was asked: "In the Far North, where there is snow, all bears are white. Novaya Zembla is in the Far North and there is always snow there. What color are the bears?" The typical response was: 'I don't know. I've never seen a white bear. I've never seen any others... Each locality has its own animal.' 13

Although this logic does not operate formally, it is nevertheless rational. In addition, it is able to integrate large amounts of experiences into a living whole, giving oral cultures a very interesting form of indigenous science.

Minimal Self-Conception
Oral cultures have difficult understanding or articulating the concept of "self", so common in "literate" cultures as to be obsessive. Ong cites the studies of a Russian scientist, Luria, to give a graphic example of the nature of oral consciousness.

"A 38-year-old man, illiterate, from a mountain pasture camp was asked, 'What sort of person are you, what's your character like, what are your good qualities and shortcomings? How would you describe yourself?' 'I came here from Uch-Kurgan, I was very poor, and now I'm married and have children'. 'Are you satisfied with yourself or would you like to be different?' 'It would be good if I had a little more land and could sow some wheat,' Externals command attention. 'And what are your shortcomings? This year I sowed one pound of wheat, and we're gradually fixing the shortcomings. More external situations. 'Well, people are different-calm, hot-tempered, or sometimes their memory is poor. What do you think of yourself?' 'We behave well-if we were bad people, no one would respect us'. Self-evaluation modulated into group evaluation ('we') and then handled in terms of expected reactions from others.' 14 (Emphasis added. References in quoted text omitted.)

Intelligence as Concrete Ability
Given the propensity of oral consciousness for the concrete, it is hardly surprising that oral cultures have a very different understanding of "intelligence". For them, "intelligence" is not what is revealed by written examinations. "Intelligence" has to be seen in operation. "Intelligence" has to be actual.

For example, Puluwat Islanders in the South Pacific have very high regard for their navigators. The skills required to navigate the treacherous high and sometimes violent seas are complex and demanding. These navigators are not called "intelligent". But they are regarded as such because they are good navigators. "Oral folk assess intelligence not as extrapolated from contrived textbook quizzes but as situated in operational contexts." 15

Homeostatic
Because oral consciousness always has reference to concrete situations in the present, the culture it creates is conservative of the present, of what works here and now. In other words, it is homeostatic, tending to preserve the status quo.

This can be clearly seen in the usage of words. The meaning of words is connected directly to what exists out there at the present moment.

"The oral mind is uninterested in definitions. Words acquire their meanings only from their always consistent actual habitat, which is not, as in a dictionary, simply other words, but includes also gestures, vocal inflections, facial expression and the entire human existential丝 in which the real, spoken word always occurs. Word meanings come continuously out of the present, though past meanings of course have shaped the present meaning in many and varied ways, no longer recognized." 16
Pitfalls to Avoid in Training Peasants and Indigenous Farmers

The most fundamental problem [with conventional training approaches] is the failure of trainees to understand and appreciate the "oral consciousness" of peasants and indigenous farmers... Hence training designs are often not appropriate to the training needs of the recipients. Abstract concepts are often not concretized through a continued linkage of the concepts with actual sense experience. The meaning of vitamin C, for example, can be discussed in terms of actual demonstrable manifestations of vitamin C deficiency.

Failure to understand the workings of oral consciousness inevitably leads to little or no understanding and appreciation of the indigenous knowledge. As a consequence, many trainings are hardly linked, if at all, to the indigenous science of the trainees.

Trainings also often suffer many of the deficiencies that accompany a mass training approach without regard or consideration for the quality and effectiveness of the training process. The duration of the training session is often too short for an effective understanding of the intricacies of ecological cropping systems and their management throughout the varied seasons of the year.

As a result, only those aspects of the technology which could be physically seen and copied. The hidden relationships that express themselves through time, sequences that require an abstract cognitive act to be perceived inwardly, e.g., changing, season-attuned cropping patterns, are rarely implemented, if at all.

Trainors also often do not adequately monitor the progress of their trainees after the course. Thus, trainors are not certain whether those they have trained are properly applying what they learned.

Conventional training approaches are often not evocative, even during the practical portion in the field. The pedagogy is often not designed for innovation nor for a critical understanding of the principles underlying sustainable agriculture. The result? Trainees have a difficult time implementing and adapting sustainable agriculture methods to the unique ecology and socio-economic constraints of their site.

A related serious drawback can also be created by a non-evocative training methodology. The trainors, without their awareness, can foster a culture of dependency among the trainees. Thus, even the trainees may be surprised that their trainees have become too dependent on their opinion and advise, not only during the training but also during implementation. Then, therefore, the trainors do not find the time to see them, the trainees lose interest and can even become skeptical of sustainable agriculture practices.

Trainors often do not have their own ecological farm. Thus these trainors find it very difficult to impart all the nuances of sustainable agriculture practices to their trainees.

Training Appropriate to Oral Consciousness

The training process should be attuned to the oral consciousness of peasants and indigenous farmers. In practical terms, this means that the most suitable and effective training approach will be apprenticeships which are culturally appropriate.

An apprenticeship approach can competently address the following requirements for an effective training:

- site-specificity;
- adequate duration;
- appropriate to oral culture;
- linkage with indigenous practices;
- avoids "blind" leading the "blind" dilemma;
- quality;
- less travel time for technicians;
- ultimately leads to independent use of technology; and
- cost effectiveness.

An apprenticeship approach implies the existence of model SA farms strategically located throughout the target area. If none exists, these model farms should first be established to iron out the site-specific nuances of ecological methods. At least mistakes done will not be at the expense of the peasant or indigenous farmer. The model SA farms could then serve as field classrooms for continuous instruction among peasants and indig-}

Founded in the Use of Appropriate Technologies

As we have seen, technology is not neutral. Technology embodies a worldview and a set of values.

The worldview of reductionist science animates Green Revolution technologies. Green Revolution believes that nature can be cut up and one will arrive at true knowledge of nature. But, as we have seen, this is not the case. And such misreading of nature results in detrimental "side effects".

Among other values that Green Revolution technology promotes is de facto centralism and disempowerment and dismantling of rural communities.

The way the technology was conceived...
assumed that peasants and indigenous farmers are "illiterate". So they must learn from the dazzling products of PhDs based in some central experiment station. In this manner knowledge became centralized and homogenized. And this centralized power has since become a form of domination over farmers.

For what in reality does a pesticide technology tell farmers in the countryside? The pesticide industry in effect tells farmers that their existing indigenous knowledge is not enough to manage pests. (Although the promoters of pesticides do not say that Green Revolution technologies induced, to a large extent, the problem of pests in agriculture.) Pesticide apologists also debunk the fact that local arthropod communities most often are enough to take care of pest problems. So farmers are made to rely on external inputs, pesticides in this case.

What does this do to the farmer? First, the farmer starts believing he is illiterate and that he has nothing of value to contribute to agriculture. This is the start of disempowering farmers. If farmers start disbelieving in themselves, in their own capacities, then this also marks the beginning of cultural collapse. Farmers start unconsciously boycotting indigenous modes of knowledge and technology adaptation. They start listening to the radio, to what the pesticide advertisers and their suppliant scientist supporters have to say. In due time, key decisions about pest management are no longer made by farmers themselves. These decisions are now externally driven. This form of disempowerment stunts human development.

The Founding Motives of IRRI

The International Rice Research Institute (IRRI) was established in 1960 with large monies coming from the Rockefeller and Ford Foundations. The objective was to breed new rice varieties along the lines of successful work with wheat in Mexico. The whole justification for IRRI’s existence was to increase the yields of rice so as to counteract the specter of an ever-increasing number of hungry people. The technology that IRRI used to realize its objectives was basically a confluence of U.S., European, and Japanese experiences in the intensification of wet rice agriculture.

The agricultural revolution in the United States was machine-driven until 1930. The US had large tracts of land so agricultural production initially was increased in an extensive manner. The agricultural revolution in Europe was driven by chemicals. Chemical fertilizers were used to increase agricultural production in an intensive manner. Japan had its own agricultural revolution that, in rice, was mainly concerned with the control of water. The Japanese developed intricate methods of irrigation and drainage that boosted crop yields.

In the 1930s, the U.S. pioneered a new era in agriculture. It introduced the hybrid corn. This new agricultural revolution combined the use of machinery, chemical fertilizers, irrigation and genetics to achieve astounding increases in corn yields. In the 1940s, chemical pesticides were introduced into this package of technologies.

Thus the seed became the converging point and the integrator of all the important driving forces that created the agricultural revolution of the past.

IRRI scientists knew this. The so-called high yielding varieties (HYVs) were going to be their beachhead into the agricultural cultures of Asia.

From its birth, however, other than purely altruistic motives were already at work. The people behind IRRI also conceived of this rice cultivation as a means to alter the cooperative nature of agrarian societies towards "aggressive interest in the marketplace". The Green Revolution was designed to modernize Asian societies so that, among others, they can become a market for goods from industrialized countries, especially US farm tools, fertilizers, pesticides, irrigation and other agricultural equipment.

Participatory Technology Development

There is a potent way to avoid alien values from entering surreptitiously into a culture or society. This way is to engage the farmer, from the very beginning, in the evolution of new technologies.

The following steps are meant to be illustrative rather than definitive. And it applies to the local setting.

1. Involve farmers in a process of participatory technology development.
Factoring in the “oral consciousness” of peasants and indigenous farmers, among the fundamental issues to explore in this cooperative process are the following.

- How do farmers understand what “literacy” consciousness refers to as “problems of chemical farming”? Is there common ground between the two sets of experiences? If so, how can the “literate” idea of “problems of chemical farming” or their present farming be understood in terms of the “oral consciousness” of farmers. This is a real issue. In our experience different farmers have different understandings of the cluster of concepts surrounding the idea of “chemical farming”.

- For farmers what “technology” results in “problems of chemical farming”? Care should be exercised in assuming that words used by “literate” NGOs or other promoters convey the same meaning in the culture. In Ifugao, for example, when asked to give an example of a “vegetable”, one mother replied: “Rice”!

In this interchange, NGO and other workers should be open if the farmers refer to other factors, unknown to them, as constituting part of the “problems of chemical agriculture”. This information will be vital in designing determinants of sustainable agriculture appropriate in the specific cultural context.

- For farmers what are some methods of farming which can “cure” “chemical farming”. How do farmers view their current practices in terms their potential to provide “alternatives” to “chemical farming”.

2. With the aid of the farmers themselves, proponents can start redesigning the farming system to be more appropriate to the socio-economic conditions of the villagers. Proponents, together with the villagers, could also inventory existing domesticated and wild plant species with potential for green manuring practices. This would be obligatory if the participatory technology development process identified a form of green manuring as one of the traditional practices being done.

3. Proponents may like to supplement the above participatory technology development process by exploring, together with farmers, the best existing cropping patterns and practices in their site and other ecologically similar food growing areas as indicators of what can be done.

4. If uncertainties and questions remain, and most likely they will, then proponents can co-design and conduct “studies” comparing preferred practices with proposed innovations. Farmer conducted experiments are ideal because these will enhance research “capacity building” within farmers. Proponents must also be open to existing indigenous research protocols, if any.

5. Proponents may establish a research station if it is clear that farmers can only do so much experimentation on their fields but are wanting to learn about other technological possibilities that can improve their livelihood. Its design should conform to what ultimately comes out as the preferred technological options as indicated by farmers themselves.

It is expected that these procedures will result in a technology truly “appropriate” for the farmers. Participatory technology development will also mean faster adaptation by farmers since the latter would have been involved in all the key decisions from the very beginning.

Participatory technology development approaches will also have a favorable impact on training efforts. Training will be easier since trainer and trainee will be speaking the same language and will be drawing out examples from the same cultural and ecological context.

Hence, one speaks of participatory technology development. Farmers have their own set of experiences, many of which have been found to be valid since the set of constraints farmers operate within. Modern developments in ecological agriculture and peasant practices can be combined fruitfully for greater yields and sustainability.

Participatory technology development also results in empowerment and is thus intimately connected with the development of human potential. Project initiators who engage farmers in a process of constructive dialogue and participatory analysis support the gradual unfolding of self-reliant individuals, an important step in human development.

Balancing Indigenous Knowledge and Holistic Science

During the process of participatory technology development, it is possible that the proponents’ concept of “appropriateness” may clash with farmers’ concept of “appropriateness”. This is a very delicate situation and requires great presence of mind.

In general, if the difference lies in the cultural dimensions of the technology, hardly anything can be done. For example, supporters of non-cruelty to animals (or humane agriculture), a part of the sustainable agriculture movement, will be horrified if they see the way some of the indigenous farmers beat up chickens during rituals connected with farming. This is a cultural difference which is difficult to reconcile if at all. Personal decisions will have to be made.

However, if the difference lies in the ecological basis of certain farming practices, there is a possibility of having a dialogue.

The case of botanical pesticides is a good example. Some farmers use botanical pesticides to kill off pests. As we shall see in the “Ecological Soundness” section, there are scientific findings and experiences which indicate that these practices may not be sustainable.

So how should the differing judgments be processed?

In the world of the “concrete” (oral consciousness), often the best way to agree to try out together the two different approaches to pest management. One will be based on the use of botanical pesticides. The other will be based on community ecology where internal biological processes, via beneficials, and increasing plant vitality, via appropriate soil fertility measure, are relied upon.

After the results are obtained, concrete comparisons can be made. Sometimes, the results are so obvious in favor of community ecology that the farmer already concedes even before the experiment is over.
However, proponents of holistic science should be open to the reality that there can be botanical pesticides that are pest-specific and only slightly interferes with the food chain that allows beneficials to continue their existence.

Central Research Stations and Appropriate Technology

Given all the nuances and intricacies involved with participatory technology development, the temptation is great for central research stations to develop technology without meaningful input from the farmers. At most, they try to ask a few token farmers about their knowledge. But if they do not believe in it, they will simply ignore it. At worst, they pretend to think that they have incoroporated farmers’ perspectives in their research and technology development process but have not. And even worse, they generate technologies that are meaningful only for the input industries and for already affluent farmers.

There are several barriers that have to be overcome if these central experiment stations are to sources of appropriate technology for sustainable agriculture.
1. They should genuinely believe in the concept of peoples’ empowerment and participation as is being discussed in this paper.
2. This means that they have to respect indigenous knowledge and peoples’ viewpoints in their research activities. They should be willing to learn from farmers and incorporate these learnings in their research protocols.
3. They should re-structure their research procedure and the decision-making protocols so that farmers will truly be able to participate at every stage of the research process.
4. They should support the establishment of truly autonomous decentralized research efforts starting with farmers themselves. A significant proportion of funds are re-directed to support this people-based, decentralized research network.
5. Research should be geared towards solving scientific problems that cannot be addressed at the level of the farmers’ fields.

Ecologically Sound

Although "ecological soundness" is one of the more universally accepted dimension of sustainable agriculture, actual implementation of the idea is fraught with wrong turns and pitfalls. Even those sympathetic to holistic science end up, in practice, with reductionist technologies.

Botanical Pesticides versus Community Ecology

In this area of sustainable agriculture, NGOs are as guilty of the technological fix mentality as the pesticide industry people. As substitutes for chemical pesticides, NGOs often rely heavily on the use of botanical pesticides in their sustainable agriculture projects.

However, botanical pesticides can suffer a number of ecological drawbacks very similar to the impacts of toxic pesticides.

First, insects can develop resistance to botanical insecticides in a manner similar to chemical pesticides.

Second, the botanical pesticide can harm beneficial insects and spiders which abound in the farmers’ fields. Like chemical pesticides, this can result in pest resurgence and the creation of new pests.

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The real alternative to chemical pesticides is ecological pest management, specifically community ecology. This new approach examines all the components of the agro-ecosystem and assesses their impact on pest populations.

An integral part of this new approach is to make sure that plants are properly fed and so do not easily succumb to disease or insect attack. This approach relies heavily on encouraging the proliferation of beneficials in the farm. Beneficials almost always keep pest populations under control.

Whose Integrated Pest Management (IPM)?

With the increasing call for sustainable agriculture and the increased rate of banning of pesticides all over the world, the pesticide industry is all of a sudden interested in integrated pest management (IPM). With their IPM program, they claim that they are also supporters of sustainable agriculture.

A good example of this was the attempt by Hoechst to convince the public that their product can be used in IPM... This is a story worth telling because our survey of pesticides will be forced to resort to similar tactics now that the world has awakened to the danger of pesticides.

In hearings last January 1992, Hoechst tried to convince government regulatory officials in the Philippines that their product was safe enough to be used in IPM. They showed slides, figures, and tables indicating that certain beneficial insects in coffee and cotton were not being harmed by endosulfan.

Unfortunately, during the question and answer session, Hoechst’s concept of IPM proved highly impractical and questionable in its fundamental design and actual operation in the farmers’ field.

For a start, Hoechst was not even aware that pesticides can alter plant physiology in such a manner as to make plants more attractive to pests. They have not studied whether endosulfan has this negative physiological impact or not.

Unfortunately, there is a good possibility that endosulfan may actually increase the pest burden of plants. After the hearing, Dr. Kern explained to the Center for Alternative Development Initiatives (CADI) that endosulfan interferes with the protein metabolism of insects, especially their capacity to combine amino acids into protein. The interference with protein synthesis is exactly the prominent theory of how pesticides can physiologically make plants more attractive to pests.

CADI also noted several inconsistencies in the Hoechst presentation.

Why were mass releases of beneficial insects still necessary? If endosulfan does not harm a certain species of beneficial insect used to control coffee borer, why then does Hoechst need to engage in mass rearing of the insects and continue to release them in the field?

There is another additional problem. Let us grant that endosulfan does not harm that beneficial species which they are releasing to the field. Why then are the beneficial insects not able to survive in the field?
Are the beneficial insects starving because endosulfan has killed the pests which serve as food for the beneficial insect? (This concern is especially critical in this case because the beneficial insect being used is a wasp. And wasps, being parasites, are more specialized in their feeding habits than predators including spiders. They are more vulnerable to loss of their regular insect diet.) Or are the beneficial insects being counter-controlled by hyperparasites?

In either case, the Hoechst IPM approach would be a failure.

As it turned out, upon probing by CADI, Hoechst admitted that it was not sure whether the beneficial insects were controlling the harmful pests or not! And at most, their combined biological and chemical control approach was only achieving a 30% success rate in small-scale trials, not enough, by their own standards, to commercialize the technology.

There is an even deeper problem with Hoechst’s IPM approach. Hoechst has designed its IPM strategy so that endosulfan has to be there to play the role of predators that endosulfan has killed and eradicated from the agroecosystem! Of course, Hoechst did not state it as bluntly as this. But, in reality, this description is scientifically accurate.

CADI questioned the relevance of Hoechst’s IPM approach to rice farming. CADI pointed to the complex web of predator/parasite/fungus-prey relationships that are known to exist in rice agroecosystems in the Philippines and other Asian countries. No less than 1,000 beneficial species are known to exist in rice paddies throughout Asia. In the Philippines, more than 700 animal species per hectare are found in intensified rice production areas.

Granted that endosulfan does not harm a few beneficial insects in coffee and cotton, what about the hundreds of other beneficial insects found in rice ecosystem? Natural biological control of pests requires the simultaneous activity of the predator-parasite complex. Why should one beneficial insect be preferred over another?

CADI’s concerns about the importance of maintaining a complex of beneficial insects, not just favor one or two, were shared by Dr. Jose Medina and the late Dr. Edwin Medina of the University of the Philippines at Los Banos. Dr. Medina requested Hoechst to do more studies on the impact of endosulfan on other beneficial insects. Hoechst should conduct detailed studies on other crops, especially rice, and not just focus on a few biological control agents of coffee, cotton, and beans.

If Hoechst conducts such a study, they will probably encounter an important information contained in IRRI’s 1980 Annual Report. IRRI scientists conducted relative toxicity studies of some insecticides to brown planthopper, green leafhopper, and whitebacked planthopper. Endosulfan was one of the insecticides investigated.

IRRI’s data showed that endosulfan is more toxic to wolf spiders (Lycosa pseudoannulata) than on brown planthoppers and green leafhoppers. The study also showed that endosulfan was of similar toxicity to the wolf spider as chlorpyrifos, an insecticide banned on rice in Indonesia.

This study supports the concern of CADI, Dr. Magallona, and determine the toxicity of endosulfan to beneficial insects. Hoechst should not use limited results obtained in a totally different ecosystem and cross-apply it to rice by implication.

Dr. Magallona offered an observation which captures the central weakness of Hoechst’s IPM approach: “This (referring to CADI’s concern) is the problem with pesticide use. There are numerous indigenous beneficial insects in rice ecosystems. If the farmer has a window of opportunity to spray to avoid damage to some predators, the farmer may be killing other beneficial insects. Therefore, if Hoechst has already decided that its endosulfan must be part of its IPM program, then Hoechst has to decide which population of beneficial insects to put at risk.”

Hoechst said they would be open to supporting a better approach if it were available. But further questioning by CADI showed that they were not really sincere.

CADI asked Hoechst: “If you were given a pest management strategy that did not require the use of any pesticides, would you support it? We know of cases in Mindanao where hundreds of hectares of healthy coffee are being grown without using a single drop of pesticides. We also know of instances of commercial pesticide-free rice farming.”

Hoechst did not answer CADI directly. Instead it showed through the overhead projector a 1984 article which stated that chemical control must accompany biological control! In effect, Hoechst said, “No”, and on the basis of studies done more than 50 years ago.

In Effect, what Hoechst wants is to design an IPM system which will continuously require the intervention of endosulfan so that they can continue earning money from their product. Hoechst’s concern for profits creates a paradigm which ignores widespread university and farmer-level data showing ample evidence that productive, pesticide-free agroecosystems are practical and economically viable.

Ultimately, Hoechst is not really interested in a full blown IPM program, one that will really reduce the use of pesticides to the barest levels, if at all. Per its own calculations, Hoechst spends only 2% of its R&D (research and development) budget to explore a version of IPM that is scientifically dubious to start with.

So it is very clear that the pesticide industry will attempt to use IPM as a Trojan horse to make their questionable products more acceptable to farmers and the general public.

So it is very clear that the pesticide industry will attempt to use IPM as a Trojan horse to make their questionable products more acceptable to farmers and the general public.

Green Manuring versus Soil Fertility Management

The use of legumes as green manures is another area where even supporters of sustainable agriculture easily slip back into a reductionist perspective.

Green manures have their limits. One will have difficulty in controlling the quality of humic substances through green manuring. However, in a compost pile, one can direct the process of de-
Establishing the sacred nature of the human being provides solid ground for the cry of "social justice and equity". If human beings were merely higher animals, there would be no philosophical nor scientific basis to be concerned about justice and equity.

At minimum, a fertile soil must have the following:
- Adequate capacity to supply plant nutrients;
- Sufficient air;
- Enough water;
- Proper acidity;
- Enough warmth;
- Quality organic matter;
- Diverse and vital microbial population and activity.

Integrated Nutrient Management: What Gets Integrated?
Proponents of Integrated Nutrient Management (INM) propose an "integrated" mix of inorganic and organic fertilizers to "sustain" crop yields. This strategy is about just as suspicious and "good" as the earlier example of the pesticide industry. One may recall that the pesticide people are proposing environmentally sound pesticides or "integrating" the use of pesticides together with beneficial insects in an "integrated" pest management package.

Similar remarks can be made about INM that have already been made with regard to green manuring. For ecological agriculture, the objective is to manage soil fertility, not just components of it. If humic acids are not understood or included, then it is not "integrated" enough. If the production of colloidal nitrogen, produced in high quality compost production, is not appreciated, then it is not "integrated" enough. And so on.

The problem with the word, "integrated", is that really important facets of soil fertility may be integrated in the mind of the listeners but may not actually be contained in the version of those who are promoting it.

One also needs to look seriously at what the inorganic portion of INM does to the organic portion of INM. Ammonium sulfate nitrogen, for example, increases the acidity of the soil. The resulting dominance of hydrogen ions displaces micronutrients in the active cation exchange portions of the soil. Is this being taken into consideration?

Environmentally-sound Biotechnology?
To [illustrate] the scientific shortcomings and potential ecological hazards of biotechnology, [let us] briefly examine whether the use of tissue culture has a place in sustainable agriculture.

Let us take the case of tissue culture of potatoes. Let us say an NGO wanted to set-up a village level tissue culture capability among farmers. The NGO considers this to be an environmentally sound application of biotechnology. For after all, what harm could result in mass producing high yielding potato varieties?

Unfortunately, the use of tissue culture for the large scale propagation of one or a few potato varieties will be tantamount to repeating the mistakes of the Green Revolution. But there is a difference. Tissue culture will not repeat the mistakes of the Green Revolution at a much faster pace.

Instead of cytoplasmically narrow HYV seeds, tissue culture will be producing cytoplasmically narrower crops. The planting materials will almost be uniform genetically. Tissue culture will not foster intra-species biodiversity. Monocultures are also more vulnerable to pest outbreaks.

There is also an inherent defect in the method of tissue culture. Evidence is showing that it increases the propensity of plants to be attacked by insects and diseases. The experience of Malaysia with oil palm shows that tissue cultured crops are up to six times more prone to be attacked by insects and diseases. Tissue culture can thus induce farmers to spray toxic chemicals more often to protect their crop.

The reliance on mass production almost by definition precludes an intercropping approach to crop production. If it does the use of pesticides would be inevitable.

And if the tissue cultured potatoes are going to be raised using chemical fertilizers, then, as we have seen, insects and diseases may flourish. Again, this is an added pressure to spray toxic chemicals.

Maybe there are cropping systems and ecological practices that can minimize the problems of tissue culture. I am open to it.

But let it not be said naively that, by giving tissue culture to the people, one is practising sustainable agriculture.
Socially Just and Equitable

The Connection of Social Equity to the Other Dimensions of Sustainable Agriculture

From a certain perspective, what we have discussed in the other dimensions of sustainable agriculture are all related to the question of "social justice", of "social equity", the sixth dimension of sustainable agriculture.

Ecological soundness avoids the "need" to poison 25 M farmers annually with pesticides, not to think of widespread devastating impacts on the environment and the health of consumers. It is terribly unjust for a few people to make profit out of the poverty and oppression of other people.

Participatory appropriate technology development ensures the justice that people are able to incorporate their values and knowledge in the technology that they would be using. Empowering a dispossessed sector of society also restores the equity required to sustain agriculture.

Cultural sensitivity develops the case for respecting farmers knowledge and values. It dismantles the inequitable domination of western forms of knowledge over the lives of millions of people in the South.

Holistic science unmasks the hidden, thus manipulating, agenda of reductionist science and technology. It destroys the political use of natural science so that scientists begin to take greater responsibility for their actions. This brings justice closer to the victims of science.

And, of course, human development. Establishing the sacred nature of the human being provides solid ground for the cry of "social justice and equity". If human beings were merely higher animals, there would be no philosophical or scientific basis to be concerned about justice and equity.

Structuration and Policy Changes

What remains to be done in this section is to indicate the general directions of policy changes needed in the macro level in order to provide a supportive context for sustainable agriculture.

The following changes need to occur to bring about greater social equity. The list below is not comprehensive and all-encompassing. Rather, if changes are brought about in these areas, they would make other subsequent changes much easier and faster.

1. A culture-specific agrarian reform program.
2. Non-token participation of all affected parties in the policy areas affecting agriculture.
3. Reform of the national research network so as to make it more responsive, in ways articulated in this paper, to the needs of sustainable agriculture. In this respect, better support for scientists so that they will not be prey to the designs of the pesticide industry.
4. Stricter implementation of environmental and pesticide regulatory laws.
5. A re-direction of government support away from the production of export crops towards meeting basic food security needs.
6. Strengthening of peoples' initiatives in all areas of agriculture.
7. NGO and farmer-participation in the regulation of pesticides.
8. Greater incentives for the production of organic fertilizers, on-farm or off-farm, the latter being a transitional stage.
9. Redirection of credit policies so that pesticides are decoupled from credit packages and credit support for sustainable agriculture is increased.

Economically Viable

Ecological Soundness Leads to Economic Viability

Acres USA, one of the leading proponents of eco-agriculture, said it best: "To be economical, agriculture has to be ecological". They said this a long time ago. Now the world of conventional economics, epitomized by the World Bank, is starting to understand what they are saying.

Basically, economists are beginning to realize that the global agricultural system is only a subsystem of the larger global ecological system. Agricultural intensification is rapidly filling up the "ecological and social space".

Take the following into consideration. The increase in human population is forcing nations to intensify agricultural production through the use of capital-intensive input including pesticides and chemical fertilizers. However, according to the World Health Organization, pesticides poison some 25 M people, mostly poor peasants in the Third World.

Pesticides are filling up the "social space". Societies are not longer tolerating them. Many want them banned. The goodwill, the social space, for pesticides is rapidly dwindling. Farmers relying on pesticides are going to find themselves increasingly marginalized in the economic market.

Their costs are going to increase because of regulation and other actions that would make it expensive to sell pesticides in the market. Already in Europe there are a number of countries that are already taxing pesticide use by a considerable percentage. Sweden has a tax of 50% on pesticides used in agriculture.

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Economic activity always depends on this silent often mute "support" (oftentimes forced) from both the "social space" and "ecological space" of the planet.

Only too late do agricultural economists realize that nature, in economic jargon, is in reality "natural capital", or in accounting terms, an "asset". In their rush to intensify agriculture, farmers and scientists have been depleting their "natural capital" instead of living off the stream of "income" that "interest", in the form of wise management of land, on "natural capital" can confer.

Thus one of the major tasks for any group supportive of sustainable agriculture is to change the accounting method, both on a micro and macro level, to reflect the harm or good being done by an agricultural technology. This good or harm should be measured in terms of the ecology of the farm, its region, as well as on a national basis.

It is almost certain that, if all the costs of Green Revolution agriculture were internalized by the conventional farmer, he would soon be out of business.
From Production to Total Productivity

Connected with this new perspective is the necessity of changing from a mere production orientation to a total productivity orientation. It is not simply enough to say that yields have been increased, but it is also useful to ask: But at what cost?

Agricultural economists are gradually coming around to this conception. They are starting to talk in terms of productivity. By this they mean, for example, the amount of biomass produced per unit nitrogen, or the amount of biomass produced per unit of water, or the amount of desired yield obtained per unit of scarce resource.

Or it can be an economic measure of productivity. Thus agricultural economist speak of amount of net income earned per unit man-hour.

However, all these are partial productivity indices. What is important is to move towards more holistic productivity considerations and try to see if economic quantification (to the extent justified) can be attached to these other new measures of productivity. For example, economic productivity may be good, but environmental productivity is being diminished. This is the case of Green Revolution technology.

Reconceptualizing the Market

A perennial problem for both conventional and alternative agriculturist is the "market". Our experience in the field shows that there can be two responses to this.

The first possibility is to respond in the conventional manner. And this, for a long time, may be the only way to respond. Try to change your cropping pattern to suit the economics of your market. This is too location specific to go into details in a paper like this.

The important idea is that, to achieve better livelihood, try to enter into a specialty market including vegetables. But for those who are stuck with "commodity" products like rice, corn and so on, the only better economic possibility is to get a reasonable premium on the product.

Customers understand. Let us say a food product cost X units of currency. Now this product is laden with pesticides, as is bound to be the case in Asian countries where pesticide regulation is weak or functionally non-existent. And because they have no choice, consumer pay the price X. Now if a better quality product - more nutritious and no pesticides - comes along, customers are easily convinced that they have to pay more for it.

With consumer consciousness moving into this direction, a second possibility exists, a more radical one. Growers can establish direct relationships with consumers and bypass all the marketing channels in between. In the South this is especially ideal because middlemen really exploit farmers and consumers. In the Philippines, farmers often only get 10-15% or even less of the final retail price of their vegetables.

§ § §

To summarize, for agricultural systems to be sustainable, they must be:
1. Ecologically Sound
2. Economically Viable
3. Socially Just and Equitable
4. Culturally Sensitive
5. Based on Integrative and Holistic Science
6. Founded in the Use of Appropriate Technologies
7. Supportive of the Awakening of Human Potentials.

This description of sustainability has found wide support.

When the Sustainable Agriculture Coalition (SAC) of the Philippines was formed in June 1990, it adopted explicitly the first five dimensions of sustainable agriculture. The first four dimensions were already articulated, even if with different emphasis and articulation by the International Alliance for Sustainable Agriculture (IASA) of which the present writer was one of four co-founders.

The first five dimensions have received wide currency in the Philippines. It also started being adopted on various occasions in the Asian region among various sustainable agriculture groups and networks.

At the international level, members of the SAC managed to gather support for the first five dimensions of sustainable agriculture from 4,000 NGOs attending the International NGO Forum. This Forum sponsored a conference parallel to the UN Conference on Environment and Development in June 1992 in Brazil. The first five dimensions of sustainable agriculture now constitute part of the NGO Treaty on Sustainable Agriculture.

The last two dimensions are included implicitly in the first five dimensions. However, in the paper, I drew them out separately for reasons already explained in the paper.

The concept of sustainability is vast, with many nuances. This paper could not possibly go into all the finer details of the sustainability concept. Hence, it has focused mostly on aspects of sustainability which are not clearly understood and not even recognized to be important. The paper sought to redress the imbalanced treatment that certain facets of sustainability have received in the past.

There is also a related rationale. Past discussions have emphasized and discussed the different dimensions of "sustainability" with the very same thinking framework that has caused the problem in the first place. One cannot create the proper policy framework if these subtle contradictions are not recognized and highlighted.

Specifically, much attention has been focused on ecological soundness, economic viability, and appropriate technology. And recently, the question of social justice and agricultural sustainability has been surfaced even if inadequately treated. But equally important and less visible aspects of sustainability are not even recognized and discussed. These new dimensions of sustainability include the concern for holistic science, the role of indigenous cultural formations, and human development.

The writer emphasizes that, in putting greater emphasis on the little understood dimensions of sustainability, he does not judge as unimportant the other, more well-known dimensions, including ecological soundness, economic viability, appropriate technology and social justice. Rather, his intention is to broaden and build upon these valid, critical, and more widely articulated dimensions of sustainability in agriculture. This is the case even when the author attacks agricul-
tural solutions which focus solely or dominantly on one dimension – be it ecological, social, economic, and so on – to the neglect of other dimensions of sustainability.

In discussing the well-known sustainability dimensions, the author has highlighted the more subtle issues involved. Take for example the case of Integrated Pest Management (IPM) which is included in discussions of ecological soundness. Many NGOs are not aware that the very business concerns that have wreaked havoc on peoples' lives and the natural environment – the pesticide industry – are advocating "environmentally friendly" pesticides and their own version of the IPM. Unless the contradictions of the IPM concept of the pesticide industry is exposed, many NGOs, government agencies, and concerned consumers will be confused.

A final word. One cannot separate the interactive effects of one aspect of sustainability from the others. Thus, when the writer spoke of seven dimensions of sustainability, he was distinguishing not dividing and fragmenting a complex reality.

A final word. When "he" was used, it was meant to include "she", to refer to the universally human. This was true in most instances except in cases where the context is clear that it refers to the masculine gender.

Notes
4 There are numerous evidences of this. Neurophysiologists, for instance, have experimentally verified the existence of the soul in laboratory experiments. Even the simplest perceptual act, the sensation of color, already indicates a soul activity, not merely the result of brain processes. Brain scientists have even pinpointed the specific location of the soul's volitional function in an important part of the brain. See Augros, R.M. and Stanciu, G.N. (1986). The New Story of Science, New York: Ballantine Books, pp. 11-16.
6 Anthroposophy preceded the Second Scientific Revolution in terms of historical time. The germ of Anthroposophy were already established by Steiner as early as 1886 in a book, Theory of Knowledge Implicit in Goethe's World Conception. It is a "third" scientific revolution in the following sense.
7 The Second Scientific Revolution exclusively explored the material world. It powered industrialization but the spirit in nature and humanity was banished. The Second Scientific Revolution points to the existence of a spiritual world behind matter. Anthroposophy directly experiences the realm of spirit and sees its scientifically explores its "connection" with matter.
13 Ibid., 52-58.
14 Ibid., 54-55.
15 Ibid., 55.
16 Ibid., 47.
17 This capacity belongs to the "literal" mind.
18 "Intelligence" here is used as it is understood by oral cultures.
19 This arrangement will simultaneously encourage institutionalization, greater participation, better relevance, and more appropriate technologies.
20 Interview with Dr. Matthew Davison, USA, 1983. Dr. Davison cited examples of how rituals in the Philippines encoded vast amounts of knowledge about their natural environment. This discovery also coincides with the findings of Walter Ong regarding the role of repetition through oral literature as one form of an external memory aid by oral cultures.
22 Ibid. Booth cites the work of Perelman, Michael.

IRRI, Beneficial Insects in Rice.

The full unabridged version of this paper is available from the ANGOC Regional Secretariat and from CADI (110 Scout Rallos Street, Kamuning, Quezon City, Philippines).
Initiatives of Regional NGOs on Sustainable Agriculture and Food Security

The involvement of Asian NGOs and people’s organizations in the area of sustainable agriculture (SA) is wide and varied. This is partly because the problem of food insecurity in the region is complex. Some view the problem as primarily technological and therefore seek the solution in technological innovations. Others perceive the problem as the result of misguided public policies and recommend a reevaluation not only of agricultural but also macroeconomic and trade policies. Still others view it as part of the dominant development paradigm and advocate a shift in the development strategy from a growth-oriented to a people-centered development approach.

The problem, however, is multi-dimensional, cross-sectoral and cuts across political boundaries. Thus, it calls for a concerted effort among NGOs and even among the different sectors.

An environmental mapping of the activities of selected regional NGOs involved in sustainable agriculture reveals three major program thrusts: 1) training and applied research on appropriate agricultural technologies; 2) networking and community organizing to empower rural communities; and 3) policy and institutional reform. It must be noted that these NGOs are also involved in other development activities and not solely sustainable agriculture.

Training and Applied Research on Appropriate Agricultural Technologies

Training linked to field research is an area well-developed among Asian regional NGOs. Foremost among these NGOs are the Southeast Asia Rural Social Leadership Institute (SEARSOLIN) and the International Institute of Rural Reconstruction (IIRR).

SEARSOLIN’s initiatives in alternative agriculture started with its regular annual course which has been an on-going activity since 1962. A recent initiative which marked SEARSOLIN’s leadership in SA training is the creation of a Sustainable Agriculture Center (SAC) attached to the College of Agriculture of Xavier University.

SAC conducts field research and organizes an SA network involving the academe, farmers, people’s organizations, NGOs, parishes and other institutions. It develops and verifies agricultural technologies that can be a basis for scientific safeguarding of the various sustainable agricultural systems. It also establishes demonstration farms, conducts basic orientation seminars on SA for farmers, clergies and rural youth, and sponsors workshops and symposia on SA.

IIRR’s work with the rural poor in developing countries spans over 30 years. To date, more than 4,000 rural development practitioners from over 80 nations, and nearly 1,300 organizations have attended training programs at IIRR.

IIRR has two major functions related to SA: Field Operational Research (FOR) and Training and Outreach (TO).

More than 100 local, national, regional

The problem of food insecurity in the region is multi-dimensional, cross-sectoral and cuts across political boundaries. Thus, it calls for a concerted effort among NGOs and even among the different sectors.
and international training activities have been undertaken in support of its SA work. These endeavors cover a wide-range of regenerative agriculture concerns, from integrated farming systems to bio-intensive gardening, agroforestry, aquaculture, plant genetic resources conservation, low-external input rice production and low-cost livestock production.

Under the FOR Program, IIRR has promoted the use of environmentally sound technologies that pursue the integration of available, on farm, resources, including labor. Since 1985, IIRR has worked closely with farmers in the adaptation, refinement and promotion of small-scale, appropriate agricultural technologies.

The Institute has produced a number of technology information kits and technical papers on its experience in the testing and refining of regenerative agriculture technologies with farmers. These include topics on low-cost farming technologies, transition strategies to low-external input agriculture and farmer-proven integrated agriculture-aquaculture technologies.

Other initiatives include the Southeast Asia Regional Institute for Community Education (SEARICE) Alternative Agriculture Program and the Pesticide Action Network Asia-Pacific (PAN-AP) Program on Women and Pesticide.

SEARICE’s Alternative Agriculture Program aims to develop a viable alternative system of agriculture which is ecologically balanced as well as people-oriented. The Institute is known for its work in genetic conservation and use in the context of SA. It is also the convenor of the Intellectual Property Rights and Biotechnology Asia-wide Meeting.

PAN-AP’s Women and Pesticide Program seeks to ban the use of hazardous chemicals and promote alternative pest management within the context of SA. The program entails training workshops, research and translation of resource materials into local languages in the Asia and Pacific region. The training workshops provide expertise in community-based health monitoring which forms the basis for some grassroots and national action.

Community Organizing and Networking to Empower Rural Communities

A consensus among the development actors in the region, as enshrined in their public declarations, is the central role of rural poor communities play in ensuring food security. Unfortunately, though the declarations get officially recognized, they are not properly understood and remain far from being instituted.

NGOs recognize this gap and have long worked on enabling grassroots action networks to position themselves in key decision centers so that they actively take part in the process. Among regional NGOs, people’s participation is an overriding theme. However, because of their resource limitations, not all would have direct community empowerment programs.

SEARICE has a long-standing record in community organizing work in the region. It has programs for peasants, fisherfolk, indigenous people, and women. The main strategy adopted by SEARICE is rural community organizing based on concrete and specific issues. Community organizing is supplemented by an educational process which clarifies the conceptual framework within which the Institute operates.

The Asian NGO Coalition (ANGOC), through its national network members, also has extensive experience in empowering rural communities. With an effective reach of over 2,000 grassroots NGOs in nine countries in Asia, ANGOC has had successes in broadening space for communities to participate in dialogues with governments and in development projects that directly affect their lives.

Through the NGO sector Development Program, ANGOC has provided training opportunities to NGO development managers, supervisors and field workers on immediate and common concerns that are not met by existing training institutions. It also organizes development education study tours on community-based resource management, forest resource management, highlands agriculture and settlement, the coconut industry and small-scale fisheries. The Southeast Asia Sustainable Agriculture Network (SEASAN) also provides a forum for exchange of experiences on SA. The main emphasis is to serve resource-poor farmers from different agroecological zones in order to enhance their food security, income and overall well-being.

SEASAN has conducted two important regional workshops on SA: the first is on the uplands held in the Philippines in 1989, and the second is on the lowlands held in Thailand in 1990. These workshops facilitated the dynamic sharing of experiences on approaches to upland and lowland development in the region and led to the publication of two resource books.

The network’s operation is concentrated in Southeast Asia, particularly Philippines, Thailand, Malaysia, Indonesia, Lao PDR, Vietnam, Cambodia and Myanmar. SEASAN’s newsletter, the Sustainable Agriculture Newsletter (SAN), has become a key resource document linking over 3,000 people and agencies in over 70 countries.

Policy and Institutional Reform

Asian NGOs, especially those that oper-
ate at the national and regional levels, are now slowly recognizing the importance of NGO intervention in policy formulation by governments and intergovernmental organizations. NGOs' organizational capability cannot match the machinery of governments, nor do NGOs entertain illusions of replacing the bureaucracy. Instead, the task at hand is to influence the policy framework within which government agencies operate and in the process transform the institutions themselves.

ANGOC is one of those regional NGOs which have developed the skills to translate field experiences into concrete policy agenda. This was demonstrated in its preparation of an Asian NGO input to the UN Conference on Environment and Development. Taking on the NGO Treaties on Sustainable Agriculture and Food Security forged in Rio in 1992, ANGOC initiates policy dialogues with governments (on agricultural policies and programs), intergovernmental organizations (on international mandates) and financial institutions (on development priorities).

Currently, ANGOC is taking a lead role in the NGO campaign to reform the Asian Development Bank. Since 1988, ANGOC has been undertaking policy researches, facilitating information exchange among NGOs, and initiating dialogues with Bank officials, especially with the Bank's environment office and agriculture department.

Recently, SEARICE has also initiated policy dialogues, particularly among people's organizations, NGOs, national agricultural research systems (NARS) and international agricultural research centers. SEARICE is the focal NGO in the dialogue with the International Rice Research Institute. It also organized the Bangkok Meeting on Rice, Food Security and Ecology.

PAN AP being one of the six regional centers of Pesticide Action Network, a global network for pesticide reform, has also been involved in policy reform focusing on the economics of pesticide use and on setting up a database on pesticides. The Network plans to analyze barriers to SA, including subsidies and agricultural policies that support conventional high input agriculture.

**NGO Strategic Intervention on Sustainable Agriculture in Asia**

Training and field researches on SA are very well covered by Asian regional NGOs. They have developed expertise in conducting short courses, basic orientation on SA and on specific agricultural technologies. Some NGOs are even going into reform of agricultural curriculum of universities and colleges.

The broad tasks of mainstreaming sustainable agriculture into government programs, however, present a major stumbling block. This will involve formulation of solid economic arguments in support of SA, policy dialogues with agricultural ministries, and enhancing the capability of support groups, among others.

Given the problems confronting agriculture and the capabilities of NGOs in the region, the following strategic interventions are forwarded:

- Linking the on-going policy shift in sustainable agriculture with the reform of land tenure systems;
- Bringing into focus the impact of international trade on agricultural production and food distribution;
- Demanding the accountability of national and international agricultural research and finance institutions;
- Initiating a movement among grass-roots action networks and support institutions on SA.

Bringing SA into the mainstream of agricultural programming also requires a new modality of work among regional NGOs as it requires a united front in dealing with governments and intergovernmental organizations. Regional NGOs will have to coordinate their work closer and forums for exchange of information must be instituted.

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