TWN Briefing Paper 5
Third World Network
www.twnside.org.sg
June 2003

Sustainable Agriculture: Critical Ecological, Social and Economic Issues

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1. Summary

Agriculture is perhaps the most outstanding issue and challenge for the sustainability objective to resolve. To attain the 'sustainable development' goal requires urgent actions on three fronts — the ecological, the social and the economic. Urgency is required as there is a big crisis and possible calamity developing in this all-important sector, on which depend the livelihoods of most of the world's people as well as the food needs of everyone.

Agriculture is facing three major problems and choices:
(a) Ecology/Technology: Which technology to base the future of world agriculture on? As the chemical-based model falters, the companies and global establishment is opting towards genetic engineering as the alternative. Ecological farming is superior, not only for the environment, but also for productivity and farmers' incomes. It has not been given the chance to prove itself. It should be.
(b) The global economic framework: The economic environment has turned extremely bad and dangerous for developing countries' small farmers. IMF-World Bank structural adjustment pressurised poor countries to liberalise food imports and abandon subsidies and government marketing boards. The WTO Agreement on Agriculture (AoA) enables rich countries to raise their subsidies and set up astonishingly high tariffs, whilst punishing developing countries (which cannot increase their subsidies, and which have to liberalise their imports further). Commodity prices have slumped. These three factors are threatening the survival of developing countries' farms and farmers. The entire framework of global and national economic policies for agriculture has to be thoroughly revamped.
(c) Land for the farmers: Many small farmers are poor and some are becoming poorer. A main reason is unequal land distribution, where small farmers have little land security or access and lose a large part of their income to landowners. Land reform is urgently required and landless farmers are fighting for their rights. But the landowners in most countries have political clout and resist change.

All three issues have to be resolved, and in an integrated way, if sustainable agriculture is to be taken seriously. Otherwise there will be an absolute catastrophe, especially if the wrong choices are made for two or all three of the aspects.

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2. Ecology and Choice of Technology for Forestry, Fishing and Agriculture

A review of aid practice is needed to correct past mistakes and lead the way to 'sustainable agriculture and rural development'. Important decisions have to be made in technology choice. Aid and technical agencies, including the World Bank and the Food and Agriculture Organisation of the United Nations (FAO) have supported the transfer of environmentally harmful technology models, which have contributed to the over-logging of tropical forests, depletion of fishery resources through trawl fisheries and to the inappropriate chemical-based "Green Revolution". Besides ecological damage, these models have also caused great social hardship to forest dwellers, to rural communities whose lands and water supplies are affected by pollution and soil erosion, and to the millions of small fisherfolk whose livelihoods are threatened by trawl overfishing.

Aid flows for destructive forestry and fishery projects should stop. So too should aid and loans for destructive commercial aquaculture projects which are ecologically harmful and are not economically sustainable, and which harm farmers and fishermen whose lands and waters are affected. In their place, small-scale community-managed and environmentally-sound forms of aquaculture, aimed at augmenting local food supply, and as have been traditionally practised in many countries, should be supported.

In the past, most agricultural aid has been for promoting the Green Revolution model, which uses seeds with a high response to big doses of inorganic fertiliser and chemical pesticides. These few seed varieties have displaced a wide range of traditional seeds, thus eroding crop biodiversity. There is also mounting evidence of and growing concern with other ecological problems, such as increasing soil infertility, chemical pollution of land and water resources, pesticide poisoning, and pest infestation due to growing pest immunity to pesticides. These are not ad hoc problems, but symptoms of a technological system in decline. The ecological and health hazards should no longer be considered as only the necessary costs to an economically and technically superior system, because the system's most important claimed benefit, high productivity, is itself now in question.

In areas where the model has operated for a longer period, there is evidence of declining yields and rising costs. In 1993, the FAO chief for Asia Pacific declared the Green Revolution era was over. There is increasing deficiency of trace elements in the soil because of intensive use of mineral fertilisers, whilst continued high dependence on pesticides is also not technologically sustainable. He revealed a yield decline of 1 to 3 percent per year on some fields using the Green Revolution technique, a situation which was described as 'a recipe for disaster within one generation' by the FAO regional officer for integrated pest control, Peter Kenmore. Developments on some of the best-managed experimental farms have added to the pessimism. On International Rice Research Institute (IRRI) test plots, varieties which yielded 10 tons a hectare in 1966, were yielding less each year and produced less than 7 tons per hectare in mid-1990s. IRRI scientists attributed the declines to environmental degradation, with irrigated rice land unable to cope. The detrimental changes included a reduction in the period when the soil was dry, the substitution of inorganic for organic fertilisers and a greater uniformity in the varieties grown. These factors are all intrinsic components of the system.

With disillusionment setting in on the Green Revolution, there is a danger that agriculture aid will turn to genetic engineering. Companies, universities and foundations have already pumped enormous funds to biotech research. But the claimed benefits of genetic engineering are far from being proven, whilst there is increasing evidence of real and potential risks. Scientists now point to scientific flaws of the genetic engineering paradigm, showing why it is impossible to predict the consequences of transferring a gene from one type of organism to another in a significant number of cases. This calls into question the value or usefulness of genetically-engineered (GE) crops.

Moreover, genetically-modified organisms may migrate, further mutate and multiply, and be transferred to other organisms and species, and in some cases the stability of affected organisms and ecosystems could be disrupted and

threatened. The more specific risks in agriculture are that some transgenic crops could become noxious weeds, and others could become a conduit through which new genes may move to wild plants which themselves could then become weeds. The new weeds could adversely affect farm crops and wild ecosystems. Similarly, genetically-engineered fish, shellfish and insects could become pests under certain conditions. There is also a possibility of new viral strains giving rise to new plant diseases. Of particular concern is the risk that transgenic crops may pose a threat to wild plants and traditional crop varieties and thus accelerate the process of the rapid loss of agricultural biodiversity, especially in the developing countries, which are world centres of crop origin and diversity.

Findings of potentially serious threats include the possibility of certain genetically-engineered bacteria unintendedly killing soil organisms, thus reducing nutrient supply to plants and threatening their survival; the rapid transfer of transgenes between oilseed rape (engineered to be herbicide tolerant) to its weedy natural relative; and the survival and spread of genetically-engineered organisms from containment. Finally, there is growing evidence of the hazards to human health of consuming foods containing genetically modified organisms. Consumers around the world are now voting against GE foods and opting for organic food.

The transfer to developing countries of projects or experiments involving genetic engineering could be hazardous — at least until adequate safety regulations are put in place in these countries. So far these regulations have not yet been adopted. There should thus be a moratorium on the introduction of genetically-engineered products in agriculture until adequate capacity is established. A mechanism should also be set up to ensure that there will not be the transfer of hazardous genetic engineering experiments, research and products to developing countries. The Biosafety Protocol, which is weak, should be greatly strengthened.

Meanwhile, ecological agriculture should be given the chance it deserves. Priority support should be made to research and projects on ecological and community-based farming practices and systems. So far, relatively few resources have been made available for this.

The value and productivity of Third World traditional agriculture has been underestimated because of the wrong estimation methodology used in comparing it with the Green Revolution model. Studies should be sponsored to understand the many types of low-input ecological farming methods, traditional as well as modern. Such studies should include analyses of their workings; energy efficiency; use of inputs; outputs of all the different crops, products and activities and the relationship between them; and the nature and use of agricultural diversity. The studies should also incorporate the various problems encountered in practice (such as shortage of organic manure, pest control, water management), and the methods of solving them.

There is a prevailing premise that whilst 'sustainable agriculture' may be good in preserving the environment, it is inferior and inadequate in terms of productivity and thus cannot be relied on to feed the increasing population. This premise is a prejudice, for there is evidence that ecological farming can be high yielding as well, higher yielding in fact than the Green Revolution method.

For India, Vandana Shiva cites the studies of the eminent Indian rice scientist, Dr Racharia, who showed that indigenous varieties can be high yielding, given the required inputs, and that the yields of many traditional farmers 'fall in or above the minimum limits set for high yields and these methods of cultivation deserve full attention'. Dr Vandana concludes: 'India is a Vavilov centre of genetic diversity of rice. Out of this amazing diversity, Indian peasants and tribals have selected and improved many indigenous high yielding varieties. In South India, in semi-arid tracts of the Deccan, yields went up to 5,000 kilogram/hectare under tank and well irrigation. Under intensive manuring, they could go even higher.'

In the Philippines, farmers, scientists and environmental groups are conducting several sustainable agriculture experiments. At an FAO Asian regional seminar on sustainable agriculture

in 1993, a Filipino agricultural scientist, Nicanor Perlas, presented case studies of successful vegetable and rice farms using ecological methods in the Philippines. In the largest set of adjacent farms totaling 1,000 hectares using the bio-dynamic farming method, there was a yield increase of 50-100 per cent and an increase in net income by farmers of 200-270 per cent, compared to the conventional (Green Revolution) method. According to Perlas, the lessons from the case studies are that sustainable agriculture can be practised in large scale; yields do not necessarily drop without the use of chemical fertilisers and pesticides; and a rapid (even immediate) transition from chemical farming to sustainable agriculture is possible if correct technical principles are followed.

Also in the Philippines, the MASIPAG group (an alliance of farmers and university scientists) has pioneered an alternative rice farming method which is non-chemical and uses seeds (developed in its rice breeding stations) which are suited to particular regional weather conditions. By 1993, the group's method was used in 4,200 hectares spread over 23 provinces. MASIPAG's data showed that yields from farms using its method were generally higher than conventional (Green Revolution) farming. MASIPAG's average yield per hectare was 4-5 tons of rice (ranging from the lowest 3.5 tons to the highest 8 tons), compared with the overall national average of 2.7 tons and the national average of 3.5 tons for irrigated rice fields with fertiliser applied.

There are many other examples of successful and high-yielding ecological farming in various parts of the world. Yet only a minute fraction of agricultural aid (in either research or projects) has been spent studying or promoting them.

Aid should now flow towards:
(a) reassessing the concept and measurement of agricultural productivity, giving due recognition to the value of traditional and ecological farming and enabling a scientific comparison with conventional Green Revolution methods;
(b) studying sustainable agriculture systems, their operations and dynamic inter-relationships, their problems and solutions to these problems;
(c) conducting sustainable agriculture experiments, test farms and demonstration farms;
(d) holding training programmes for farmers, policy and extension officials, and NGOs on sustainable agriculture;
(e) supporting farmers' programmes and government programmes in implementing sustainable agriculture, which could eventually take place on a large scale;
(f) supporting farmers, community groups and governments in establishing community-based seed banks to revive and promote the use of traditional varieties, and supporting the subsequent exchange of seeds amongst farmers and the improvement of seed varieties, using appropriate traditional breeding methods.

Since the United Nations Conference On Environment And Development (UNCED) in 1992, there has been agreement in principle of the need to move away from environmentally harmful to sustainable agriculture. However, whilst there has been increased interest and awareness of ecological farming, the aid agencies and the international agricultural technical agencies have not taken any effective action to phase out chemical-based agriculture nor to promote sustainable agriculture. Moreover consumers worldwide are now opting for organically grown food. There is a cultural and safety basis now to provide the demand for ecologically produced food.

A large dose of commitment is needed by the aid and loan agencies. They need to put their resources where their lip-service now is, and to take the above measures, at the least, so that greater scientific understanding of sustainable agriculture can be accumulated, and a paradigm shift in policy can then take place. Such a policy shift is important, for sustainable agriculture today remains at the level of anecdotes and case studies. The biases against it are deep-seated, so that policy-makers are still chasing after new technological miracles to feed the world, whereas the essential elements for both sustainability and productivity are already present and need to be rediscovered: the indigenous knowledge of farming communities and the broad diversity of Nature's resources.

3. Structural Adjustment and the WTO: A Shift of Economic Fundamentals

Globalisation is now the main determining economic factor in Third World agriculture, the main channels being the Bretton Woods institutions and the WTO. The agriculture component of structural adjustment programmes usually included cutbacks in government expenditure on the agricultural and rural sector; privatisation of state marketing institutions; liberalisation towards private land ownership; liberalisation of agriculture imports; removal or reduction of agricultural subsidies; the 'freeing' of food and other agricultural prices.

The liberalisation of agricultural imports has had an especially damaging effect on the Third World farm sector, and pressures increased after the setting up of the WTO and especially its Agreement on Agriculture. Under the AoA, developing countries must remove non-tariff controls on agricultural products and convert these to tariffs, then reduce the tariffs by 24 per cent over 10 years. Cheaper imports are threatening the viability of small farms in many developing countries. Many millions of small Third World farmers could be affected. There is also increased fear of greater food insecurity, as developing countries become less self-sufficient in food production. For many, food imports may not be an option due to shortage of foreign exchange. They have to depend on food aid.

A 2000-2001 FAO report on 14 developing countries' experiences in implementing the WTO Agreement on Agriculture showed that import liberalization had a significant effect. The average annual value of food imports in 1995-98 exceeded the 1990-94 level in all 14 countries, ranging from 30 per cent in Senegal to 168 per cent in India. The food import bill more than doubled for two countries (India and Brazil) and increased by 50-100 per cent for another five (Bangladesh, Morocco, Pakistan, Peru and Thailand). In all but two countries, food import growth exceeded export growth. Some countries were obliged to set applied rates well below their WTO bound rates due to loan conditionality. Several countries reported import surges in particular products, notably dairy products (mainly milk powder) and meat. In some regions, especially the Caribbean, import-competing industries faced considerable difficulties.

In Guyana, there were import surges for many main foodstuffs that had been produced domestically in the 1980s under a protective regime. In several instances the surge in imports has undermined domestic production. For example fruit juices imported as far away as France and Thailand have now displaced much of domestic production. Producers and traders of beans indicated that increasing imports have led to a decline in the production of minca peas, developed and spread throughout Guyana in the 1980s. The same applied to local cabbage and carrot. The fear was expressed that without adequate market protection, accompanied by development programmes, many more domestic products would be displaced or undermined sharply, leading to a transformation of domestic diets and to increase dependence on imported foods. In Sri Lanka, policy reforms and associated increases in food imports have put pressure on some domestic sectors, affecting rural employment. There is clear evidence of an unfavourable impact of imports on domestic output of vegetables, notably onions and potatoes. The resulting decline in the cultivated area of these crops has affected approximately 300,000 persons involved in their production and marketing.

The rich countries have been notorious for their high protection and subsidisation of their own farm sector. Ironically, the WTO Agreement on Agriculture allows them to continue high protection through tariffs (some of the tariffs are 100 to 300 per cent) as well as continued export and domestic subsidy. Indeed, the OECD countries' total domestic farm subsidies rose from US$275 billion (annual average for 1986-88) to US$326 billion as an increase in 'non trade distorting subsidy' (allowed under WTO) more than offset 'trade distorting subsidy' (which has to be reduced under WTO rules). Thus, highly subsidised and artificially cheap food from rich countries are entering the poorer countries that have no funds to subsidise and are being pressured to further cut their tariffs.

Meanwhile, the WTO's Trade-Related Aspects Of

Intellectual Property Rights (TRIPS) Agreement also poses a threat to farmers (not only in the South) as governments are required to patent some life forms as give intellectual rights protection to plant varieties. This facilitates 'biopiracy' (appropriation of farmers' knowledge by companies) and is leading to a situation where farmers have to prove they did not 'steal' the seeds of protected plant varieties owned by companies.

What should be done?
(a) Structural adjustment conditions must be changed, so that countries can adopt pro-poor and pro-local farmers' policies. The IMF, World Bank and donor countries should stop pressuring developing countries to liberalise their agricultural imports, or to give up subsidies or marketing assistance to farmers.
(b) The WTO Agreement on Agriculture must be radically changed. Developing countries should, under special and differential treatment, be allowed to take tariff and non-tariff measures to protect the viability and livelihoods of their small farms. They should be exempt from the disciplines of import liberalisation and subsidy for food products for domestic consumption. Developed countries should not continue to artificially cheapen their products by subsidy for export.
(c) The WTO TRIPS agreement should be amended to prohibit the patenting of lifeforms and to enable developing countries to set up their own version of a *sui generis* system to protect the rights of farmers and indigenous communities as the innovators of plant varieties, without being challenged.
(d) Developing countries should be allowed the flexibility to establish their own agriculture policies, with the priority of being able to have farmers to produce food without being hampered by inappropriate and damaging rules of the IMF, World Bank or WTO.

4. Access to Land and Other Social Issues

Farmers and the rural population in developing countries also face serious social problems. First among these is insecurity of land tenure, and lack of access to land. Many farmers are tenants, beholden to landlords, to whom they pay rent that can significantly reduce the family income. In many countries, unequal land distribution, and the exploitation of the landless peasants, is the major cause of rural poverty and insecurity.

Sustainable agriculture and rural development requires a new commitment by governments and international agencies to improve the land access and land rights situation of farmers and indigenous communities. These communities are also affected by development projects (such as dam, forestry and mining projects) which displace the communities.

Thus the issue of the human rights of these disadvantaged groups is crucial in the striving for sustainable agriculture.

5. Conclusion

The agricultural sector has multiple roles in developing countries: to help ensure food security, anchor rural development, provide resources for the livelihood and adequate incomes of a majority of people, and to do this without destroying the environmental base. There are thus two inextricably linked components, the social and environmental, to agricultural sustainability.

The erosion of the spirit and practice of international cooperation, especially on a North-South basis, is having serious repercussions on agriculture and on rural development in developing countries. This erosion is most noticeable in the decline in aid. However, the globalisation process facilitated by structural adjustment, the Uruguay Round and the WTO, has even more serious implications.

It is thus imperative that a change of mindset takes place, to review the present damaging framework and build a new paradigm of policies that can promote sustainable agriculture.

Whether such a paradigm shift takes place in agriculture is the acid test of the success or failure of sustainable development in the next few years ahead.

(This paper first appeared as a Briefing Paper of the Third World Network for the World Summit on Sustainable Development (WSSD) held in July/August 2002.)

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