VII. MYANMAR*

A. Assessment of the current state of agriculture, forestry and marine resources

1. Agriculture resources

The agriculture sector forms the basic core of the national economy of Myanmar, since 76 per cent of the population resides in rural areas and is engaged in agricultural and animal husbandry. The role of agriculture in the national economy of Myanmar remains extensive, and thus has a direct bearing on all other socio-economic aspects of the country. As the vehicle for overall development, agriculture has received strong support through appropriate long- and short-term plans, general policies for self-sufficiency in national food requirements, adequate production of raw materials for local agro-based industries and the generation of a substantial surplus for exports.

Agriculture was adversely affected by the 1982-1987 policy framework under which the centrally planned economic system laid down the types and areas of crops to be grown and the inputs to be used by individual farmers, with public sector agencies procuring crops at fixed, low prices. Farmers responded quickly to the relaxation of controls in 1987/88 with the result that cropping was expanded and diversified; as a result, exports have been increased in the past six to seven years. The liberalization of external trade, coupled with decontrol of domestic trade for all major crops, has resulted in a marked improvement in terms of trade for agriculture as well as changes in crop prices. With farmers now free to grow crops of their choice, there has been a shift away from staple food crops to higher value cash crops such as beans, pulses and oilseeds.

To achieve its objectives, the Ministry of Agriculture has adopted five measures:

(a) The development of land resources for agricultural expansion;

(b) The provision of adequate water for agricultural purposes;

(c) The provision of mechanized power for agriculture purposes;

(d) Technology generation and dissemination;

(e) Multiplication and utilization of quality seed stock.

2. Forestry resources

Myanmar is well endowed with natural forests and vegetation cover. Of the total land area, 388,500 sq km (57 per cent) is forest; of that area, 103,600 sq km constitute reserved forests and 284,900 sq km comprise public forests (unclassified forests).

The forests comprise numerous timber species, including the most valuable timber, teak. Associated with teak are other important hardwoods such as Pyinkado and Padauk. The Dipterocarp and sub-alpine forests, mangroves and esturine and bamboo forests all contribute to providing some 1,200 timber species and 780 varieties of small trees. Currently, however, only about 45 species are being exploited.

The forestry sector registered significant increase in 1989/90 as a result of grants on the tender

* Prepared by U Myint Thein, Director-General (Retd), Ministry of Agriculture and Irrigation, Yangon.

system to cooperatives and private sector for extracting hardwood and other forest products, other than teak. Granting logging concessions was terminated in December 1993 and the export of logs was banned in 1993. The sale of logs in foreign currency, however, is done occasionally through systematic tender systems by the Myanma Timber Enterprise.

3. Marine resources

Myanmar has an abundance of rivers and streams, a long coastline and a large mangrove area in the delta region. An area of about 486,000 sq km in the coastal regions has been demarcated as an economic zone in for fisheries. The country also has an ocean area of about 163,000 sq km which is suitable for trawling.

The fisheries sector is complex, consisting of four types of fresh-water fishing and three types of marine fishing. Fresh-water fishing is made up of pond and river (leasehold) fisheries, both conducted by the private and State sectors, and open and flood fisheries conducted by the private sector. The total catch appears to have expanded since 1988, although seasonal fluctuations make it difficult to assess trends.

4. Land conservation and rehabilitation

Land and soil resources and their problems

There are about 24 soil types in Myanmar which are dictated by soil-forming factors such as rainfall, parent rocks, topography and land forms. However, only three main soil groups are recognized as agriculturally important: alluvial, black and red laterite soils. The alluvial soil makes up some 50 per cent of the total sown area and is located in river basins and the delta. Black soil occurs in about 30 per cent of the area and is generally found in the dry zone region, while red laterite soil accounts for 20 per cent of the area and is found in lower Myanmar associated with undulating topography.

Problem soils are characterized by soil and agro-climatic constraints to sustainable agricultural production, limiting the range of crops that can be grown successfully. In Myanmar, problem soils occupy an area of nearly 1 million ha, representing about 7.8 per cent of the total cultivable land. Of the area of problem soils, about 68.75 per cent (660,000 ha) comprises saline and alkaline soils, although most of them are currently under cultivation. The remaining problem soil area comprises acid sulphate, degraded, peat and swampy soils. Therefore saline and alkaline soils are the predominant problem soils in Myanmar. In the hilly region and in the central plains of Myanmar gradual degradation of soil fertility is occurring through erosion. However the worst affected region is the dry zone which covers Mandalay, Sagaing and Magwe Divisions. The depletion of natural resources is a matter of concern, as is the wasteful destruction of forests through shifting cultivation, with its attendant soil and gully erosion. In the hilly regions, wind and sheet erosion and gradual desertification in the semi-arid zones are cases in point.

Steps need to be taken to introduce and enforce terraced cropping or stripped cropping with appropriate forest belts in between, in lieu of shifting cultivation, in the hilly regions. In some parts of the hilly regions of the Chin and Shan States traditional shifting land-use practices have resulted in continuous soil degradation, making the land less suitable for economic crop production. In order to avoid the recurrence of such problems, steps are being taken to promote of terrace cultivation and conservation farming methods in those areas. Similarly, extensive wind belts, associated with suitable cropping patterns in the dry zone, need to be established to minimize soil losses and halt desertification. For the development of soil-depleted areas, measure will be taken to prevent further deterioration of hitherto eroded and fertility depleted fallow sloping areas.

The dry zone, one of the nine distinct natural regions of Myanmar is a resource-poor area. Water is scarce, vegetation cover is thin and soil erosion severe. The region is characterized by low annual rainfall ranging between 20 and 40 inches, with high variability and uneven distribution. The monsoon rain is bimodal with a drought period during July when dry desiccating winds blow from the south. The undulating land, composed mainly of clay and sandy loams with natural low fertility, is subjected to severe erosion under rain and strong winds. That environment, with its natural limiting factors has led to severe environmental degradation. With declining inputs, both in terms of organic and inorganic materials, agricultural productivity is decreasing annually. Compounded by increasing population pressure, high competition for

naturally thin vegetation and tree cover (for fuelwood and livestock fodder), the region is suffering rapid environmental degradation.

Based on mean annual precipitation, 22 out of 26 townships in Mandalay Division, 18 out of 25 townships in Magway Division and 18 out of 34 townships in Sagaing Division are classified as being in the dry zone. The zone covers approximately 677,000 sq km (17 per cent of the total land area). The present population of the three Divisions is estimated at 14.2 million, of whom an estimated 11.5 million (27 per cent of the total population) reside within the dry zone. That places a heavy burden on the lean resources and fragile environment of the zone. With an average population density of 99 persons per sq km, it is the third most densely populated region in Myanmar.

5. Environmental impact of pesticide and fertilizer use

Concern over environmental damage has assumed global dimensions and Myanmar cannot remain divorced from stark realities. However, because of budgetary and foreign exchange constraints, the sum total of pesticide and fertilizer use does not meet the actual requirement which may be a blessing in disguise. As yet, pollution and contamination are not grave problems in Myanmar. The utilization of pesticides and fertilizers is very low compared to neighbouring countries. In fact, of the 23 in the Asia-Pacific region, Myanmar is among the 10 countries which have the lowest fertilizer consumption in terms of nutrients (1990/91 figures).

Being a developing agricultural country, at least for the foreseeable future, Myanmar will inevitably use pesticides in agricultural food production, although other parallel efforts of a non-chemical nature are being investigated in plant protection strategies. The most practical way to handle the pest problem is the use of chemicals with intelligent concern and proper control. However, recent data indicate the need for cautious control through coordination and cooperation between government agencies and with the people themselves. In addition, agricultural pesticide use in the country is expected to increase with the abrupt change of cropping pattern aimed at increased rice production and the expansion of various crop growing areas.

The quantity of pesticides imported by semi-government organizations and NGOs has been growing in recent years. In the near future the proportion of imports by private organizations may dominate as a result of government policy to encourage the private sector while the government concentrates on technical and legislative measures.

The Ministry of Agriculture has a pilot pesticides formulation plant for which technical grade materials are imported and pesticides produced. The plant extract insecticide is produced by the ministry's pilot neem pesticide plant. Insecticide from the Neem tree is effective against many leaf-eating caterpillars but has little or no toxic affect on humans or the environment.

For the purpose of scrutinizing the efficacy of pesticides to be approved for use, minimizing hazards to human health and environment, promoting safe and effective use of pesticides, and assurance of registration, the government formed the Pesticide Registration Board in 1992.

The Board is entrusted to implement the Pesticide Law with the following objectives:

(a) The registration of all pesticides before marketing;

(b) The control of pesticide use on food and the environment;

(c) The control of pesticide production, distribution and disposal etc.;

(d) Monitoring the quality of pesticides in use;

(e) The control of residues in food and the environment.

So far, no national standards for pesticide residues have been established. Since Myanmar has encountered some pesticide residues in food from international trade, it is essential to set maximum residue limits and legally control them. Activities aimed at enforcing such legislation are discussed below.

Pesticide residues detected in food in recent years

The ratio of samples violating the Codex Maximum Residue Limits (Codex MAL) and National MRL (export requirement), based on the number of

samples analysed by the Pesticide Analytical Laboratory in recent years is quite significant.

The commodities analysed were mainly beans for export and the residues exceeding the limits were mostly the result of post-harvest application of improper pesticides such as Aldrin and DDT. The national export requirements are generally lower than the Codex MRL. The current use of persistent pesticides will effect the residual levels in food through plant uptake for many years. Some organo-phosphorous insecticides were also detected. In addition, residues from the incorrect use of post-harvest pesticides, e.g., aluminium phosphide, still remain to be examined.

6. Water for sustainable food production and rural development

Myanmar is endowed with abundant water resources, and feasibility studies have already been undertaken on their exploitation and utilization for agriculture and rural development. At present, there are 24 watersheds with dams that supply water for agriculture, rural development, and hydropower for domestic and industrial uses. Those watersheds are of considerable importance since they cover a total land area of 19,000 sq km. Several additional hydropower projects and irrigation schemes have been proposed, covering a total area of about 11,090 sq km.

The prime criterion of the agricultural and rural development policy in Myanmar, like many other countries, is "sustainability". The efforts of Myanmar to promote sustainable use of water for agriculture and rural development are also in line with the International Action Programme on Water and Sustainable Agricultural Development activities, developed under Agenda 21 of UNCED.

(a) Provision of adequate water for agriculture

The availability of adequate water for agriculture is a critical factor and remains crucial in enhancing per unit yields. The Ministry of Agriculture has accordingly adopted five measures with a view to raising irrigation coverage of the net sown area to 25 per cent. The percentage of irrigation facilities made available for the net sown area in 1992/93 was 12.7 per cent. It is feasible to raise that to 16.6 per cent in 1993/94 and the target for the end of 1996/97 is to bring it up to 25 per cent.

The Ministry of Agriculture is placing emphasis on the following five measures for providing adequate water for agriculture purposes:

(a) The construction of new reservoirs and dams;

(b) The renovation of existing reservoirs to raise water storage capacity and increase efficient delivery of irrigation water;

(c) The diversion of water from streams and rivulets during high water levels into adjacent ponds or depressions and for storage with sluice gates;

(d) Lifting of water from rivers and streams through pump irrigation;

(e) The utilization of groundwater.

7. Deforestation

In the forestry sector the basic objective is to increase the output of forest products while ensuring long-term sustainability through strictly adhering to the Myanmar Selection System which constitutes one of the least destructive timber production practices to the environment and biodiversity of the tropical forests.

The export of logs has been significantly reduced to encourage investment in the domestic production of value added forest products, with reliance on raw materials within the annual allowable cut.

The demand for fuelwood and charcoal for cooking is rising with the growth in population, resulting in indiscriminate cutting of trees for fuelwood in forest areas adjacent to villages and towns. In addition, illegal logging of valuable trees in some areas is worsening deforestation and environmental degradation.

(a) Rate of deforestation

Myanmar faces a deforestation problem to a certain extent. Forests of all categories covered about

498,626 sq km or 74 per cent of the whole country in 1989, of which 51 per cent were closed forests. During the 14-year period from 1975 to 1989, the total actual forest cover was reduced at a rate of 220,000 ha per year. Deforestation in Myanmar is not caused by the commercial extraction of timber; the Myanmar Selection System has enabled the country to use this important natural resource on a sustainable basis. Deforestation is mainly caused by shifting cultivation, local fuelwood shortages and, to a certain extent, the impact of population growth.

(b) Shifting cultivation

Shifting cultivation is a poor form of land use even though it is a traditional way of life which has provided a section of population with some crops for centuries. In Myanmar, shifting cultivation is practiced by about 2.6 million people mostly living in the Kachin, Kayah, Kayin, Chin and Shan States, covering an area of about 142,000 ha.

Most of the shifting cultivators are unaware of any damage to the environment. In the absence of any other viable alternative in their ecological setting, they regard their farming as an appropriate form of food production, although in the process they destroy valuable timber species and preempt their regeneration, causing soil erosion and depletion of soil fertility.

(c) Impact of population growth

Although Myanmar has a relatively low population density compared with most countries of South-East Asia, its forest resources have come under growing population pressure, resulting in a certain amount of deforestation and a decline in wildlife populations through overhunting and habitat destruction.

(d) Fuelwood problem

In Myanmar, more than 70 per cent of renewable energy consumption depends upon forest resources. Few rural homes in Myanmar have a supply of gas or electricity. Thus there is heavy reliance on fuelwood, resulting in the depletion of forest cover in marginal forests outside the reserve forest areas.

The majority of people in Myanmar earn their livelihood in agriculture and live in rural areas. By the year 2000, as the population reaches 50 million, the demand for fuelwood will also increase accordingly. Hence, it is highly probable that unless alternative sources of fuel are provided the rate of depletion of unclassified forests will be aggravated, particularly in the dry zone. The rural poor, having no other alternative sources of energy for cooking, rely only on fuelwood collected from adjacent degraded forests and are extending their collecting into other unclassified forests.

Mangroves in Myanmar are of interest to conservationists because of the unique life forms that live among them and the adaptation of the mangroves themselves. However, most of the extensive mangroves in the Ayeyarwaddy delta are much degraded because of exploitation for fuelwood and charcoal production.

(e) Conservation of forests, replanting and reforestation

The increase in population and the rising demand for timber required the establishment of large-scale, block-type plantations, comprising commercial village supply, industrial and watershed protection plantations. The afforestation and reforestation programmes of the Forest Department continue at about 32,400 ha annually. Existing and future plantations, on reaching maturity, will contribute to the current annual sustained exploitation of 16,200 ha.

In addition to its annual plantation of 32,400 hectares, the Forest Department was distributing free more than 4.5 million seedlings a year to be planted by the population in a country-wide, re-greening programme. That number of seedlings was increased to 11 million from 1992. Myanmar is also developing the community fuelwood woodlots; and the Forest Law makes provision for the private sector to establish private plantations on deforested government-owned land, giving the right to land tenure and ownership.

8. Marine coastal degradation

(a) Exploitation of marine resources

The coastline of Myanmar, from the Naff estuary of Rakhine State to Kaw Thaung of Tanintharyi

Division is about 1,800 kilometres. When the coastlines of gulfs and islands are included the coastline totals nearly 3,000 kilometres, of which an area of about 230,000 sq km is suitable for marine fishing.

The sea area of Myanmar is estimated to contain a standing stock of 1.7 million tons of pelagic and demersal fish, of which about 1 million tons comprise the maximum sustainable yield (i.e., can be caught without diminishing the original stock). Since the total fish and prawn catch in 1994/95 was only 600,000 tons, it is obvious that as far as marine fishing is concerned there is no overexploitation; thus there is no danger of depleting the marine resources at the present rate of production. One support piece of evidence that the current marine catch per hour of 200 kg is unchanged from that recorded over the past 15-20 years.

Foreign fishing and joint venture company vessels are allowed to fish only outside the continental shelf and fees are imposed in accordance with GRT. Those measures also help to prevent overexploitation of marine resources.

(b) Coastal erosion and sediment

Myanmar has 410,000 ha of mangrove areas along its coastline which are being systematically preserved. The marine forests furnish protection from natural disasters such as storms, tidal waves and floods while catching the silt from rivers and streams, thus minimizing erosion.

Since there are very few factories, mineral mines or wharves along the coast of Myanmar there is no natural sedimentation yet, and since the coastal aquaculture industry is still using the traditional "trap and hold" method, sedimentation is not a threat.

(c) Reef degradation and eutrophication

Along the coasts, mangrove forests as well as reefs are important habitats for marine fauna. The existence of coral reefs also prevents erosion as do the mangrove forests: old and traditional methods are still largely practiced in catching fish and prawn along the reef. Since methods such as dredging and the utilization of specific poisons and bombs are not commonly practiced yet, reef degradation and eutrophication are not a danger at present.

(d) Harvesting of near-shore fish and reef resources

Along the coasts, local (artisanal) fishermen still practice the "drift net" and "trammel net" methods for harvesting near-shore fish. Even so, in accordance with government regulations and guidelines, only officially prescribed nets are permitted for catching a particular kind of fish. Regarding fishing vessels, vessels of a maximum 30-foot in length with 6 horsepower engines are allowed to operate close to the coast while larger vessels must operate at 5-10 miles from the shore, thus preventing overharvesting of near-shore reef fish resources.

9. Improvement of farm production and farming systems

Under the current circumstances, there clearly is much scope for improvement of farm production. The conditions of land, climatic influence and availability of manpower remain favourable. The infusion of necessary inputs and technology could serve to pave the way for increased production and establishment of agro-based industries for domestic and export purposes.

(a) Current agriculture infrastructure

(i) Land

The net sown area in Myanmar at present is only 8,770,000 ha. The prevalent land-use pattern indicates that the current sown area could be doubled without disrupting the ecological balance. Land reclamation and land clearing are being undertaken by the Irrigation Department and the Agriculture Mechanization Department respectively. The total area with flood protection from the construction of embankments and drainage channels by Irrigation Department in lower Myanmar as of 1994/95 (provisional) was 1,310,000 ha. Mechanized land clearing by the Agriculture Mechanization Department will increasingly form part of land development operations. Mainly in Ayeyarwaddy and Bago Divisions progress has been made in the land development programme through the combined efforts of the

government and the population in recent years.

(ii) Water resources

At present only about 1,650,000 ha (13.35 per cent) of the total area under cultivation enjoy irrigation facilities. Efforts are being made to widen the coverage. In that respect, the many existing perennial water sources, readily available groundwater and catchment areas remain as valuable assets that can be harnessed.

The scope for lift irrigation will also have to be enlarged. The permanent irrigation networks at present, however are located in the semi-arid zones. The presence of riverine and water resources in lower Myanmar, on the other hand, offer scope for increasing pump irrigation. Lift irrigation forms an important requisite for that purpose. In particular, the expansion of pre- and post-monsoon crops will remain dependent on the availability of lift irrigation. It will also be the dividing line between the success or failure of crops. As such, it is crucial for that sector to be strengthened.

With regard to expanded irrigation facilities, about 610,000 ha of arable land is to be brought under crops by the year 2000 as one of the approaches towards increased production. However, the major share of any increase in production will have to be generated through greater cropping intensities and higher yields, optimizing farmland already under cultivation. The availability of supplement water, will however, be a critical factor in implementing such a measure. An adequate amount of water at the appropriate time is indispensable for the healthy growth of crops; since the climatic conditions and patterns of rainfall in Myanmar make that possible, irrigation will play an important role.

Although the task of providing irrigation support in Myanmar is currently assumed by the State, certain networks managed by local communities themselves or jointly with the State are also providing a contribution.

(iii) Farm power

At present the main reliance is on animal power, mainly buffaloes and oxen. As a result of inadequate numbers, however, their primary contributions remain confined mostly to the cultivation of main crops; and as their uses are overstretched by the first crop, an extension of their use for the second crop is marginal and constitutes a limiting factor in increasing multiple cropping. In practice, however it has not been feasible, since the ratio of area under crops to animal population remains disproportionate in many Divisions and States.

(b) Crop diversification and multiple cropping

The total area under multiple cropping has increased from 530,000 ha in 1961/62 to 1,800,000 ha in 1990/91. An increase in area of 1,530,000 ha was registered between 1990/91 and 1994/95. Expansion will continue with improved irrigation facilities and drainage. As stated above, although the expansion of the crop area through the opening of new land cannot be carried out extensively, area expansion under multiple cropping has been accepted as one way of raising total crop production.

The present systems for crop diversification can be summarized as:

(a) Growing a pre-monsoon crop before the main crop in rice-growing areas (summer rice, jute, cotton, sesame);

(b) Growing some suitable crops after rice (summer rice, sunflowers, food legumes);

(c) Growing two suitable crops in succession in dryland areas, with or without irrigation (sesame, food legumes, corn etc.);

(d) Mixed sowing of two crops with different rates of maturity in the same field (for example, sesame and pigeon peas, groundnuts and corn).

An increase in the area under multiple cropping has been accomplished mainly through irrigation and agriculture mechanization. The expansion of the irrigable area in upper Myanmar has contributed much towards the increase of area under pre-monsoon long staple cotton, while the expansion of area under late rain groundnuts, sesame, peas and beans, and jute in lower Myanmar is being achieved mainly through agriculture mechanization.

Rice-based crop diversification over monoculture was effectively and extensively launched

by the government in 1970s for economic as well as nutritional reasons. With improved and modern technology, exotic crop varieties were also introduced from various international research institutes.

Depending on the regions where they live, almost every farm family keeps a family-size livestock such as poultry, pigs, cattle, buffaloes, goats, sheep etc. It is more or less a tradition for farmers to keep those animals for eggs, meat, milk or for draught power. Although experimental and pilot-scale farming was carried out as early as the beginning of 1970, sophisticated and economically viable size rice-fish farming was introduced by the farmers of Ayeyarwaddy Division with full support of the government.

(c) Rice-fish farming

Rice-fish farming is being introduced in deep-water areas which were totally non-cultivable land where the cultivation of deep-water paddy as a single crop was uncertain. Rice farming has enabled double cropping of paddy or of paddy followed by other crops, while additionally permitting fish and prawn culture and cultivation of vegetables and fruit on the bunds. This symbiotic farming of crops, aquaculture and livestock is an environmentally friendly system and is being copied in other States and Divisions. However, such a farming system should be adopted only in naturally topographically suitable areas.

(d) Rural infrastructure and proportionate regional development

The different agro-ecological zones in Myanmar are fairly well defined. In order to promote proportionate regional socio-economic development, it will be necessary to expand research in order to assist in recommending the most suitable crops and the best adaptive technology for each respective region. It will also be important to encourage greater involvement in integrated farming to generate supplementary farm incomes and create rural job opportunities.

The Ayeyarwaddy river is the largest navigable and the most important river in Myanmar. The east bank had been developed even before the Second World War as a result of better transport and communications than those on the west bank. Since the beginning of the 1990s, the government has constructed several bridges across the smaller rivers along the west bank as part of its regional development efforts. The most recent one, which is still under construction, is from Pyay to Padaung; on completion it will greatly improve the agriculture and industrial sectors of the region.

B. Agricultural policies on sustainable development

1. Agricultural policy review

Under the former centrally planned socialist economy, a 20-year long-term plan and five four-year short-term plans were implemented, during which various economic policies restricted investment in infrastructure and production and led to low productivity and income, poor technology, inadequate management and chronic foreign exchange difficulties. The economy achieved little more than maintaining self-sufficiency in food. Manufacturing, mainly for import substitution, was limited in scope and low in productivity, and the service sector developed very slowly.

When the State Law and Order Restoration Council (SLORC) took over governing the country, it announced the adoption of a free market economy in 1988 and has since taken further steps to pursue liberalization including: (a) enacting a new foreign investment law (November 1988), which gave greater incentives and guarantees to foreign investors; (b) the legalization of border trade (late 1988) to encourage trade with neighbouring countries; (c) a clearer definition (March 1988) of the role of the State economic enterprises and the restriction of the number of activities to which they had exclusive rights; and (d) the introduction in 1988 of new trading mechanisms to allow the private sector to enter the export sector and retain foreign exchange earnings.

(a) Agriculture policies

The agricultural policies of the government include:

(a) *The right to till land*: Since the State is the ultimate owner of land, under the present land policy a farmer is given the right to till the

land so long as he and his family utilize it and it remains inheritable. However, he cannot sell or sublet his land to tenants. This policy protects a farm family from becoming landless. Also, by giving the right to till the land to the actual tiller, the number of farmers with large holdings has been substantially decreased, while the number of farmers working on smaller holdings has increased correspondingly.

(b) *The freedom of farmers to choose crops, fix price and arrange marketing*: With the adoption of an open market economy, farmers are free to choose any crop and area they like, transport and store the produce, and sell to anybody at any price they choose. This policy was welcomed by the farmers and there was an abrupt increase in the volume of cash crop production, mainly peas and beans. For the national economy, the government should provide a guided control over the farmers to a certain degree as practiced even in some developed countries. The impracticability of overzealous and abrupt increases in areas sown with various crops on the same land and during the same season should be reconsidered;

(c) *The right to cultivate or utilize land*: With notification No. 44/91 of 13 November 1991, the government prescribed the duties and rights of the Central Committee for the Management of Cultivable Land, Fallow Land and Waste Land. The Committee has the authority to grant the right to cultivate Land, the right of State-owned organizations, joint ventures, other organizations and private individuals to utilize commercially viable land, fallow land and wasteland for the purpose of carrying out agriculture, livestock breeding, aquacultural enterprises or other affiliated economic development enterprises. In accordance with the existing land laws, the Committee has the right to grant 5,000 acres of such land for a maximum period of 30 years, with the possibility of extension. Many national and international investors approached the government for permission to expand the area and the extension of the grant period. The government eventually agreed to expand the grant area up to 50,000 acres but it retained the 30-year period;

(d) *Land-use planning and management*: The government would like to develop the present 9,510,000 ha of fallow land and cultivable wasteland into cultivable land through forests clearing, reclamation etc. Initially, such types of land should be identified, priority areas analysed and maps prepared using satellite imagery, geographical information systems and field surveys. An educational programme should be carried out to foster understanding and responsibility for the use and conservation of land. Land-use plans would be developed with the participation of line ministries.

2. People's participation

In Myanmar, sustainable agriculture, like any other activity, will be built upon a tradition of communal cooperation and voluntarism. Villagers and rural communities will be actively involved in the overall process of village-level agricultural plans, developing strategies, preparing the ground work and, eventually, implementation activities. That will ensure that the participating villagers are adequately informed of the objectives and strategies set forth by the plan and that they are consulted and made a part of implementing the plan. In Myanmar, especially in the rural areas, it is a mixture of social, voluntarism and religious tradition when villagers get together and help each other at times of problems. Social welfare activities, be it sad events like funerals or merry- making like wedding ceremonies, meritorious deeds like religious functions and pagoda festivals, or public works like the construction of roads and bridges, the restoration of wells and ponds, or even a trivial errand like renovating and re-thatching roofs, villagers and neighbours join together and successfully accomplish the job. The key contacts are the village elders, religious leaders and Village Law and Order Restoration Councils.

C. Desirable strategies for sustainable agricultural development

The national agricultural policy has to be formulated in the light of the required role of the

agriculture sector in national development. Alleviation of poverty as well as the need to maintain and sustain the contribution of the agricultural sector is of paramount importance. Policies should cover reforms in order to further improve the agricultural production and market support systems, and support services and facilities.

The objectives of such a policy are to maximize income from agriculture through efficient utilization of national resources and to revitalize the contribution by the sector to the overall economic development of the country. Efficient resource utilization combined with maximization of farm income, based on efficient production, modern technology and the judicious selection of economically remunerative crops, will lead to growth of the agriculture sector. That growth, in turn, will contribute to overall economic development.

Maximizing farm income serves not only to alleviate rural poverty and improve quality of life but also facilitates the retention of productive labour in agriculture. The process of maximizing farm income will be achieved through the expanded production of traditional export crops, and the development and expansion of production of food and industrial crops. The current approach to agricultural development through new land development, *in situ* development, the provision of support services and incentives, and social and institutional development, should also be strengthened.

To enhance farm productivity, the efficient use of land will be complemented by a crop diversification programme, lower costs of farm inputs and improved farm practices. The long-term sustenance of agriculture will be protected through appropriate management and conservation of land and water resources.

1. Suggested policies for sustainable agricultural development

(a) Suggested policies

The following proposed policies may need grouping and rephrasing from the point of view of their legality, before being adopted:

(a) Encouraging the private sector. Under the centrally planned socialist economy, the people expected the government to do everything for them. Now that a market economy has been introduced, the government should minimize its intervention in agricultural production and marketing by encouraging the involvement of the private sector in areas except rice, the staple food of the country. The government should concentrate on research and development, the transfer of technology, and infrastructure and support services;

(b) Expansion of employment opportunities in the agricultural sector through resettlement programmes. Certain places in the country, for example, Kabaw Valley in northern Sagaing Division, has tens of thousands of sparsely populated acres where the soil is fertile and the climatic conditions are conducive to the cultivation of a rice-based cropping system. Resettlement programmes should be introduced and established in such places with a strong workforce led by agricultural graduates from Agriculture High Schools, Diploma Colleges, the Institute of Agriculture and the Institute of Animal Husbandry and Veterinary Science, as well as unemployed and idle manpower. The government should provide the necessary infrastructure, input facilities and credit. Such resettlement programmes will not only boost agricultural production but also boost the socio-economic development of the region and ultimately the country;

(c) Urban-rural income disparity. A policy on boosting rural income, expanding the rural production base and improving the rural environment should take into consideration the well-known Saemaul Undong (New Community) programme of the Republic of Korea. The programme comprises a comprehensive rural community development movement and a grain price support programme under which the government buys foodgrains from domestic farmers and sells them at prices lower than the cost of purchase. As a result, urban-rural income disparity in the Republic of Korea was significantly reduced. The Saemaul Undong movement, which is now deeply rooted in rural society, has improved the social environment in rural areas and enhanced the

standard of rural living in the Republic of Korea. Since it proved to be so effective and popular, such a plan should be tried in Myanmar where the rural population accounts for some 68 per cent of the total population;

(d) Socio-economic development policy for rural areas with consideration on environment protection factor. Improving the rural social environment and promoting rural welfare is one of the most important investments that a country has to make. Through the continuous promotion of the related activities in rural areas, the quality of life in the rural social environment can be improved. Regarding integrated rural development, Myanmar has had a head start; the country has already gained extensive experience in that field, having gone through difficulties and hardships, especially in its remote and isolated areas where accessibility is one of the main limitations. In the integrated rural development programme of Myanmar, top priority is given to the development of border areas and the ethnic groups residing in those remote areas because they have lagged behind in all aspects of development as a result of insurgency. A separate Ministry for Progress of Border Areas and National Races and Development Affairs was formed in September 1992, with a view to implementing the programme more effectively.

The invaluable experience gained from border area development programmes could be used to expand the integrated development programme to other rural areas in the country. In fact, such an important programme which targets the majority of the population should be integrated into a national agricultural policy;

(e) The importance of the fundamental role of the agricultural sector in industrialization. Agriculture has remained the single source of income and employment for the majority of people in Myanmar, and poverty is most rampant among those engaged in this sector, and in particular among landless farmers. Thus, in order to raise the standard of living of the majority of the poor, it is imperative that the agricultural sector be developed. That development is essential to the industrialization of the country and the promotion of export trade. Only when there is success in increasing, at low cost, the volume of production of foodgrains and other farm products will the wages of industrial workers and the prices of raw materials remain stable, thus enabling industry to stand up to international competition.

(b) Desirable strategies

The degree of the success with the national agriculture plan and its objectives largely depends on the strategies used for implementation. Those strategies should include:

(a) Infrastructure development, especially in the cultivating areas;

(b) Close coordination and cooperation between line ministries, government organizations, State and Division Law and Order Restoration Councils;

(c) Carefully planned multiple cropping, using balanced fertilization and economically viable farming systems;

(d) Transfer of technology. The Agricultural Research Institute (ARI) and the Applied Research Division (ARD) intensive research programmes should be revived at all levels and in all disciplines, and training courses resumed for farmers;

(e) Quality seed production. The seed production system is now well established, and the private sector should be encouraged to set up a seed industry and take over the majority of production;

(f) Development of land resources. Proper long- and short-term land-use planning should be introduced for the development of available land resources;

(g) Full utilization of existing infrastructure. While studying or exploring new and better types of infrastructure and programmes, investment and efforts should be devoted to fully utilizing existing infrastructure. Focus should given to investment in programmes that are likely to rapidly boost production within a short span of time; it would be useful to review and revise such programmes that

are already in operation;

(h) Improving the quality of agricultural produce and imports of commodities substitutes. The government is making use of private and independent inspection agencies, mutually appointed by exporters and importers, to inspect agricultural products for export such as rice and pulses, and ensure that they meet the specifications agreed upon prior to signing a contract. In the case of import substitution, the annual import value of palm oil of about US$ 50 million will gradually be reduced;

(i) Agro-industrial processing. Although tropical fruit and vegetables are abundant during the peak season in Myanmar, providing a surplus that could be exported, a large amount goes rotten as a result of the lack of proper food preservation and processing technology. The government should therefore encourage a processing industry, especially for perishable commodities. Financing should be made available to private investors for commercial agro-industrial ventures. Such emphasis should be a major consideration in designing an appropriate agricultural development programme. Soundly-based joint venture projects, capable of providing the necessary technical and financial inputs, should be welcomed. The expected benefits are a greater market potential, creation of employment opportunities, increased returns to growers, the generation of foreign exchange and a reduction in food imports. Meanwhile, as a medium-term plan, qualified and experienced food technologists from overseas should be recruited to assist in identifying viable agro-based processing possibilities;

(j) Government service awareness. In Myanmar, people have been over-aware of government service. Soon after leaving school, graduates have attempted to join government service which has resulted in too much competition and unemployment. Using current agricultural policies, the government should actively encourage agriculture, fishery and animal husbandry graduates of all levels to enter, individually or collectively, agricultural, fisheries and animal husbandry enterprises. Graduates in economics, commerce, statistics, accountancy, English, and civil and mechanical engineering can reinforce basic agro-animal husbandry farming and enterprises. Credits and input facilities should be provided by the government;

(k) Employment generation and income distribution. This depends on the scale of production and its implications for employment generation and distribution. Of the three scales of operation to implement programmes and projects, village-scale farmers, commercial smallholders and corporate or large-scale farming, the first two should be favoured for their higher contribution to employment and income generation and also because they involve low levels of capital input;

(l) Promotion of investments for commercial plantations. A corollary to the policy on cultivation or the right to utilize land, the government should encourage the formation of large-scale commercial plantations using modern management techniques capable of generating large export surpluses. To that end, the government should support worthwhile joint venture projects between either the State or the private sector with foreign investors in agriculture. Proposals to bring in experienced outside management to assist with locally-inspired projects should be encouraged. Terms, conditions and processing should be modified to attract and expedite investment, especially foreign investment;

(m) Large agricultural enterprises should also be encouraged. For example, with technological assistance from the government, the private sector should set up a large-scale seed production industry to produce quality seeds for economically important crops as well as hybrid seeds for rice, corn and cotton. A yield increase of about 30 per cent would provide a big boost to the total national crop production;

(n) Maximum utilization of the existing facilities. A high priority should be given to the maximum utilization of existing facilities and to the improvement of productivity in areas already covered by irrigation facilities. Command area development, efficient water distribution and improvement of crop-soil-water management practices should be

encouraged;

(o) Intensification of existing land. Before reclaiming and developing fallow and cultivable wasteland, intensification of production on existing land with adapted crops as well as improvements in product quality are crucial for future agricultural development. Development of additional reclaimed arable land should be carefully expanded;

(p) The human factor, which plays a very important role in the successful implementation of agriculture plans, is of paramount importance in the improvement of administrative, managerial and technical skills of staff. Close supervision down the line will reveal those staff who deserve to be either penalised or rewarded; such supervision will enhance the diligence of the staff;

(q) The importance of extension service and research in achieving agriculture sector programmes, objectives and targets cannot be overemphasised. Extension and research efforts will be rationalised in accordance with priorities of the agriculture sector. The links between extension and research should be strengthened to ensure that positive results are effectively transmitted to farmers in order to increase productivity and improve the application of modern technology for increased agricultural production. Training of in-service staff and farmers will also be actively pursued through existing institutions and Agricultural Extension Stations needs to be revitalized. The extension service should be modernized and its sources diversified, to ensure the swift, effective communication of new ideas, techniques and results to farmers;

(r) Weather forecasts. Special and accurate weather forecasts for farmers and officials concerned should be arranged for agricultural purposes. It is important for such forecasts to be announced through all available media well in advance, to enable adequate preparations and precautions to be taken;

(s) Identifying new water supply projects. In identifying new water supply projects, focus needs to be on short gestation, cost effectiveness and labour intensive water projects, except where large projects are needed for conservation of water to feed small projects in the dry season. Thus small and medium-sized flood protection, drainage and gravity irrigation, and minor irrigation projects need to be given priority for implementation. As the Department of Water Resources and Utilization, which was recently under the Ministry of Agriculture and Irrigation, should identify and list various ways of tapping water, especially by village level irrigation projects. Depending on the availability of funds, manpower, materials and equipment, and with due consideration of the political, socio-economic and regional development aspects, projects should be prioritized and prepared as part of the Master Plan which will form the main basis of the development of the water sector;

(t) Priority crops. Of more than 60 crops, including fruit and vegetables, currently under cultivation, several should be selected as priority crops according to specific economical criteria. New exotic crops which are important both for domestic consumption and export, such as oil crops and medicinal plants, should be introduced; if testing shows them to be adaptable and of value, their cultivation should be expanded;

(u) Participation of local people as beneficiaries. The participation in projects by local people as beneficiaries of drainage and irrigation programmes will be encouraged from the planning to the implementation stage. This would include voluntary labour contributions and management, especially through the administrative bodies of States and Divisions;

(v) Floating/barge-mounted water pumps. The augmentation of streams and channels leading from small and large rivers should be pursued with the use of larger capacity floating/barge-mounted water pumps;

(w) Stricter control of expenditure. As the volume of networks under the agriculture plan expand and maintenance of existing works continues, a higher budget will be required. That will result in calls for stricter control over expenditure. Proper accounts should be kept by well-qualified and experienced staff; quarterly auditing by internal auditors and six-

monthly audits by external auditors will need to be carried out.

2. Suggested policies for the promotion of sustainable development in the forestry sector

(a) Suggested policies

The following policies are proposed:

(a) *Forest inventory.* In order to ensure availability of up-to-date information on national forest cover, a forest inventory should be taken regularly, using satellite imagery, the geographical information system and aerial photography followed by statistically and biologically sound ground checks. The inventory must include, *inter alia*, the location, topography, type of forests, tree species and, if possible, some parameters for estimating the age of trees so that the value of forest products can be appraised at the time of the inventory. Such data are valuable in checking whether or not illegal timber extraction is taking place;

(b) *Forest protection.* Existing forests need to be fully guarded and protected from various forms of destruction, be it ecological or mechanical, and especially from illegal loggers and poachers. Access routes by land or sea must be blocked and regularly checked;

(c) *Securing high productivity from use of agricultural and forest land.* Areas requiring urgent action to contain adverse impacts on forests include the adoption of improved technology to secure high productivity from agricultural and forest land, combined with a careful assessment of land potential to permit allocation for the most appropriate use. Investments in research, training and the dissemination of necessary technology are required to ensure optimum, together with adjustments in policy and planning in order to support implementation. A fundamental requirement is the awareness, commitment and full participation of the *de facto* decision-makers, i.e., the population and communities involved in forestry and agriculture;

(d) *Social forestry.* Apart from the long-term benefits of eco-restoration, including soil and water conservation, the immediate benefits of forestation are substantial in terms of generating employment and providing fuel and fodder. In addition to State and Division schemes for social forestry, the centrally sponsored schemes of social forestry such as the greening of nine districts in the central dry zone of Myanmar and village fuelwood plantations should be extended to cover all fuelwood deficit areas. Special attention should be given to the identification and propagation of indigenous, location-specific and thermal-efficient species that are acceptable to the people. Efforts must also be made to bring down the unit cost of afforestation and to secure wide participation by the population. Forest management should be made more sensitive to the aspirations and needs of the public;

(e) *Coordination and cooperation between the agricultural and forestry sectors.* The agriculture and forestry sectors should coordinate and cooperate closely in various tasks including, *inter alia*, proper land-use planning, construction of dams, watershed management and catchment area control, preventing siltation and sedimentation of reservoirs, coping with submerged trees in new irrigation projects and sloping agricultural land technology (SALT). SALT is an excellent example of where agriculture and forestry programmes combined symbiotically to form a replicable model. SALT is a well-known soil conservation-oriented farming system developed in the Philippines in the late 1970s. The agroforestry technology of SALT has gained Asian-wide popularity as a culturally appropriate, ecologically fit, economically sound and technically astute development tool. SALT should be introduced as an effective substitute system in slash-and-burn areas. SALT technology will complement government policy on the development of border areas and ethnic groups as well as secure the border regions;

(f) *Land-use policy.* Encroachment into tropical forest areas is the result of population pressure which results in the need to expand

agricultural land. The problem calls for a land-use policy to oversee and coordinate overall land utilization in the country. It is necessary to prepare a land-use plan which should ensure that land is used for the purpose for which it is best suited. The most important issue is to ensure that the total land area of Myanmar is used prudently and effectively as that will ultimately lead to socio-economic development in an environmentally friendly way;

(g) *Shifting cultivation.* The problem of shifting cultivation has long been a focus of attention among administrators, foresters, agronomists and diverse specialists. With the application of SALT, about 2 million roving farm families who cultivate an area of about 2,430,000 ha, which mainly comprises unclassed and degraded forest land, can settle down in locations of their choice. Through SALT they can enjoy farm produce as well as forest products. However, the rapidly growing population has resulted in a major increase in the frequency with which shifting cultivation blocks are being cultivated. That has led to changes in the vegetation structure of the forests being transformed into degraded secondary shrubland that has no production potential. That fact is observed more clearly in the coastal, eastern and north-eastern regions of Myanmar which bear ample testimony to the damage done to soil and vegetation. Consequently, serious efforts should be made to establish a well-defined tenure system to serve as an incentive for shifting cultivators to improve the productivity of the land. All available means should be employed through education and training of farmers to promote the use of permanent and modern agricultural systems.

3. Desirable strategies

(a) Nurture planted seedlings and trees to ensure survival

One of the most important measures that must be taken is the nurturing of already planted seedlings and trees, to ensure their survival and optimal growth. That measure is of the utmost importance to the government in view of the funds and time already invested in planting, and because the location of plantation has already been formally recorded. All possible rehabilitation measures must be taken in nurturing newly afforested areas.

(b) School nursery programme

A school nursery programme in village fuelwood plantations would have great benefit. The establishment of forest nurseries is an essential ingredient of most tree-growing programmes. The promotion of participatory approaches to forestry development calls for a large number of widely dispersed nurseries in rural areas to make seedlings easily accessible to villagers. For administrative and financial reasons, such nurseries are not viable when operated departmentally. Therefore, as a means for the seedlings to reach villagers, small and decentralized nurseries are essential. With their salaried staff, dependence on government departments for setting up a large number of such nurseries can lead to high costs in seedling production and transportation. A viable alternative is the production of tree seedlings by school children. A well-planned school nursery programme should be prepared by the Forestry Department, based on the selection of strategically located schools, while availability and proximity of water for nursery beds and interest displayed by school principals and staff are important considerations. The Forestry Department staff assigned to the programme should guide school staff in the various silvicultural aspects of nursery management. A mutually beneficial programme of this type would create a love and appreciation of nature among children. It would pave the way for enhanced environmental awareness, while also imparting knowledge among schoolchildren of living things, especially trees and forests, and creating physical exercise and a source of income to buy books, games and equipment.

(c) Annual plantation

The current annual plantation of 32,389 ha should be evaluated for survival rate. If there are trees missing as a result of any type of destruction, they should be replanted in order to maintain the accuracy of the recorded statistics. Depending on the success of the annual programme, a reasonable and practical magnitude of incremental programmes should be implemented, thus enabling the annual afforestation programme to develop year by year. The government

should also sanction an appropriate budget as well as the necessary manpower and materials.

(d) Large-scale commercial plantations

The government should encourage the formation of large-scale commercial plantations which use modern management techniques capable of generating large export surpluses. To that end, the government should support worthwhile joint venture projects between the government and outside parties, either local or foreign, or between private entrepreneurs and foreign investors. Proposals to bring in experienced outside management to assist with locally-inspired projects should be encouraged, with the government standing ready to assist in negotiating leases and contracts as well as providing essential institutional support and facilities, particularly in the areas of marketing and loan financing in local currency. Chapter V of the New Forest Law, 1992, contains provision for the regeneration of forests, whereby joint ventures or private enterprises may, with government permission, undertake forest regeneration. This clearly is a provision, under the new economic policy, which is intended to encourage private enterprises.

(e) Deforestation

A major part of tropical deforestation is the result of pressure to expand agriculture, grazing and fuelwood gathering, mainly originating in the growth of poor rural populations. Reducing such pressure depends above all on more general economic and social development. However, while development can reduce the pressure emanating from rural poverty it can also generate increased demand for forest products and food, particularly livestock products. Such demands should be met by adequate technological progress in order to prevent further unsustainable harvesting and expansion of farming. Thus, efficient forest management and provision of incentives for conservation are an essential part of any policies concerned with keeping deforestation in check when poverty-reducing development occurs.

(f) Service functions of forests

The perspective for forestry development in a decade or two is one of intensifying competition for the goods and services of the forests and for the use of forest land. The demand for forest products will continue to grow with the increase in population and economic development. In the developing countries, part of the forest land must be transferred to agriculture. The increasing scarcity of undisturbed forests makes the need to conserve such areas, in terms of soil, water, ecosystems, genetic diversity and the composition of the atmosphere, more urgent.

(g) Consolidated annual afforestation programme

A well-consolidated annual afforestation programme which takes into consideration the area, location, tree species and other logistics should be prepared well in advance. Such a programme should be strictly enforced and every effort should be made to ensure that it is successfully implemented and that the target is met.

(h) Wood-based industries

Myanmar used to export timber in log form to earn scarce foreign exchange, but the policy has changed with every effort being directed towards the promotion of wood-based industries and exports of value added products, e.g., sawn timber. The government should hold frequent discussions with private wood-based industries and assist them in any way it can to supply raw materials and facilitate exchange visits between local and foreign wood industrialists. Assurance of a national balance between the national forest industry processing capacity and resource availability is a prerequisite. The government should also render assistance to local wood industries in importing necessary materials, tools, equipment and spare parts on easier terms. The formation of joint venture companies between the government and the private sector, or between domestic and overseas entrepreneurs, should be encouraged by the government.

(i) Encourage use of lesser known species

Teak is accepted as the best timber in the world.

In Myanmar the people, rich or poor, like to use teak for every wooden product. It is vital for the government to use all possible means to discourage the use of teak for ordinary purposes and to encourage the use of other lesser known species, some of which are almost as good as teak. This kind of public education should include publicizing the physical characteristics of the different lesser known species of trees by demonstrating their use in the construction of buildings, furniture and other utilities. Price incentives should also be used by the direct method of raising the teak price in the currency and lowering the prices of lesser known species.

(g) Forestry research

The Forest Research Institute was established in 1975 as a Division of the Forestry Department. Recognizing the pivotal role of forests and forestry product research in support of successful forest conservation and development programmes, existing research facilities should be developed into a dynamic research institution with sufficient manpower and facilities to carry out its functions more effectively.

(k) Extension service

An Extension Service Division was recently established in the Forestry Department. Although it will have a different function to that of agricultural extension staff, who have to deal with a large number of farmers all over the country, the service is a necessity for the Forestry Department which needs to develop mechanisms for greater public involvement in forestry programmes. Extension Demonstration Centres should also be set up as necessary in townships to provide, *inter alia*, information, education and communication, supervision and inspection of all operations, and the transfer of technology and training.

5. Suggested policies promoting sustainable development of marine resources

(a) Current policies

Current policies include:

(a) Increasing all-round production, conservation and effective utilization of resources;

(b) Sharing surplus marine resources with neighbouring countries through joint ventures;

(c) Encouraging the expansion of marine and fresh-water aquaculture;

(d) Permitting the private sector, local and foreign, to utilize fallow and virgin land for aquacultural purposes.

(b) Suggested policies

Additional policies could include:

(a) *A marine resources inventory*. Such an inventory is always very useful as it provides up-to-date data on marine resources, which can fluctuate depending on the magnitude of exploitation, be it legal or illegal, and destruction as a result of diseases, pollution etc. With regard to marine resources, it is estimated that pelagic and demersal fish constitute a standing stock of 1.7 million tons, of which the maximum sustainable yield is about 1 million tons. This resource should be checked regularly with the help of the acoustic method, the trawling method or any other modern system for estimating the stock. Data should include, *inter alia*, types of marine products, fish species, location and migratory pattern. Availability of such statistics will help in revealing illegal fishing;

(b) *Securing marine resources*. Special arrangements should be made to secure the marine resources. With the granting of concession areas and the establishment of joint venture companies, there have been several undesirable incidences of illegal catches through various means. Therefore fishing grounds and exit routes should be thoroughly protected and severe punishment meted out to violators;

(c) *Zone-specific and species-wise capture fisheries.* Ways and means should be sought for enforcing zone-specific and species-wise capture fisheries in order to avoid incidental by-catches and technical difficulties in

storage. Even if unwanted fish are caught they should be utilized to produce higher value products such as fish meal. The discarding of by-catches and other marine resource wastes at sea must be prevented to avoid economic loss and sea pollution. In this connection, the Ministerial meeting of the twenty-first session of the FAO Committee on Fisheries, held in Rome from 14 to 15 March 1995, drew the attention of the international community to the fact that to achieve the production levels needed to keep per capita fish consumption at its present level, action was required on several fronts, including:

(i) Increasing production from aquaculture;

(ii) Implementing vigorous and sustained measures to ease the pressure of over-fished stocks;

(iii) The use of sea ranching and stock enhancement techniques;

(iv) The protection of marine and coastal fish habitats;

(v) The reduction of the present massive waste of fish resources.

(c) Current strategies

Strategies for future development laid down by the Ministry of Livestock and Fisheries for the development of fisheries sector include:

(a) Expanding local fishing fleets;

(b) The construction of shrimp hatcheries;

(c) Increasing the distribution of fingerlings;

(d) Establishing onshore facilities;

(e) Developing fishery production research activities;

(f) Promoting private shrimp farming activities.

(d) Desirable strategies

Desirable strategies include:

(a) *Quality upgrading.* In order to boost the output of marine products, it will be necessary to emphasize: (i) the protection of the resource; (ii) develop and improve ways and means of keeping such products fresh, and of processing them; and (iii) fully exploiting and utilizing the resource in a rational way in order to increase production and upgrade quality;

(b) *Laws and regulations.* The government should strengthen control of the fisheries industry, introduce laws and regulations on fisheries, issue fishing permits, control the intensity of offshore fishing and protect all aquatic resources. The management of coastal and offshore fishing grounds should be strengthened in order to preserve marine resources;

(c) *Infrastructure.* To increase fish production, it will be necessary to promote infrastructure support, particularly the development of fishery facilities and regional ports;

(d) *Research and training*. Among the agricultural, forestry and fishery sectors, agriculture ranks top in research institutions, facilities and infrastructure, followed by the forestry sector. In the fisheries sector, wide and varied areas in need of research exist, such as identification and taxonomy of marine products (e.g., shrimps, lobsters, crabs, cuttle fish, oysters etc.), capture fishing, processing and fishmeal production. Facilities similar to those in the agriculture and forestry sectors should be strengthened and scientific research undertaken on marine resources;

(e) *Extension division.* The necessity for an extension service in agriculture and forestry has been already explained above. Similarly, such a service is an essential component of marine fishery programmes to enable the upgrading of the skills and competence of fishermen.

D. Conclusion and recommendations

Myanmar, like any other developing country, needs to have sectoral policies, objectives and strategies in agriculture, forestry and fisheries which

are based on the present socio-economic, political and administrative situation. The three sectors should be monitored, supervised, evaluated and revised as necessary. The ministries concerned should issue documents that formalize the commitment and intent of the government in ensuring sustainable development of the resources for economic and environmental purposes. Surveys and studies which have not been previously or properly carried out (e.g., water demand in industries, soil sedimentation and rehabilitation) should now be undertaken systematically as part of short- and long-term plans; the results should be officially documented and published.

With regard to environmental affairs in Myanmar, the concept is: "Everything possible is being done to prevent environmental degradation and make it a heritage that future generations can enjoy".

Myanmar, although included among the least developed countries, is well endowed with natural resources for agriculture, forestry and fisheries. Modern technology and capital investment, coupled with a well-prepared plan and proper management, will lead to sustainable utilization of those resources. Priority should be given to self-sufficiency in food in order to contain domestic prices. When any surplus is exported, proper processing, packaging, storage and transportation are prerequisites to meeting international market requirements and standards.

The suggested policies in this report, which have been discussed in detail to bring about better comprehension and serious consideration, could be used as a base to modify and improve and, if found feasible, officially adopted. All government policies on the three sectors must be well-defined, officially and legally documented, published and have their notification issued by the government.

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