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DEVELOPMENT AND INTERNATIONAL ECONOMIC CO-OPERATION: ENVIRONMENT

Progress made towards sustainable and environmentally  
sound development

Addendum

Report submitted by the Food and Agriculture Organization  
of the United Nations

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ASPECTS OF FAO POLICIES, PROGRAMMES, BUDGET AND ACTIVITIES

AIMED AT CONTRIBUTING TO SUSTAINABLE DEVELOPMENT

INTRODUCTION

1. The following report was prepared in response to UN General Assembly resolutions 42/187 and 42/186, and FAO Conference resolution 9/87. An extended version (document CL 94/6) was considered by the FAO Council at its 94th Session in Rome (15-25 November 1988), and subsequently submitted to the UNEP Governing Council in May 1989 and to the Second Regular Session of ECOSOC in July 1989. During the interval between the 1988 Council meeting and the convening of the present General Assembly, there have been a number of new developments in FAO which deserve mention. This document is therefore presented in two parts; the first deals with the new developments, whilst the second part is a shortened and slightly revised version of the earlier FAO Council document.

I. New Developments

2. Important changes have been proposed for FAO's work on genetic resources and biological diversity which addresses the twin issues of conservation and utilization rather than adopting a more narrow conservation approach. These proposals build on FAO's Global System for the conservation, availability and use of Plant Genetic Resources, which is already supported by 120 countries. The Global System currently provides a legal framework - the International Undertaking on Plant Genetic Resources; an intergovernmental forum - the Commission on Plant Genetic Resources; and a financial mechanism - the International Fund for Plant Genetic Resources.

3. The Commission on Plant Genetic Resources, at its Third Session from 17-21 April 1989, requested the Director-General to submit to the FAO Conference an agreed interpretation of the International Undertaking on Plant Genetic Resources together with a draft resolution endorsing the concept of farmers' rights, which could provide an equitable mechanism to ensure that donors and users of biological diversity share the benefits derived from its availability. This concept arises from the important and longstanding role of farmers in conserving, improving and making available plant genetic resources. The Commission also requested that studies begin on "informal innovative systems" in order to better understand the process whereby farmers and others manage and manipulate genetic resources to derive specific benefits.

4. In 1989 the Tenth Session of the FAO Committee on Agriculture (COAG) and the 95th Session of the FAO Council recognized the need for greater preservation and improved use of animal genetic resources. They requested that an Expert Consultation be held to examine the many technical, legal, financial and institutional aspects of a global programme for animal genetic resources, bearing in mind the possibility of integrating the institutional infrastructures within one system, taking into account the relationships and needs of fisheries and wildlife. The expert consultation will be held from 26-28 September 1989. The COAG and Council also affirmed their support for the Working Group of the FAO Commission on Plant Genetic Resources to study the possibility for FAO to establish a global system of

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genetic resources, including animal genetic resources. The Working Group will meet from 23 to 27 October 1989.

5. Preparations are under way for the 7th Session of the FAO Panel of Experts on Forest Gene Resources, to be held in Rome in December 1989. Membership of the Panel has been revised to take into account its expanded mandate in the in situ conservation of plant genetic resources, as well as the new findings of forest biotechnologies. Further efforts have been made through the Tropical Forest Action Plan to support national conservation activities.

6. FAO places high priority on its programme on the safe distribution and use of pesticides, which account for a substantial proportion of the toxic chemicals entering international trade. Its efforts are centred on the implementation of the International Code of Conduct on the Distribution and Use of Pesticides which was adopted in 1985. The Code aims to improve the regulation, marketing and use of pesticides in member countries in order to protect human health and the environment.

7. Further steps have been taken to strengthen the Code, in particular by the incorporation of the principle of Prior Informed Consent (PIC). The PIC principle is that international shipment of a pesticide that is banned or severely restricted in order to protect human health or the environment should not proceed without the agreement, where such agreement exists, or contrary to the decision of the designated national authority in the importing country. In addition to PIC's benefit for normal trade and use, it could make a major contribution to the prevention of the dumping of toxic chemicals in developing countries. Following a Government Consultation in January 1989 FAO revised its PIC proposals, which have been approved by the Committee on Agriculture and the Council and are to go forward to the FAO Conference in November 1989 for adoption. FAO and UNEP have collaborated closely to ensure that the provisions for PIC in the Code of Conduct are compatible with those adopted for the "London Guidelines for the Exchange of Information on Chemicals in International Trade". Discussions are being held between FAO and UNEP for a joint programme on the operation of PIC.

8. Although FAO's mandate in sustainable development began with its Constitution, it recognizes that much can be accomplished through policy and programme adjustments to better address old issues and to begin dealing with new ones. Such actions have begun in FAO and will continue into the foreseeable future. In 1988 the 94th Session of the FAO Council adopted a definition of sustainable development that is found later in this report, and FAO is now moving towards an operational strategy for sustainable development. The 25th Session of the FAO Conference (November 1989) will consider a document on "Sustainable Development and Natural Resources Management". The Conference will also consider the Review of the Regular Programme which includes environment and sustainable development issues. The 1990-91 budget includes a specific element on sustainable development. In the near future FAO will discuss with UNEP matters related to sustainable agriculture, in preparation for the proposed 1992 Conference on Environment and Development, where it is foreseen that agriculture and related issues will take a prominent role.

9. FAO has completed a position paper on the potential effects of climate change on agriculture, forestry and fishery production, and has begun to take this problem into account in its Regular Programme activities. The new activities include work on the potential impact on

agriculture of sea-level rise and shifts in climate zones. The Organization regularly participates in meetings of the Intergovernmental Panel on Climate Change (IPCC), and supports the Panel by the provision of data and in the preparation of documents.

II. Revised Version of FAO Council Document CL 94/6

10. The World Commission on Environment and Development (WCED) has described the concept of sustainable development as a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change meet the needs of the present without compromising the ability to meet the needs of future generations. Its concern was to ensure that the criterion of sustainability should influence the orientation and pattern of the entire development process.

11. As the concept of sustainable development is evolving and as it extends beyond FAO's mandate and activities, FAO's ad hoc Working Group on Sustainable Development adopted the following operational definition.

"Sustainable development is the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable."

12. FAO has long been concerned with many individual and connected components of what is now defined as "sustainable development". Article I of FAO's Constitution includes among the functions of the Organization "the conservation of natural resources and the adoption of improved methods of agricultural production". Moreover, the objectives set out in the Preamble to FAO's Constitution: "raising levels of nutrition and standards of living", "securing improvements in the efficiency of the production and distribution of all food and agricultural products", and "bettering the condition of rural populations", all contribute to sustainable development. Also, seven out of the eight long-term goals identified under Major Programme 2.1 "Agriculture" in the 1988-89 Programme of Work and Budget accord more or less directly with the concept of sustainable development as set out by the WCED.

13. A limitation inherent in any established programme structure - the FAO Programme of Work and Budget is no exception - is that it reflects imperfectly, and sometimes even masks, cross-sectoral linkages and priorities. This report, therefore, draws from the various sub-programmes only those activities relating to sustainable development as defined in paras. 10 and 11 above. FAO's Sub-programme on Environment and Energy is an example of different activities linked to the broader concept of sustainable development through the Interdepartmental Working Group on Environment and Energy.

14. This report examines FAO's policies, programmes, budget and activities contributing to sustainable development. For the sake of brevity,

the focus is on FAO's Regular Programme, although selected examples of extra-budgetary funded field activities are also given. In view of the close relationship between the Regular and Field Programmes, the implementation of FAO's policies and programmes linked to sustainable development is essentially at regional and country levels.

15. The total Regular Programme budgetary allocation for activities contributing to sustainable development in 1988/89 amounts to nearly \$16 million. This figure should be viewed, however, with a number of caveats in mind. First, since most of FAO's activities related to food production and the alleviation of rural poverty contribute in a general way to sustainable development, an effort has been made to select those which fall within FAO's definition of "sustainable development" (para. 11 above). Secondly, even where specific activities or programme elements directly contribute to sustainable development, it is difficult to identify the precise proportion of their allocations related to sustainable development. Thirdly, the resources included for specific activities refer only to the direct substantive costs of those activities.

16. Hence, the \$16 million estimated as the value of FAO's Regular Programme activities related to sustainable development for the 1988-89 biennium should be considered as a conservative figure. In addition, 88 Technical Cooperation Programme (TCP) projects, with activities falling within the definition of sustainable development, were approved or being implemented during the first 6 months of this biennium.

#### POLICY AND PLANNING

17. Although the term "sustainable development" has been given a wider dimension by the WCED, it is not a new concept. Its essential features regarding natural resource conservation and rural development were embodied in FAO's Constitution over 40 years ago. FAO's policies have evolved over the years to address the multi-dimensional aspects of sustainable development - particularly its ecological and socioeconomic components - and to respond to emerging problems. For example, evidence of the adverse effects of pesticide use has caused FAO to shift its policy emphasis away from single component, pesticide-based strategies toward integrated pest management strategies based on knowledge of population dynamics and damage thresholds of pest organisms, and using suitable mixes of cultivation practices, biological control, pesticides and resistant plant varieties to achieve more sustainable control while using less pesticide.

18. FAO's policies address, either individually or collectively, the five main components of the operational definition of sustainable agricultural development given in para. 5 above. FAO's policy for soil and water conservation has three main parts: wider adoption of land use planning; encouragement of ecologically-sound production systems for crops, forests and fisheries; and an integrated approach to water resource development. FAO policy emphasis is on prevention rather than cure in such activities as soil conservation; plant, forest and animal genetic resource conservation; and watershed management.

19. Policies to achieve environmentally non-degrading development are focused on programmes such as integrated pest management (mentioned above) and integrated plant nutrition systems. For the latter, support is given to organic recycling techniques, biological nitrogen fixation and efficient use of mineral fertilizers.

20. FAO's policies to ensure technical appropriateness address a wide range of issues, including strengthening agricultural research systems through research manpower development, expansion of networks and bilateral or sub-regional research cooperation. In its position as co-sponsor of the Consultative Group on International Agricultural Research (CGIAR), FAO encourages the International Agricultural Research Centres (IARCs) to match their activities to the needs of small farmers and marginal environments.

21. If environmentally-sound practices are to be adopted and maintained, they must be economically viable to the farmer, forester or fisherman. FAO's policy is therefore to encourage new conservation based practices in the context of the farming systems in which they are applied, in the input/output marketing chain and through favourable product prices.

22. The final dimension of sustainable development is that of social acceptability. This is closely related to rural poverty which is a major cause of unsustainable development. FAO's policy for addressing these issues is found in actions to assist the resource poor farmer and the landless in gaining the means to grow or buy more food, fuel, or other amenities, without over-exploiting the environment. FAO encourages institutional change aimed at land and credit reform, people's participation in decision-making, and wider integration of women into the development process.

23. FAO's policies related to sustainable development are embodied in the decisions of its governing bodies and in policy instruments such as the Programme of Action of the World Conference on Agrarian Reform and Rural Development (WCARRD), the World Soil Charter, the International Undertaking on Plant Genetic Resources, the Strategy for Fisheries Management and Development, the International Code of Conduct on the Distribution and Use of Pesticides, the Tropical Forestry Action Plan, and the World Food Security Compact, each covering an important component of "sustainable development".

24. Rural poverty alleviation was the central theme of the World Conference on Agrarian Reform and Rural Development (WCARRD) organized by FAO in 1979. Its Programme of Action continues to provide the framework for FAO policies in regard to anti-poverty-focused rural development, emphasizing access to land, people's participation, the integration of women in development, agricultural extension/training and rural, non-farm employment. The WCARRD stressed the need to increase access to, as well as equity and participation in, all relevant aspects of agricultural and rural development - themes taken up by the WCED as central to sustainable development.

25. The framework for FAO's policies relating to improved land use are set out in FAO's World Soil Charter (1982), whose policy perspectives related to sustainable development have been incorporated into FAO's programmes. Sustainable development demands a multidisciplinary and integrated approach to land use planning, which is supported through FAO's Interdepartmental Working Group on Land Use Planning. Guidelines already prepared will be tested during 1988-89 to provide a planning package for assistance to countries.

26. FAO's policy has always been to ensure the collection, conservation, evaluation and unrestricted availability for use of genetic resources. This was reflected in the 1983 FAO Conference which adopted the International Undertaking on Plant Genetic Resources. A Commission on Plant

Genetic Resources was also established to provide a forum for discussions and negotiations on matters related to plant genetic resources conservation and utilization, and to monitor implementation of the principles of the International Undertaking. In 1987, the FAO Conference established an International Fund on Plant Genetic Resources to provide support for the preservation and utilization of germplasm world wide.

27. The 1984 Strategy for Fisheries Management and Development incorporates policies and priorities relating to sustainable development in fisheries, including the conservation and rational utilization of fishery resources in marine and inland waters; assistance to countries in the planning and development of small-scale fisheries and aquaculture, and the promotion of fish in nutrition. Country policy reviews, taking into account the 1982 UN Convention on the Law of the Sea and advisory services in fisheries planning and legislation are being carried out and the development of small-scale fisheries and aquaculture is being promoted.

28. The 1985 Tropical Forestry Action Plan (TFAP) reflects FAO's policy perspectives for forestry development and conservation. Its priority areas are: 1) forestry in land use, including conservation of the resource base and integrating forestry into agricultural systems; 2) forest-based industrial development, promoting appropriate industries/technologies and reducing waste; 3) increasing fuelwood supplies and wood energy programmes without negative environmental effects; 4) conserving tropical forest ecosystems, including plant and wild animal genetic resources; and 5) promoting appropriate institutions and people's participation for improved forest management, conservation and use.

29. FAO's effort to develop, in consultation with others, an International Code of Conduct on the Distribution and Use of Pesticides, follows and accompanies many other events going back some 25 years. The standing FAO policy was embodied in this Code, adopted by the 1985 FAO Conference, which is intended to increase international confidence in the availability, regulation, marketing and use of pesticides for the improvement of agriculture and public health. FAO assists countries in the implementation and monitoring of this Code. A recently established Pesticides Law Advisory Programme also assists countries in this regard.

30. The 1985 World Food Security Compact incorporates the principles contained in previous international understandings and agreements on food security. It reaffirms a commitment to ensuring that people are able to produce or procure the basic food they need. The Compact calls upon governments to undertake measures to achieve food security, expand production, increase stability in the flow of supplies and improve access to food by the poor.

31. FAO policy calls for the proper integration of environmental concerns in the development process. This was recently discussed at FAO's 16th Regional Conference for Europe, for which the paper "Integration of environmental aspects in agricultural, forestry and fishery policies in Europe" served to identify the need for greater harmony between environment and development policies.

32. A requirement for sound planning for sustainable development is a natural resources inventory and evaluation. FAO's pioneering work on assessment of population-supporting capacities of lands will be continued in this biennium through development of techniques for assessing crop and population potentials through agro-ecological zone analysis. Updating of

the Soil Map of the World is being carried out in collaboration with Unesco/International Soil Reference and Information Centre (ISRIC) and national soil institutes. A major publication on land evaluation is being completed, while modern techniques of land and water resource evaluation are being propagated through publications and training. The effects of possible long-term climatic changes on water resources and cropping potentials will be reviewed. An assessment of water resources for irrigation potential is being undertaken in some African sub-regions.

33. FAO's policies stress an integrated approach to water development for irrigation, incorporating concerns related to sustainability, such as water and land quality (waterlogging, salinity), water and health (water-borne diseases), re-use of waste waters for irrigation, emphasis on small-scale irrigation and utilization of existing capacity (with less damaging environmental consequences), improved water-use efficiency, and greater farmer participation in irrigation water management. Many of these principles are embodied in the report of the Lomé Consultation on Irrigation in Africa, organized by FAO in 1987. Planning for integrated water resource development is being carried out in this biennium mainly in Africa and Asia, with emphasis on small-scale irrigation, together with programmes for improved water management, and more farmer and NGO participation and involvement of women in irrigated agriculture.

34. FAO has begun the introduction of environmental impact assessment (EIA) procedures, so that projects with potentially negative environmental impacts are reviewed and monitored. Steps will be taken to avoid or mitigate negative environmental consequences. Technical assistance and training in EIA will be emphasised to strengthen the capabilities within FAO and national institutions.

35. The main thrust of FAO policies in regard to rural energy is to increase the supply and utilization of both conventional and renewable sources of energy to meet increasing demands of the agricultural and rural sectors. FAO activities in this field follow a complementary approach between energy assessment and planning, and energy technological development, in order to set in their proper context decentralized energy technologies for agricultural and rural development. A methodology for rural energy planning is being incorporated in a training manual to be issued in this biennium, as a basis for technical assistance and training activities.

36. The Geographic Information System (GIS) provides an integrated data system for agricultural, forestry and fishery resource planning. A re-assessment of the situation and trends in forest resources will commence in this biennium, leading to a world forestry assessment in 1990. The Forest and Wildlands Conservation Information System (FOWCIS) will also be further developed.

#### NATURAL RESOURCES CONSERVATION AND MANAGEMENT

37. As a follow up to the 1980 World Conservation Strategy, FAO is assisting countries in the formulation of national and regional conservation strategies, in cooperation with the International Union for the Conservation of Nature and Natural Resources (IUCN) and UNEP. FAO is assisting in the preparation of national conservation strategies for two countries during the 1988-89 biennium and is cooperating in the development of a regional conservation strategy for the wetlands of West Africa. An international scheme for the conservation and rehabilitation of African

lands is in preparation by FAO and work will soon start on developing a similar scheme for countries in the Asia and Pacific Region.

38. Since much land is lost annually due to salinity and sodicity, a guideline and a manual are being prepared on management of salt-affected soils and management of land irrigated with low quality water, to be followed up by field activities. Options are being investigated for low-cost improvement of wastelands, particularly wetlands and salt-affected lands. In the Near East, assistance is being given to the regional network on gypsiferous soils, and a manual on the management of gypsiferous soils is in preparation.

39. In regard to water sources, a publication has been prepared to provide criteria and guidelines for the safe use of marginal and waste waters for irrigation. An inventory and evaluation of irrigation technologies will be undertaken to facilitate the identification of and training in operational techniques, methods and practices. Support will continue on the health aspects of water development, with participation in the WHO/FAO/UNEP Panel of Experts on Environmental Management for Vector Control (PEEM), together with advisory services to governments on the health aspects of water development. FAO has assumed responsibility for preparation of a UN system document on water resources and sustainability with proposals for an inter-agency programme in the nineties.

40. Field manuals on watershed management have been published. Support is being provided to regional TCDC networks in training activities, together with audio-visual aids to disseminate tested techniques for upland conservation. Technical support continues to a number of integrated projects for watershed management. The FAO/UNDP project for "Support to Water Management in Asia" illustrates the integration of watershed management with forestry and food production, community development and people's participation in management, conservation and monitoring. Guidelines on land evaluation for forestry have been developed to assist land use planners. Guidelines are being prepared for the monitoring and evaluation of upland conservation projects, and a consultation on people's participation in upland conservation was organized for the Asia/Pacific region in 1988.

41. FAO's wildlife and protected area management activities seek to promote the participation of local communities in management, thereby enhancing not only their benefits from the resource, but also their stake in its sustainability. Data will be collected and analysed on the economic value of wildlife and its role in food and nutrition, as a basis for integrated planning. FAO will continue to provide technical inputs through a regional project to strengthen the network of national and wildlife parks in Latin America, while it continues with promotional and training activities, aimed at a similar network in Africa, at the request of the countries of the SADCC sub-region.

42. Forest conservation and management in arid zones and control of desertification are addressed through problem assessment, national seminars, extension and training, and the establishment and strengthening of TCDC networks relating to sand dune stabilization, shelterbelts and the use of trees and shrubs in agro-silvo-pastoral systems. Guidelines relating to the prevention and control of bush fires and management of vegetation cover for fuelwood production will be produced.

43. Reviews of sustainable management of tropical moist forests in Asia and Africa have been published and the same is in preparation for Latin America. A review of conservation and management of mangroves in South East Asia has been published as well as a manual on mapping and inventory of mangroves. Technical and operational support continues for field projects in natural forest, including mangrove, management and conservation in many countries. Projects on the sustainable development and conservation of bamboo and rattan are being executed in Asia.

44. A review is being undertaken of fisheries resources potential at national, regional and global levels, with improvements being made in fishery resources assessment methodology and its transfer and adaptation to developing countries. Analytical and advisory services will be provided to countries for improving and sustaining the fish resources of lakes, rivers, coastal lagoons and estuaries. A subregional project, "Inland Fisheries Planning, Development and Management in East Africa", will assist the riparian countries of the larger lakes of East Africa in developing and managing shared fish resources. Management techniques in lagoon fisheries will be improved and computer modelling will be undertaken for improved management of coastal fisheries.

#### CONSERVATION AND USE OF BIOLOGICAL DIVERSITY

45. Genetic resources are the heritage of mankind and most of the centres of genetic diversity are in the tropical and sub-tropical regions of the world. This genetic base is being rapidly depleted and conservation of such resources is an urgent global concern. Based on the objectives of the International Undertaking on Plant Genetic Resources, activities will focus on the establishment of a globally coordinated network of national, regional and international genetic resource programmes, including base collections, and a global information system to link the existing systems.

46. The International Fund on Plant Genetic Resources, established in 1987, will be primarily used to supplement the efforts of national governments and to complement those already undertaken by the International Board for Plant Genetic Resources (IBPGR) and other organizations. Countries' work on policies and strategies to strengthen plant genetic resources work will be supported, including the evaluation of collections, improvement of plant breeding and complementary training. Field projects with extra-budgetary funding will continue to help countries establish and effectively utilize gene bank facilities. Regional training courses will be held in Latin America and Africa on the conservation and utilization of plant genetic resources of regional importance. Efforts are also underway to establish an international network of base collections in genebanks.

47. Forest genetic diversity is fast disappearing due mainly to destruction of natural ecosystems. Assistance will be given to national institutions in the evaluation of genetic material and in seed procurement. Arrangements will be made with national institutions for exchange and improvement of genetic resources and ex situ conservation. Increased emphasis will be given to in situ conservation, through direct assistance to countries in the establishment of pilot areas to combine genetic conservation with sustainable utilization. Policy and technical work will continue through the FAO Panel of Experts on Forest Gene Resources, while field projects will continue to support this work, as in the case of the regional project in Africa for "Genetic Resource Conservation of Multi-

purpose Woody Species". A practical booklet on in situ conservation will also be published.

48. Support has been organized to provide countries with Regional Animal Gene Banks, where germplasm may be stored cryogenically on a long term basis. These banks are organized on the basis of Technical Cooperation between Developing Countries. They are established in Africa, Asia and Latin America. A Global Animal Genetic Data Bank has also been organized in the Federal Republic of Germany, where all countries may send data on genetic characterizations and on census and survey results. Access to this data is open for all countries and other users. Biotechnology applied to animal genetics is being developed to assist developing countries in the form of Regional Networks with the aim of addressing research and development to national and regional problems.

49. Fisheries genetic resource conservation seeks to protect the diversity of natural and cultured fish stocks through the protection of the aquatic environment. This requires a holistic approach to river-basin development and to the management of capture and culture fisheries. It also seeks to protect indigenous aquatic species from replacement by less valuable exotic species and from disease accidentally introduced with them. A technical paper (FAO Fish.Tech.Pap., 294) "International Introduction of Inland Aquatic Species" has been issued which lists all known international introductions of inland fish species and analyses their impact. A Code of Practice to reduce the risks of introductions of exotic species was adopted by the European Inland Fisheries Advisory Commission at its Fourteenth Session (1986, Bordeaux, France) and is currently being studied by the regional fishery bodies for the inland waters of Africa (CIFA), Latin America (COPESCAL) and South-East Asia (IPFC) for adoption within these regions.

#### PRODUCTION SYSTEMS MANAGEMENT

50. Some FAO programmes encourage production systems which reconcile growth as well as sustainability under different agroecological conditions. A paper, prepared for the Committee on Agriculture in 1987 on "Improving Productivity of Dryland Areas" reviewed various options which could be implemented. Assistance is being given to countries to develop and adopt improved soil management practices within existing production systems. The rotation of cereals with grains and fodder legumes for the improvement of production and soil management systems is being promoted in different agroecological regions. Technical support is provided to the network on minimum tillage for semi-arid areas in Latin America. A similar network is being promoted in Africa, backed by two national training courses on soil management in these regions. Multi-disciplinary work will be carried out through national institutions on alternatives to shifting cultivation, including the combined use of perennial food and cash crop trees; the resulting recommendations will be implemented through field projects.

51. FAO's approach to farming systems analysis and development is based on understanding the perceptions and problems of farm households and communities, and the trade-offs between profitability, productivity stability, equitability and sustainability. Methodologies are being incorporated in training materials, which will be field tested in this biennium. Studies of the evolution of particular farming systems over time are being conducted in some countries of the Asia/Pacific region, to be followed by a workshop in 1989 on sustainability and change within production systems.

The farming systems approach to land use planning is also to be applied in two countries faced with severe erosion problems.

52. Greater attention is being given to traditional crops and to crop diversification within indigenous and introduced mixed-cropping systems. Emphasis is also being given to the introduction of roots and tubers within production systems as a means of strengthening food security at farm-household and community levels, as through the FAO/UNDP regional project on "Production and Development of Roots, Tubers, Plantains and Bananas in Tropical Africa". In agriculture and forestry, there is a discernible shift towards the greater integration of forests and trees in land-use systems for food, fodder and fuelwood production. Mixed perennial crops/trees and livestock in home gardens are being successfully implemented in a number of countries, while projects for the integration of livestock in coconut plantations are being successfully implemented in the Caribbean and the Pacific.

53. Grassland and forage resources, including fodder trees, can be utilized to increase animal production as well as to protect the environment. FAO tries to promote other types of agricultural production along with pasture and fodder development. Activities include the improvement of grazing resources in the arid/semi-arid regions emphasizing the use of leguminous fodder trees adapted to those regions, and the distribution of plant types with greater adaptation to salt-affected areas, as in the Near East and North Africa. Practical training is carried out in pilot demonstration areas. Work will focus on grassland productivity and technologies adaptable to particular ecosystems, such as the mountainous areas of the Himalayan and Andean countries, including the incorporation of fodder trees and shrubs. Work will continue on grassland/livestock productivity in the Sahel. Biological nitrogen fixation will be further emphasised with the promotion of legume species (fodder trees, fodder crops, pasture legumes) in improved grazing programmes, as in the Maghreb.

54. Shifting cultivation and agroforestry systems integrate forestry with agricultural land use. Studies of natural and artificial forest fallows, and a review of silvo-pastoral systems and of successful multi-purpose forestry projects (such as the rehabilitation of shifting cultivation in Madagascar) are being undertaken as a basis for improving and stabilizing shifting cultivation. The introduction of fuelwood cultivation in farming systems and village forests is being pursued through community forestry projects. An integrated approach is being followed in the development of mangroves and coastal forest systems, as well as in the diversification of production under mountain ecosystems.

55. In the fisheries sector, direct technical assistance and extension is provided for aquaculture, with support through TCDC activities under the direction of the Regional Fishery Bodies. Advisory missions as well as field projects for the integration of aquaculture in selected farming systems are being undertaken, supported by on-farm research and extension. A sub-regional field project on methodology and assistance for integrating aquaculture into small-scale farming systems, is in progress initially in the SADC region. Assistance is also being provided to improve and intensify the management of small reservoir fisheries.

#### TECHNOLOGY DEVELOPMENT AND APPLICATION

56. Almost all FAO's activities for technological improvement in agriculture, forestry and fisheries could be included under the broad

definition of sustainable development - in that they help to raise the income and food security of rural people while, at the same time, protecting the natural resources. However, such a definition has been avoided in order to focus on those technologies which aim consciously at sustainability, or which seek to improve, diversify, intensify and stabilize existing or traditional production systems geared to sustainability.

57. Advanced technologies can contribute to sustainable development. This applies to FAO's activities in computer-supported remote sensing technology, in agro-ecological zonation, and in agro-meteorology, all of which contribute to resource assessment and monitoring, which, in turn, contribute to better management and conservation of agricultural, fishery and forestry resources. Biotechnology can help in the improvement of agriculture - plant and animal production, rainfed and irrigated farming systems, food and nonfood crops, and agriculture in favoured and marginal zones, terrestrial and aquatic. Biotechnology will also be utilized to improve processing techniques, including the application of improved fermentation processes to enable better residue utilization at village-level.

58. The application of sophisticated radio-isotope technologies can play a significant role in enhancing the sustainability of production from given resources. FAO activities, carried out jointly with the International Atomic Energy Agency (IAEA) in Vienna, include research into the nitrogen-fixing properties of different species, increasing the yield of environmentally well-adapted rice and grain legume varieties through induced mutations, the use of nuclear and immunoassay techniques to improve animal reproductive performance, disease control and better feed utilization, and monitoring the pollution levels of pesticide residues. Such technologies are being used in insect/pest control (especially through the Sterile Insect Technique), for example to help control the Mediterranean fruit fly and trypanosomiasis, which could release large areas of land for sustainable development.

59. In regard to soil fertility and fertilizer use, FAO's programme on Integrated Plant Nutrition Systems (IPNS) exemplifies the adaptation and use of known technologies for sustainable development. Activities seek to promote increased fertilizer efficiency and integrated plant nutrition systems which achieve desired crop production levels through the combined applications of on-farm and off-farm sources of plant nutrients. Activities include the development and transfer to farmers of technologies specific to prevailing conditions, through technical assistance projects, advice and publications on efficient fertilizer use, and on the use of alternative and supplementary sources of plant nutrients through biological nitrogen fixation, crop residue management and the recycling of organic wastes. Activities include setting up small-scale inoculant production plants, the demonstration of biological nitrogen fixation (BNF) for pasture and forage legume production, and the introduction of azolla, sesbania and blue green algae technologies in rice farming.

60. FAO advocates the use of integrated pest management (IPM) whenever possible. IPM combines several methods of pest control in the best blend of control measures. One of the main objectives is to use natural control mechanisms combined with the judicious use of pesticides. FAO identifies situations that are conducive to IPM and establishes projects to address these situations. At present, a major field project, funded by the Netherlands and Australia, is being executed on IPM of rice in Southeast Asia. National projects include cotton and coconuts. FAO is developing

programmes in integrated pest management of vegetables and other crops where pesticide misuse or over-use is easily identifiable. Other activities in plant protection for the biennium include work on disease resistance in crops, production of virus-free planting material, and the implementation of the Code of Conduct on the Distribution and Use of Pesticides, which gives guidelines on all aspects of pesticide use. Regular Programme funds are used to promote integrated strategies by countries, while extra-budgetary resources are utilized to support field activities.

61. Inadequate post-harvest systems result in excessive losses, rendering more difficult the attainment of sustainable development from given resources. FAO's Action Programme for the Prevention of Food Losses assists countries in interdisciplinary planning and implementation of programmes for the reduction of such losses through advisory and project formulation missions, training and publications. Other activities include the improvement of food-processing, conservation and storage technologies. Efforts are being made to promote these activities through TCDC mechanisms, in order to ensure the sustainability of technical assistance and development efforts. A technical cooperation network will be set up in this biennium among West African countries to combat post-harvest losses of root and tuber crops.

62. Appropriate, energy-efficient agricultural mechanization technologies can contribute to sustainable development. FAO's activities include the formulation of agricultural mechanization strategies, the introduction of suitable engineering technologies and the preparation of training materials for the development and establishment of village blacksmiths and artisans. Improvements are being sought in traditional technologies for food processing, for oilseed and cash crop processing, and for the production of indigenous flours and composites. With reference to animal draught technology, FAO actions relate to improvement in draught animals and the implements and equipment needed for food production and on-farm processing. Field activities include the encouragement of TCDC in animal draught technology in Africa, and the Asia and Pacific Regions.

63. The technologies developed for the conservation and utilization of new and renewable sources of energy contribute directly to sustainable development. Technologies for the more efficient use of fuelwood, as well as fuel substitution, are being promoted through, for example, the Regional Wood Energy Development Programme in Asia/Pacific. Assistance is given to countries in improving technologies for charcoal-making and for wood-based commercial energy, such as decentralized electricity generation for industrial and community use. Biogas production using organic wastes and residues continues through an integrated approach, as in the Biogas Network in Asia and the Pacific, and the Rural Energy Network in Latin America and the Caribbean. Gasification of waste wood and agricultural residues for the operation of internal combustion engines is also being promoted. Activities extend to the development and promotion of sources of renewable energy, such as solar and wind energy systems which can contribute to food production, processing and preservation, as well as to rural industries.

64. Wasteful and environmentally-harmful methods of timber harvesting continue to create environmental hazards. Case studies on intermediate technology in tropical timber harvesting are being carried out with special emphasis on reducing wood waste and negative environmental impacts. Pilot logging operations using such technologies together with related training are being undertaken through field projects. More importance is being

given to introducing small-scale technologies in forest industries through field projects. Studies are being carried out on means of reducing wood waste in the forest, and in forest industries.

#### POLLUTION CONTROL

65. The excessive use of pesticides is a major source of pollution in agriculture in some regions. In 1985, FAO launched the International Code of Conduct on the Distribution and Use of Pesticides to minimize the human health and environmental hazards arising from their incorrect or excessive use. FAO assists countries in the implementation and monitoring of this Code. Provision has been made for the preparation of a number of technical guidelines on subjects such as "Proper pesticide application practices", "Disposal of bulk quantities of pesticide wastes", and "Prevention of groundwater contamination".

66. The analysis and amelioration of the impacts of pollutants on marine fisheries and aquatic organisms is an area of continuing collaboration between FAO, UNEP and other UN agencies. FAO provides technical support to the UNEP Regional Seas Programme, and to the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP). Aquatic pollution problems are also monitored through special working parties of many of FAO's Regional Fishery Bodies, while Guidelines for Marine Environment Protection Legislation are under preparation.

67. Chemical and microbiological contamination of food is another area of concern. Residues arising from agriculture (pesticides, processing chemicals, drugs and additives) as well as mycotoxins arising from mould growths are responsible for a wide range of health and trade problems. FAO assists countries in preventing or controlling food contamination through monitoring and surveillance programmes within the framework of national food control and consumer protection systems. Training of national staff in food quality and safety inspection is being undertaken, using TCDC approaches. FAO services the Joint FAO/WHO Expert Committee on Food Additives and Contaminants, and the Codex Alimentarius Commission which sets standards and guidelines for food safety from chemicals and other toxic substances. FAO collaborates with WHO and UNEP in the International Food Contaminants Monitoring Programme, and with LAEA in regard to radionuclide contamination.

#### SOCIO-ECONOMIC ASPECTS

68. Regular monitoring of rural poverty, and policies and measures for its alleviation, is a continuing part of WCARRD follow up. WCARRD inter-agency missions will work this biennium with six countries in developing strategies and policies for rural development and poverty alleviation, with environmental issues also receiving attention.

69. FAO seeks to integrate population components in its related programmes such as food/agricultural planning, and in its field projects relating to rural development, community forestry, women in development, rural youth and agricultural extension, often with UNFPA assistance. Population education is being built into agricultural extension projects as well as into two inter-country workshops in this biennium; it is also being introduced into rural youth programmes in some countries.

70. Land tenure can adversely affect sustainable development, first, by denying access to land to large numbers of farmers, thereby exacerbating

rural poverty and, secondly, by denying the needed tenurial incentives for ensuring long-term productivity and sustainability. FAO activities in this regard provide assistance to countries in tenurial studies as a basis for agrarian policy formulation, including studies in this biennium on minifundia and landlessness in Latin America, and the monitoring of changes in customary land tenure in Africa. Assistance is offered to countries in the formulation of agrarian reform policies and programmes, and in the formulation of appropriate legislation, as well as in the planning and implementation of land settlement programmes and projects.

71. FAO is giving specific attention to the integration of women in food, cash crop, livestock and forestry production programmes. Activities relating to women in food systems examine women's production problems under differing farming and social systems, with emphasis on the production of drought-resistant staples, and underexploited cultigens adapted to dryland conditions, and appropriate technologies. Since women often depend on the forests for food and fuel, forestry projects incorporate this element in their work, while the home economics programme assists rural women with the introduction of energy-saving technologies. The programmes on women in development and agricultural extension are both re-orienting their activities to improve the relevance and reach of agricultural extension services to women farmers.

72. Since the ultimate impact on scarce and dwindling resources is through people, the enlisting of people's participation in resource conservation and agricultural/rural development activities is considered central to sustainable development. Following WCARRD, FAO seeks to introduce people's participation in all relevant FAO programmes and projects. Pilot projects under the People's Participation Programme are being implemented in more than 13 countries, while participation is being introduced with success in forestry and fishery projects. Guidelines for people's participation in rural development projects are being tested through case studies and two inter-country workshops in Africa and Asia. The replicability of people's participation approaches will be evaluated, while participatory approaches will also be introduced in monitoring and evaluation. Special emphasis is being given to linking up with NGOs in these activities.

73. FAO's food security programme has international, regional, national and household dimensions. At the international level, the Committee on World Food Security, serviced by FAO, addresses many issues pertaining to food security and sustainability. Under the Food Security Assistance Scheme (FSAS), food security policy and programming missions as well as other technical assistance will continue to support inter-related production, storage and marketing activities suited to local conditions. Studies will be carried out in this biennium on the relative merits of different measures to ensure access to food by poor and vulnerable groups. A continuing assessment of the role of traditional staples in food security, and a more intensive monitoring of national food policies will be undertaken.

74. Nutritional adequacy, also emphasized by the WCED, is important for sustainable development. FAO's policies in this regard include on the one hand, improvement of people's nutritional status, and on the other, prevention of nutritional deficiencies and food contamination. Nutritional concerns are integrated in food and agricultural development policy and planning, as well as in field projects for agricultural and rural development. Activities in this biennium include the incorporation of

nutritional indicators within the GIS, advisory missions for food and nutrition policy planning, the preparation of guidelines for nutritional aspects in agricultural, fishery and forestry projects, and nutritional intervention programmes in favour of vulnerable groups. Training activities will support the above. Emphasis is also given to improving nutrition within existing farming systems through the production of traditional crops rich in Vitamin A. Nutritional surveillance and action against food contamination continue as part of the programme.

75. From the economic analysis and planning point of view, the new emphasis on decentralised planning will enable greater attention to be given to population, environmental and energy issues at the local level. Training materials are being prepared for the integration of environmental and rural energy concerns in rural development and agricultural planning, particularly at district and project levels.

#### INFORMATION TRANSFER AND EXCHANGE

76. FAO conducts training and disseminates technical information on subjects which impact directly on sustainable development. It has created data bases and information systems on agriculture, fisheries and forestry, which are provided to countries and other agencies of the UN system as a basis for environmental and development planning and conservation. This is supplemented by technical information from assessment of the natural resource base. Such information collection and exchange includes joint inter-disciplinary activities with other agencies in areas such as human health aspects of water development (in collaboration with WHO), international cooperation in agrometeorology (with WMO), information on food contamination (with WHO) and irradiation (with IAEA).

77. Technical information relating to aspects of sustainable development falling within the subject-matter areas of FAO's technical competence continues to be disseminated as part of ongoing programmes. Information and guidelines on soil conservation/management are provided through FAO Soil Bulletins, with issues in this biennium on "Soil and Water Conservation in Semi-Arid Areas" and "Soil Conservation in the Humid Tropics". An information pack entitled "Soil Conservation for Sustained Agricultural Production" provides educational publications, slide sets and video materials under the theme of protect and produce. Various educational materials on forest conservation are being produced, such as the FAO Conservation Guides and appropriate filmstrips. Technical information on the environment is provided through the FAO Bulletin on Environment and Energy.

78. Environmental education is sometimes provided through agricultural extension projects, as in the TCP project on "Community Extension in Environmental Protection and Improvement" in Indonesia. Likewise, an Environment Education Manual is being prepared for Zambia through a field project. Environmental concerns are beginning to be incorporated in agricultural and forestry education curricula, and technical papers and training materials produced for agricultural and forestry education and extension. Training on environmental aspects (such as proper land use) are provided through land use and soil fertility projects, as well as through crops, grasslands, forestry, agro-forestry and community forestry projects. Agricultural extension and women's projects also impart relevant training on the population, environment, land use and energy aspects of development.

## CONCLUSION

79. The concept of sustainable development is still evolving and more analytical work is needed to translate the concept into practical and operational policy and programmes in the agriculture, forestry and fisheries sectors. A first step in this direction is being undertaken through the inclusion of a special chapter in the State of Food and Agriculture 1988 on sustainable agricultural and rural development. The chapter will re-assess the past and present work of FAO that has or could contribute to sustainable development, in the light of the conclusions and recommendations of the WCED and the System-wide Medium-term Environment Programme (SWMTEP).

80. FAO's governing bodies have given policy direction in the various fields of work that make up a programme for sustainable development. However, there is still more to be done to achieve greater integration of programme activities. Consequently, the scope of the Organization's natural resources programme is being expanded to provide a special focus on sustainability.

81. Sustainable development requires human resources and institutions capable of advancing the development process in the desired directions. FAO, therefore, attaches great importance to human resource development through training activities, as illustrated above, and promotes TCDC networks and mechanisms to enable countries to sustain their development efforts through their own institutions.

82. As the concept of sustainable development is multi-sectoral and multi-disciplinary by nature, it must be approached in an integrated manner. FAO's work on environment in relation to sustainable development is coordinated through an Inter-departmental Working Group (IDWG) on Environment and Energy, in which the relevant departments are represented. Many of the other areas stressed by the WCED as essential components of sustainable development are also coordinated through multi-disciplinary and multi-divisional working groups, such as the IDWG on Land Use Planning, the Interdepartmental Committee and InterDivisional Working Group on Rural Development, the IDWG on Women in Development and the IDWG on Training. The inter-divisional and inter-departmental groups will continue to operate as multidisciplinary mechanisms through which the concept of sustainable development can be further developed and translated into operational activities for Regular Programme and extra-budgetary financed programmes and projects.

83. FAO collaborates closely with UNEP on environmental issues, mainly through joint programmes and project activities, and participation in the preparation of the second System-wide Medium-term Environment Programme. It also collaborates with Unesco in the Man and the Biosphere Programme and works closely with NGOs in the field of environment, particularly with the International Union for the Conservation of Nature and Natural Resources (IUCN). FAO's active cooperation with other agencies of the UN system (WHO, WMO, ILO and UNDP) in the many individual subject-matter areas relevant to sustainable development are recorded in the relevant sections of this report. Increased inter-agency cooperation particularly through the Designated Officials on Environmental Matters (DOEM) and the ACC mechanism will be further pursued in working towards the goal of sustainable development.