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CONTENTS

EDITORIAL

The **Earth Summit**, the UN Conference on Environment and Development (UNCED), held at Rio de Janeiro, Brazil, 3-14 June 1992, was acclaimed by the press as a Summit of the Century. An estimated 40,000 people, including more than 100 heads of state, mobilized political, public and institutional efforts around key issues concerning global development. They debated the worsening poverty and hunger, deteriorating ecosystems, erosion of biodiversity, degenerating natural resources and conflicts between ecological and economic securities. The Summit underlined that the integration of environment and development concerns was the only road to the fulfilment of food security and other basic needs, such as improved living standards, sustainable ecosystems, and a safer, more prosperous common present and future for all.

The challenge after Rio is to strengthen our efforts towards sustainable agricultural and rural development (SARD) through appropriate strategies, policies and programmes. The UNCED process and Agenda 21 have also provided guidelines for research and technology development and transfer for SARD. Recognizing that the environmental, economic and social problems transcend national boundaries and no nation in isolation can achieve the goals, a regional or global partnership for sustainable development is a must. In this context, the role of APAARI in achieving the goals and objectives set in Agenda 21 concerning Asia-Pacific Region becomes evident.

In this issue, we have made special efforts to highlight major outcome of the Earth Summit for the benefit of our readers. The objectives and activities of three programmes most directly related with research and technology development, namely, promoting sustainable agriculture and rural development (SARD), environemently sound management of biotechnology and environmentally sound technology, and transfer, cooperation and capacity building have been highlighted.

Editors

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The Earth Summit - Its Agricultural Research Implications

The Earth Summit, the UN Conference on Environment and Development (UNCED), was held at Rio de Janeiro, Brazil, 3-14 June 1992. A total of 178 UN member countries, including 115 Heads of state and government, were represented at the Summit. UN agencies, international financing institutions, international and regional organizations, and some 1,000 NGOs were also represented.

The Director-General, FAO delivered a most inspiring speech emphasising to produce more and better food for burgeoning population without inflicting injuries to the environment. He stressed the need for radical changes in production and consumption patterns both in the developing and developed countries in order to alleviate the plight of the poorest, to promote equity, and to conserve the world's natural resource base.

From the statements made by the delegations and the plenary discussions on wide-ranging topics, including socio-economic aspects and poverty; environmental degradation, natural resources and conservation; and sustainable development and peoples participation, the following main outputs emerged:

- ***Rio Declaration on Environement and Development:*** Twenty-seven guiding principles on rights and obligations of States on environment and development were agreed (by consensus). The Declaration will be elaborated further for presentation of an Earth Charter at the 50th Anniversary of the United Nations in 1995.
- ***International Convention on Biological Diversity:*** The Convention was signed by 154 countries, expressing their solidarity and commitment to protect natural diversity, particularly natural ecosystems and endangered species. The Convention does not show explicit commitment for *ex situ* conservation and use of existing genetic resource collections. The USA although an advocate and promoter of biodiversity conservation, especially forest conservation, refused to sign the Convention.
- ***International Convention on Climate Change:*** Signed by 154 countries, the Convention underlines the commitment of the nations to reduce greenhouse gas emissions with facilitating arrangements for developing countries. However, no targets and deadlines were agreed upon. Small island countries, in particular, expressed their discontent with the agreement which set no targets for reduction of emissions, thus not enforcing measures to prevent global warming and possible sea-level rise. Maldives, from within the Asia-Pacific Region, made one of the strongest appeals for an early action to avert the dangers emanating from predicted sea rise.
- ***Non-Legally Binding Principles on Forests:*** A set of mandatory codes/principles for sustainable management of all forests, recognising sovereignty over forest resources and rights to development, were evolved and agreed. As stated in Agenda 21 (described later), the non-binding principle states "to consider the need for and the feasibility of all kinds of appropriate internationally agreed arrangements to promote international cooperation on forest management, conservation and sustainable development of all types of forests".
- ***Agreement to Negotiate on International Convention on Desertification:*** The Summit had agreed to establish an International Convention on Desertification. The UN General Assembly will decide on modalities and scope of the negotiations. UNEP, UNSO and FAO are likely to be involved.
- ***Agenda 21:*** The Summit adopted a comprehensive action plan on environment and development for the period 1993-2000, including four sections, forty chapters and 115 programme areas (500 pages in 4 volumes). The four sections are:
  - social and economic dimensions;
  - natural resources conservation and management;
  - strengthening the role of major (social) groups; and
  - means of implementation.

Although most of the chapters contain issues and programme areas which have direct or indirect bearing on sustainable agricultural and rural development, some of the chapters, as listed below, contain issues and programmes of direct and major significance to agriculture:

- ***Chapter 10:*** Integrated approach to the planning and management of land resources
- ***Chapter 11:*** Combating deforestation
- ***Chapter 12:*** Combating fragile ecosystems: combating desertification and drought
- ***Chapter 13:*** Managing fragile ecosystems: sustainable mountain development
- ***Chapter 14:*** Promoting sustainable agriculture and rural development
- ***Chapter 15:*** Conservation of biological diversity
- ***Chapter 16:*** Environementally sound management of biotechnology
- ***Chapter 17:*** Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources
- ***Chapter 18:*** Protection of the quality and supply of freshwater resources: application of integrated approaches to the development, management and use of water resources
- ***Chapter 32:*** Strengthening the role of farmers
- ***Chapter 34:*** Environmentally sound technology: transfer, cooperation and capacity-building
- ***Chapter 35:*** Science for sustainable development.

In each of these chapters, several programmes have been identified. Each programme has its specific objectives, and a set of activities to achieve these objectives have been defined. The activities fall in three categories: management-related, data and information, and international and regional

cooperation and coordination. Means of implementation of the programmes have also been outlined. These comprise: financing and cost evaluation, scientific and technological means, human resource development, and capacity building.

As regards agricultural research and technology development, Chapters 14, 16 and 34 are most important. The objectives and plans of action (activities) suggested under these chapters are given below.

Chapter 14 on promoting sustainable agriculture and rural development highlights 11 programme areas, each with its specific objectives, as described under:

[A] Agricultural policy review, planning and integrated programme in the light of the multifunctional aspect of Agriculture, particularly with regard to food security and sustainable development

(a) By 1995, to review and, where appropriate, establish a programme to integrate environmental and sustainable development with policy analysis for the food and agriculture sector and relevant macroeconomic policy analysis, formulation and implementations;

(b) To maintain and develop, as appropriate, operational multisectoral plans, programmes and policy measures, including programmes and measures to enhance sustainable food production and food security within the framework of sustainable development, not later than 1998;

(c) To maintain and enhance the ability of developing countries, particularly the least developed ones, to be able to manage policy, programming and planning activities, not later than 2005.

[B] Ensuring people's participation and promoting human resource development for sustainable agriculture

(a) To promote greater public awareness of the role of people's participation and people's organizations, especially women's groups, youth, indigenous people (and people under occupation), local communities and small farmers, in sustainable agriculture and rural development;

(b) To ensure equitable access of rural people, particularly women, small farmers, landless and indigenous people (and people under occupation,) to land, water and forest resources and to technologies, financing, marketing, processing and distribution;

(c) To strengthen and develop the management and the internal capacities of rural people's organizations and extension services and to decentralize decision making to the lowest community level.

[C] Improving farm production and farming systems through diversification of farm and non-farm employment and infrastructure development

(a) To improve farm productivity in a sustainable manner, as well as to increase diversification, efficiency, food security and rural incomes, while ensuring that risks to the ecosystem are minimized;

(b) To enhance the self-reliance of farmers in developing and improving rural infrastructure, and to facilitate the transfer of environmentally sound technologies for integrated production and farming systems, including indigenous technologies and the sustainable use of biological and ecological processes, including agroforestry, sustainable wildlife conservation and management, aquaculture inland fisheries and animal husbandry;

(c) To create farm and non-farm employment opportunities, particularly among the poor and those living in marginal areas, taking into account the alternative livelihood proposal *inter alia* in dry land areas.

[D] Land-resource planning, information and education for agriculture

(a) To harmonize planning procedures, involve farmers in the planning process, collect land-resource data, design and establish database, define land areas of similar capability, identify resource problems and values that need to be taken into account to establish mechanisms to encourage efficient and environmentally sound use of resource;

(b) To establish agriculture planning bodies at national and local levels to decide priorities, channel resources and implement programmes.

[E] Land conservation and rehabilitation

(a) By the year 2000, to review and initiate, as appropriate, national land-resources surveys, detailing the location, extent and severity of land degradation;

(b) To prepare and implement comprehensive policies and programmes leading to the reclamation of degraded lands and the conservation of areas at risks, as well as improve the general planning, management and utilization of land resources and preserve soil fertility for sustainable agricultural development.

[F] Water for sustainable food production and sustainable rural development

This programme area, comprehensive as it is, has been described in Chapter 18 (protection of the quality and supply of fresh water resources), as detailed later.

[G] Conservation and sustainable utilization of plant genetic resources for food and sustainable agriculture

(a) To complete the first regeneration and safe duplication of existing *ex situ* collections on a worldwide basis as soon as possible;

(b) To collect and study plants useful for increasing food production through joint activities, including training, within the framework of network of collaborating institutions;

(c) Not later than the year 2000, to adopt policies and strengthen or establish programmes for *in situ* on-farm and *ex-situ* conservation and sustainable use of plant genetic resources for food and agriculture, integrated into strategies and programmes for sustainable agriculture;

(d) To take appropriate measures for (the fair and equitable) sharing of benefits and results of research and development in plant breeding between the sources and users of plant genetic resources.

[H] Conservation and sustainable utilization of animal genetic resources for sustainable agriculture

(a) To enumerate and describe all breeds of livestock used in animal agriculture in as broad a way as possible and begin a 10-year programme of action;

(b) To establish and implement action programmes to identify breeds at risk, together with the nature of the risk and

appropriate preservation measures;

(c) To establish and implement development programmes for indigenous breeds in order to guarantee their survival, avoiding the risk of their being replaced by breed substitution or cross-breeding programmes.

[I] Integrated pest management and control in agriculture

(a) Not later than the year 2000, to improve and implement plant protection and animal health services, including mechanisms to control the distribution and use of pesticides, and to implement the International Code of Conduct on the Distribution and Use of Pesticides;

(b) To improve and implement programmes to put integrated pest-management practices within the reach of farmers through farmer networks, extension services and research institution;

(c) Not later than the year 1998, to establish operational and interactive networks among farmers, researchers and extension services to promote and develop integrated pest management.

[J] Sustainable plant nutrition to increase plant nutrition

(a) Not later than the year 2000, to develop and maintain in all countries the integrated plant nutrition approach, and to optimize availability of fertilizer and other plant nutrient sources;

(b) Not later than the year 2000, to establish and maintain institutional and human infrastructure to enhance effective decision-making on soil productivity;

(c) To develop and make available national and international know-how to farmers, extension agents, planners and policy makers and environmentally sound new and existing technologies and soil-fertility management strategies for application in promoting sustainable agriculture.

[K] Rural energy transition to enhance productivity

(a) Not later than the year 2000, to initiate and encourage a process of environmentally sound energy transition in rural communities, from unsustainable energy sources, to structured and diversified energy sources and making available alternative new and renewable sources of energy;

(b) To increase the energy inputs available for rural household and agro-industrial needs through planning and appropriate technology transfer and development;

(c) To implement self-reliant rural programmes favouring sustainable development of renewable energy sources and improved energy efficiency.

[L] Evaluation of the effects of ultraviolet radiation on plants and animals caused by the depletion of the stratospheric ozone layer

The objective of this programme area is to undertake research to determine the effects of increased ultraviolet radiation resulting from stratospheric ozone layer depletion on the Earth's surface, and on plant and animal life in affected regions, as well as its impact on agriculture, and to develop, as appropriate, strategies aimed at mitigating its adverse effects.

Activities:

Activities of the Programmes A to E and G to L are grouped in three categories:

- Management related activities
- Data and information
- International and regional cooperation and coordination.

Means of Implementation:

For each programme, means of implementation were grouped in four categories

- Financing and cost evaluation
- Scientific and technological means
- Human resource development
- Capacity building.

The total finance required to implement the 10 programmes [A-E and G-K] was estimated at US dollar 31.8 billion per year.

The Chapter 16 on environemently sound management of biotechnology has the following five programme areas:

(a) Increasing the availability of food, feed, and renewable raw materials;

(b) Improving human health;

(c) Enhancing protection of the environment;

(d) Enhancing safety and developing international mechanisms for cooperation;

(e) Establishing enabling mechnisms for the development and the environmentally sound application of biotechnology.

As an example, basis for action, objectives and activities of the programme area mentioned under (a) above is reproduced below:

Biotechnology for Increasing the Availability of Food, Feed and Renewable Raw Materials

Basis for action

To meet the growing consumption needs of the global population, the challenge is not only to increase food supply, but also to improve food distribution significantly while simultaneously developing more sustainable agricultural systems. Most of this increased productivity will need to take place in developing countries. It will require the successful and environemently safe application of biotechnology in agriculture, in the environment and in human health care. Most of the investment in modern biotechnology has been in the industrialized world. Significant new investments and human resource development will be required in biotechnology, especially in the developing world.

Objectives

The following objectives are proposed, keeping in mind the need to promote the use of appropriate safety measures:

(a) to increase to the optimum possible extent the yield of major crops, livestock, and aquaculture species, by using the combined resources of modern biotechnology and conventional plant/animal/micro-organism improvement, including the more diverse use of genetic material resources, both hybrid and original. Forest

product yields should similarly be increased, to ensure the sustainable use of forests;

(b) to reduce the need for volume increases of food, feed and raw materials by improving the nutritional value (composition) of the source crops, animals and micro-organisms, and to reduce post-harvest losses of plant and animal products;

(c) to increase the use of integrated pest, disease and crop management techniques to eliminate overdependence on agrochemicals, thereby encouraging environemently sustainable agricultural practices;

(d) to evaluate the agricultural potential of marginal lands in comparison with other potential uses and to develop, where appropriate, systems allowing for sustainable productivity increases;

(e) to expand the application of biotechnology in forestry, both for increasing yields and more efficient utilization of forest products and for improving afforestation and reforestation techniques. Efforts should be concentrated on species and products that are grown in and are of value particularly for developing countries;

(f) to increase the efficiency of nitrogen fixation and mineral absorption by the symbiosis of higher plants with micro-organisms;

(g) to improve capabilities in basic and applied sciences and in the management of complex interdisciplinary research projects.

Activities

(i) Management-related activities

Governments at the appropriate level, with the assistance of international and regional organizations, the private sector and academic and scientific institutions, should improve both plant and animal breeding and micro-organisms through the use of traditional and modern biotechnologies, to enhance sustainable agricultural output to achieve food security, particularly in developing countries, with due regard to the prior identification of desired characteristics before modification, taking into account the needs of farmers, the socio-economic, cultural and environmental impacts of modifications and the need to promote sustainable social and economic development, paying particular attention to how the use of biotechnology will impact on the maintenance of environmental integrity.

More specifically, these entities should:

(a) improve productivity, nutritional quality and shelf-life of food and animal feed products, with efforts including work on pre- and post-harvest losses;

(b) further develop resistance to diseases and pests;

(c) develop plant cultivars tolerant and/or resistant to stress from factors such as pests and diseases and from abiotic causes;

(d) promote the use of underutilized crops of possible future importance for human nutrition and industrial supply of raw materials;

(e) increase the efficiency of symbiotic processes that assist sustainable agricultural production;

(f) facilitate the conservation and safe exchange of plant, animal and microbial germplasm by applying risk assessment and management procedures, including improved diagnostic techniques for detection of pests and diseases by better methods of rapid propagation;

(g) develop improved diagnostic techniques and vaccines for the prevention and spread of diseases and for rapid assessment of toxins or infectious organisms in products for human use or livestock feed;

(h) identify more productive strains of fast-growing trees, especially for fuelwood, and develop rapid propagation methods to aid their wider dissemination and use;

(i) evaluate the use of various biotechnology techniques to improve the yields of fish, algal and other aquatic species;

(j) promote sustainable agricultural output by strengthening and broadening the capacity and scope of existing research centres to achieve the necessary critical mass through encouragement and monitoring of research into the development of biological products and processes of productive and environmental value that are economically and socially feasible, while taking safety considerations into account;

(k) promote the integration of appropriate and traditional biotechnologies for the purposes of cultivating genetically modified plants, rearing healthy animals and protecting forest genetic resources;

(l) develop processes to increase the availability of materials derived from biotechnology for use in food, feed and renewable raw materials production.

(ii) *Data and information*

The following activities should be undertaken:

(a) consideration of comparative assessments of the potential of the different technologies for food production, together with a system for assessing the possible effects of biotechnologies on international trade in agricultural products;

(b) examination of the implications of the withdrawal of subsidies and the possible use of other economic instruments to reflect the environemental costs associated with the unsustainable use of agrochemicals;

(c) maintenance and development of data banks of information on environmental and health impacts of organisms to facilitate risk assessment;

(d) acceleration of technology acquisition, transfer and adaptation by developing countries to support national activities that promote food security.

(iii) *International and regional cooperation and coordination*

Governments at the appropriate level, with the support of relevant international and regional organizations, should promote the following activities in conformity with international agreements or arrangmeents on biological diversity, as appropriate:

(a) cooperation on issues related to conservation of, access to, and exchange of germplasm; rights associated with intellectual property and informal innovations, including farmers' and breeders' rights; access to the benefits of biotechnology; and bio-safety;

(b) promotion of collaborative research programmes, espe-

cially in developing countries, to support activities outlined in this programme area, with particular reference to cooperation with local and indigenous people and their communities in the conservation of biological diversity and sustainable use of biological resources, as well as the fostering of traditional methods and knowledge of such groups in connection with these activities;

(c) acceleration of technology acquisition, transfer and adaptation by developing countries to support national acitivities that promote food security, through the development of systems for substantial and sustainable productivity increases that do not damage or endanger local ecosystems;

(d) development of appropriate safety procedures taking account of ethical considerations.

The estimated average annual cost of this programme area for the period 1993-2000 could be upwards of US $ 5 billion to be met from national and international resources. For all the biotechnology programmes taken together, the estimated average annual cost was upwards of US$ 20 billion, of which about 70 percent was for biotechnology for improving human health.

Chapter 34 on Environmentally sound technology: transfer, cooperation and capacity building has the following major objectives as well as activities.

Objectives

(a) To help to ensure the access, in particular of developing countries, to scientific and technological information, including information on state-of-the art technologies;

(b) To promote, facilitate, and finance, as appropriate, the access to and the transfer of environmentally safe and sound technologies and corresponding know-how, in particular in developing countries, on favourable terms, including on concessional and preferential terms, as mutually agreed, taking into account the need to project intellectual property rights as well as the special needs of developing countries for the implementation of Agenda 21;

(c) To facilitate the maintenance and promotion of environmentally (safe and) sound indigenous technologies that may have been neglected or displaced, in particular in developing countries, paying particular attention to their priority needs and taking into account the complementary roles of men and women;

(d) To support endogenous capacity-building, in particular in developing countries, so they can assess, adopt, manage and apply environmentally (safe and) sound technologies. This could be achieved through *inter alia*:

(i) Human resources development;

(ii) Strengthening of institutional capacities for research and development and programme implementation; and

(iii) Integrated sector assessments of technologies needs, in accordance with countries plans, objectives and priorties as foreseen in the implementation of Agenda 21 at the national level;

(e) To promote long-term technological partnership between holders of environmentally (safe and) sound technologies and potential users.

Activities

i) Development of international information network which link national, subregional, regional and international systems.

(ii) Support of and promotion of access to transfer of technology.

(iii) Improvement of the capacity to develop and manage environmentally (safe and) sound technologies.

(iv) Establishment of a collaborative network of research centres.

(v) Support of programmes of cooperation and assistance.

(vi) Technology assessment in support of the management of environmentally (safe and) sound technology, and

(vii) Collaborative arrangements and partnerships.

(f) Water for sustainable food production and rural development

Sustainable agriculture and rural development and food security depend heavily on sound and effecient water use and conservation practices consisting primarily of irrigation development and management with respect to rainfed areas, livestock water-supply, inland fisheries and agro-forestry.

Objectives

The key strategic principles for holistic and integrated environmentally sound management of water resources in the rural context may be set forth as follows:

(a) Water should be regarded as a finite resource having an economic value with significant social and economic implications reflecting the importance of meeting basic needs;

(b) Local communities must participate in all phases of water management, ensuring the full involvement of women in view of their crucial role in the practical day-to-day supply, management and use of water;

(c) Water resource management must be developed within a comprehensive set of policies for (i) human health; (ii) food production, preservation and distribution; (iii) disaster mitigation plans; (iv) environmental protection and conservation of the natural resource base;

(d) It is necessary to recognize and actively support the role of rural populations, with particular emphasis on women.

An International Action Programme on Water and Sustainable Agricultural Development (IAP-WASAD) has been intiated by FAO in cooperation with other international organizations. The main objective of the Action Programme is to assist developing countries in planning, developing and managing water resources on an integrated basis to meet present and future needs for agricultural production, taking into account environmental considerations.

The Action Programme has developed a framework for sustainable water use in the agricultural sector and identified priority areas for action at national, regional and global levels. Quantitative targets for new irrigation development, improvement of existing irrigation schemes and reclamation of waterlogged and salinized lands through drainage for 130 developing countries are estimated on the basis of food requirements, agro-climatic zones and availability of water

and land.

FAO global projection for irrigation, drainage and small-scale water programmes by the year 2000 for 130 developing countries are as follows: (a) 15.2 million hectares of new irrigation development; (b) 12 million hectares of improvement/modernization of existing schemes; (c) 7 million hectares installed with drainage and water control facilities; and (d) 10 million hectares of small-scale water programmes and conservation.

The development of new irrigation area at the above-mentioned level may give rise to environmental concerns in so far as it implies the destruction of wetlands, water pollution, increased sedimentation and a reduction in biodiversity. Therefore, new irrigation schemes should be accompanied by an environmental impact assessment, depending upon the scale of the scheme, in case significant negative environmental impacts are expected. When considering proposals for new irrigation schemes, consideration should also be given to a more rational exploitation, and an increase in the efficiency of productivity, of any existing scheme capable of serving the same localities. Technologies for new irrigation schemes should be thoroughly evaluated, including their potential conflicts with other land uses. The active involvement of water-users groups is a supporting objective.

It should be ensured that rural communities of all countries, according to their capacities and available resources and taking advantage of international cooperation as appropriate, will have access to safe water in sufficient quantities and adequate sanitation to meet their health needs and maintain the essential qualities of their local environments.

The objective with regard to water management for inland fisheries and aquaculture include conservation of water-quality and water-quantity requirements for optimum production and prevention of water pollution by aquacultural activities. The Action Programme seeks to assist member countries in managing the fisheries of inland waters through the promotion of sustainable management of capture fisheries as well as the development of environmentally sound approaches to intensification of aquaculture.

The objectives with regard to water management for livestock supply are twofold: provision of adequate amounts of drinking water and safeguarding of drinking-water quality in accordance with the specific needs of different animal species. This entails maximum salinity tolerance levels and the absence of pathogenic organisms. No global targets can be set owing to large regional and inter-country variations.

Activities

All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the following activities:

(a) Water supply and sanitation for the unserved rural poor

(i) Establish national policies and budget priorities with regard to increasing service coverage;

(ii) Promote appropriate technologies;

(iii) Introduce suitable cost-recovery mechanisms, taking into account efficiency and equity through demand management mechanisms;

(iv) Promote community ownership and rights to water-supply and sanitation facilities;

(v) Establish monitoring and evaluation systems;

(vi) Strengthen the rural water supply and sanitation sector with emphasis on institutional development, efficient management and an appropriate framework for financing of services;

(vii) Increase hygiene education and eliminate disease transmission foci;

(viii) Adopt appropriate technologies for water treatment;

(xi) Adopt wide-scale environmental management measures to control disease vectors;

(b) Water-use efficiency

(i) Increase of efficiency and productivity in agricultural water use for better utilization of limited water resources;

(ii) Strengthen water and soil management research under irrigation and rain-fed conditions;

(iii) Monitor and evaluate irrigation project performance to ensure, *inter alia*, the optimal utilization and proper maintenance of the project;

(iv) Support water-users groups with a view to improving management performance at the local level;

(v) Support the appropriate use of relatively brackish water for irrigation;

(c) Waterlogging, salinity control and drainage

(i) Introduce surface drainage in rain-fed agriculture to prevent temporary waterlogging and flooding of lowlands;

(ii) Introduce artificial drainage in irrigated and rain-fed agriculture;

(iii) Encourage conjunctive use of surface and groundwaters, including monitoring and water-balance studies;

(iv) Practise drainage in irrigated areas of arid and semi-arid regions;

(d) Water-quality management

(i) Establish and operate cost-effective water-quality monitoring systems for agricultural water uses;

(ii) Prevent adverse effects of agricultural activities on water-quality for other social and economic activities and on wetlands, *inter alia*, through optional use of on-farm input and the minimization of the use of external input in agricultural activities;

(iii) Establish biological, physical and chemical water-quality criteria for agricultural water-users and for marine and riverine ecosystems;

(iv) Minimize soil run-off and sedimentation;

(v) Dispose properly of sewage from human settlements and of manure produced by intensive livestock breeding;

(vi) Minimize adverse effects from agricultural chemicals by use of integrated pest management;

(vii) Educate communities about the pollution-related impacts of the use of fertilizers and chemicals on water-quality, food safety and human health;

(e) Water resources development programmes

(i) Develop small-scale irrigation and water-supply for human and livestock and for water and soil conservation;

(ii) Formulate large-scale and long-term irrigation

development programmes, taking into account their effects on the local level, the economy and the environment;

(iii) Promote local initiatives for the integrated development and management of water resources;

(iv) Provide adequate technical advice and support and enhancement of institutional collaboration at the local community level;

(v) Promote a farming approach for land and water management that takes account of the level of education, the capacity to mobilize local communities and the ecosystem requirements of arid and semi-arid regions;

(vi) Plan and develop multi-purpose hydroelectric power schemes, making sure that environmental concerns are duly taken into account;

(f) Scarce water resources management

(i) Develop long-term strategies and practical implementation programmes for agricultural water use under scarcity conditions with competing demands for water;

(ii) Recognize water as a social, economic and strategic good in irrigation planning and management;

(iii) Formulate specialized programmes focused on drought preparedness, with emphasis on food scarcity and environmental safegards;

(iv) Promote and enhance waste-water reuse in agriculture;

(g) Water-supply for livestock

(i) Improve quality of water available to livestock, taking into account their tolerance limits;

(ii) Increase the quantity of water sources available to livestock, in particular those in extensive grazing systems, in order to both reduce the distance needed to travel for water and to prevent overgrazing around water sources;

(iii) Prevent contamination of water sources with animal excrement in order to prevent the spread of diseases, in particular zoonosis;

(iv) Encourage multiple use of water-supplies through promotion of integrated agro-livestock-fishery systems;

(v) Encourage water spreading schemes for increasing water retention of extensive grasslands to stimulate forage production and prevent run-off;

(h) Inland fisheries

(i) Develop the sustainable management of fisheries as part of national water resources planning;

(ii) Study specific aspects of the hydrobiology and environmental requirements of key inland fish species in relation to varying water regimes;

(iii) Prevent or mitigate modification of aquatic environments by other users or rehabilitate environments subjected to such modification on behalf of the sustainable use and conservation of biological diversity of living aquatic resources;

(iv) Develop and disseminate environmentally sound water resources development and management methodologies for the intensification of fish yield from inland waters;

(v) Establish and maintain adequate systems for the collection and interpretation of data on water quality and quantity and channel morphology related to the state and management of living aquatic resources, including fisheries;

(i) Aquaculture development:

(i) Develop environmentally sound aquaculture technologies that are competible with local, regional and national water resources management plans and take into consideration social factors;

(ii) Introduce appropriate aquaculture techniques and related water development and management practices in countries not yet experienced in aquaculture;

(iii) Assess environmental impacts of aquaculture with specific reference to commercialized culture units and potential water pollution from processing centres;

(iv) Evaluate economic feasibility of aquaculture in relation to alternative use of water, taking into consideration the use of marginal-quality water and investment and operational requirements.

The Conference has recommended that the UN General Assembly establish a "high level Commission on Sustainable Development" of ECOSOC to review and coordinate implementation of Agenda 21 and other UNCED agreements and environmental conventions. FAO, as the specialized UN agency for food and agriculture, is directly concerned and involved in the above programmes. An ACC Task Force for the implementation of Agenda 21 has been set up by the UN Secretary General. The Director-General of FAO was asked to chair the Task Force.

AN INSTITUTE PROFILE
DEPARTMENT OF AGRICULTURE (THAILAND)

The Department of Agricultuere (DOA) is one of the 11 departments within the Ministry of Agriculture and Cooperatives. In its new administration, it was established in 1972 by merging the former Agriculture and the Rice Departments together. Its major responsibility is to conduct research and development activities on crops, sericulture and farming systems. The Department aims to benefit farmers to yield increases and efficiency. DOA provides services of analyzing samples of soils, fertilizers, plants and agricultural chemical material for the public. It conducts agri-developmental work in areas which possess economic and security problems. DOA produces foundation seeds for the Department of Agricultural Extension and farmers. It disseminates information and provides training for government officers and the public. It also provides regulatory services according to certain agricultural laws.

Administration and Organization

DOA has its headquaters in Bangkok where majority of DOA's scientific staff are stationed and serve as the centre of

agricultural activities and administration as well as agricultural support services for programmes or projects covering the five main commodity groups, viz. rice, field crops, horticultural crops, sericulture, and para rubber. Research programmes are identified and planned at the headquarters as well as at regional centres. A programme is well underway to regionalize the Department's activities through twenty plus regional centres administered by the five commodity institutes.

DOA is headed by the Director-General and three Deputies who have specific designated responsibilities. The operation of the DOA is being conducted through twelve divisions, comprising seven technical divisions with research or service functions, one regulatory division and four administrative divisions.

The duties and responsibilities of the technical divisions and research institutes are shown below:

Planning and Technical Division: Responsible for project planning, programme budgeting, foreign relations, statistical techniques and planning including survey research, research and analysis, research project documentation, monitoring and evaluation, and dissemination of research results through mass media.

Agricultural Regulatory Division: Responsible for regulation, production and movement of plants, plant products, plant seeds, fertilizers and pesticides, within, and to and from Thailand, in accordance with various Government Acts.

Agricultural Chemistry Division: Responsible for research and development on various aspects of agricultural chemistry, research on plant agricultural and industrial products, agricultural chemicals, agricultural industrial waste and agricultural nuclear technique, providing chemical and physical analysis on soil, water, fertilizer, plant, agricultural and industrial waste.

Agricultural Engineering Division: Responsible for research and development of agricultural machinery and equipment (including storage and processing materials and technologies) liaison with manufacturers and provision of assistance; provision of some training in mechanics to farmers; repair and maintenance service for the DOA's agricultural machinery and for its land development facilities.

Plant Pathology and Microbiology Division: Responsible for research into and development of effective, economical and non-hazardous control measures for plant disease, and means to utilize or cultivate beneficial microorganisms.

Entomology and Zoology Division: Responsible for research and development in search of effective, economical and non-hazardous control measures for all agricultural crop pests.

Soil Science Division: Responsible for research and development in soils, fertilizer use, fertilizer technology, soil chemistry, soil microbiology, soil physics, soil and water management, soil survey and mapping and soil diagnosis for the Divisions/Institutes of the Department.

Botany and Weed Science Division: Response for research and development on botany and plant physiology (with emphasis on economic crops) and also R and D to solve weed problems and weed control measure strategies.

Agricultural Toxic Substance Division: Responsible for research on toxic substances, residue effects, by chemical and physical analysis of both agricultural commodites (with emphasis on economic crops) and other materials, as quality control measures in the interest of public health.

Rice Research Institute: Responsible for research and development for rice improvement, eg. breeding programmes, agronomic practices, fertilizer application and seed storage. Organized into the following research activities: genetics, low land rice, deep water rice, screening and testing for resistance to diseases, insects and adverse environmental conditons, grain standard and quality, seed multiplication, upland rice and winter cereals, and post-harvest. Operates through six research centres and 17 experimental stations located throughout Thailand.

Field Crops Research Institute: Responsible for research and development for yield improvement of all field crops with economic potential. There are two operational units. The central unit is responsible for administration and coordinating work, training and development and also monitoring. The regional unit consists of seven autonomous research centres and 13 satellite experiment stations located mainly in the central, northern and northeastern regions of the country. Research activities are conducted regionally. The research disciplines include plant breeding, cropping practices, soils and fertilizers, crop protection, post-harvest technology, seed technology and production. Research at Chai Nat Field Crops Research Centre (FCRC) is concentrated on mungbean and irrigated field crops; Chiang Mai FCRC on mungbean and vegetable maize; Khon Kaen FCRC on peanut and kenaf; Nakhon Sawan FCRC on maize and cotton; Rayong FCRC on cassava; Suphan Buri FCRC on sugarcane and sorghum; and Ubon Ratchathani FCRC on castor bean, sesame and rainfed agriculture.

Horticulture Research Institute: Responsible for research and development for yield improvement of horticultural crops. There are two integral units: administrative and coordinating works, training and development, and also monitoring are responsibilities of the central unit, which is located in Bangkok. The regional unit consists of six independent research centres and twelve satellite research experiment stations located throughout the country. These research disciplines are similar to Field Crops Research Institute. These include Chanthaburi HRC which works on papaya, citrus, mango, rambutan, durian, pineapple, man-

gosteen, banana, grape, yardlong bean tomato, orchids, rose, jasmine, neem, aster, gerbera, anthurium, and ornamental plants; Chiang Rai HRC concentrates on litchi, longan, mango, citrus, grape, mustard (green), garlic, orchids, gladiolus, carnation, rose, chrysanthemum, aster, gerbera, anthurium, ornamental plants; Phichit HRC works on pummelo, banana, papaya, mango, Chinese convolvulus, cucumber, jasmine, chrysanthemum; Si Sa Ket HRC works on mango, papaya, chilli, shallot, cashewnut, and local ornamental plants; Chumphon HRC works on coconut and cacao; Surat Thani HRC works on oil palm, durian, rambutan, mangosteen, langsat, anthurium, local ornamentals, coffee, cacao, cashewnut, clove, and cardamon.

Sericulture Research Institute: Responsible for research and development on mulberry silkworm varieties, silkworm egg production, silkworm rearing method, silkworm diseases, silk reeling method and training programme. There are 12 experimental stations and three research centres under the control of this institute.

Rubber Research Institute: Responsible for research and control of production and distribution of rubber, produces the enforcement of Rubber Control Act B.E. 2481, the coordination on activities in compliance with the Rubber Replanting Aid Fund Act B.E. 2503 (Revised Act B.E. 2530), and the Government Rubber Estate's Founding Decree B.E. 2504, the improvements on rubber productivity and quality produce, technical training and service, collaboration with international organizations concerned with natural rubber. Research and development activities are carried out by three research centres, located in provinces of Songkhla, Surat Thani and Chachoengsao, and 17 experimental stations.

Asia-Pacific Agricultural Networks

As stated in the first issue of APAARI Newsletter (Vol. 1, No. 1), details concerning activities of the Asia-Pacific Agricultural Networks will be presented in subsequent issues of APAARI Newsletter. As for the present issue, relevant information of two such networks is presented below:

Asian Network on Sericulture Research and Development

History: The Regional Expert Consultation on Sericulture Development in Asia which was convened at FAO/RAPA in Bangkok in February 1989 strongly recommended the establishment of the Asian Network on Sericulture Research and Development (RAPA Report: 1989/1 and RAPA Publication: 1989/5].

Membership: Membership of the Network shall be open to any of the silk producing and/or processing countries in Asia, through their institutions and organizations concerned with sericulture research, development and training. These could be parastatal focal institutions, concerned government departments/bureau/agencies, or where these do not exist, apex federations or cooperatives. The present members include Bangladesh, China, India, Indonesia, Malaysia, Republic of Korea, Philippines, Sri Lanka, Thailand and Vietnam.

Objectives: The overall objectives of the network shall be to contribute to improving and promoting sericultural research, and silk production by way of better sericulture, biological and genetic research on moriculture and sericulture, cocoon and raw silk production, processing and domestic marketing.

Activities: In pursuance of the above objectives, the network may undertake the following activities:

i) Periodic compilation and dissemination of country-wise information regarding progress and problems of sericultural research, development, production and marketing.

ii) Documentation and dissemination of methodologies and innovative techniques in regard to the introduction of better and more productive techniques of moriculture, silkworm breeding and rearing, cocoon production, processing and marketing.

iii) Facilitating inter-country visits and training necessary to implement promising research and development technologies and application of techniques to promote technical cooperation.

iv) Organizing periodic network meetings to facilitate the exchange of experiences between subject-matter specialists on an inter-country basis.

v) Maintenance of a directory of institutions and resource persons by country and field(s) and interest.

vi) Serving as a reference framework for inter-country exchange in matters relating to sericultural research, development, training, production and marketing.

vii) Assisting in the formulation and implementation of programmes and projects at the country and inter-country levels dealing with the improvement of moriculture and sericulture, raw silk production, processing and marketing.

The network shall not be concerned with activities pertaining to international trade in silk which will continue to be dealt with by the Consultative Group on Silk operated by ESCAP.

Operation: The network shall broadly be operated as follows:

i) The secretariat of the network shall be provided by the FAO Regional Office for Asia and the Pacific.

ii) The Regional Agricultural Services and Agro-Industries Officer shall be the Secretary of the network and shall convene all the meetings of the network.

iii) In undertaking this activity he will ascertain from ESCAP the possibility of their offering any inputs in terms of secretariat papers.

iv) Participation in the network will not entail any fee at this state. However, the member institutions will be expected to assume the following obligations:

a) To supply the Secretariat of the network with requisite information and compile an annual country report on progress and problems of sericultural research, development, production, processing and marketing for dissemination in the network bulletin.

b) To set apart some local currency funds for facilitating activities of the network, particularly activities which are in the spirit of TCDC.

c) Wherever possible to bear the cost of attending meetings of the network.

Recent Action Undertaken: The Network organized the

Round Table on Standardization of Design Principles for Silkworm Rearing House and Instruments for Sericulture Development at FAO/RAPA in Bangkok during 19-23 November 1990 and moved to Khon Kaen for field visits and technical discussion between 20-22 November 1990. The objective of the Round Table was to have information exchange and technical discussions on the standardization of design principles for silkworm rearing house and instruments for tropical and temperate countries in Asia, to enable quality cocoon and raw silk production. Specifically the Round Table attempted to evaluate and record environmental aspects, site location and direction, surroundings and layout, as well as the materials of construction, and technique of fabrication of rearing houses and instruments (RAPA Publication: 1990/24).

In 1991, the Network requested CARE International in Thailand to test a new kind of synthetic fibre netting in one of its sericulture villages in Ubon Ratchathani Province. The material is developed and was supplied by Siam-Dutch Mosquito Netting Co., Ltd., in a batch of 80 m. The material has been in trial use under normal conditions in rearing houses, rearing rooms, over shelves of hatches, and rearing trays for over four months. It was found that the polyester netting appears to be eminently suited for sericulture operations of all kinds and can therefore be recommended (CARE International in Thailand's report, Sept. 1991).

Asian Network on Oilseed Crops

History: The Regional Expert Consultation on Edible Oil Crops which was convened at FAO/RAPA Office in Bangkok during 19-20 January 1988 recommended that regional network for improved production and utilization of oilseed crops should be established which would serve as a standing mechanism for consultation and as a forum for TCDC in the Region (RAPA REPORT: 1988/9). The Consultation also prepared and endorsed the document related to objectives, activities, participation, secretariat support of the proposed network (which appears below).

Membership: All countries which were present in the Expert Consultation on Edible Oil Crops (19-20 Jan. 1988) formed the core of the network. Other interested countries may join later. The leading oilseed crop institutes/organizations in each country should be the cooperators of the network. Present members include Bangladesh, China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Republic of Korea, Sri Lanka, Thailand and Vietnam.

Objectives: The overall objectives of the Asian Network on Oilseed Crops shall be to improve capabilities of the countries of the Region for increased and sustained production and utilization of oilseed crops for better income and nutrition of the people. The network shall aim at exchange of information on progress and problems of production, and post-harvest handling of selected oilseed crops and promotion of exchange of expertise, germplasm and planting materials in the spirit of TCDC.

Activities: The network shall undertake following set of activities:

- Exchange information on development of varieties, management practices and new production and post-harvest technologies.
- Exchange information on government policies and programmes on promotion of oilseed crops.
- Exchange of germplasm and planting materials.
- Assessment and arragements for training needs and workshops.
- Promotion of TCDC for development of oilseed crops in the Region.

Operation: The Network shall broadly be operated as follows:

i) The Secretariat of the Network shall be provided by the FAO Regional Office for Asia and the Pacific.

ii) The Regional Plant Production and Protection Officer shall be the Secretary of the Network and he shall convene all the meetings of the Network.

iii) Participation in the Network will not entail any fee. However, the member institutions will be expected to assume the following obligations:

- to supply requisite information and report to the Secretariat of the Network periodically.
- to prepare catalogues of germplasm collection of different oilseed crops and to make them available to other members through the Secretariat; materials should also be available upon requests from other members.
- to document successful cases of adaptive technology in oilseed crop production in the member countries for adoption in other countries.

Recent Action Undertaken: The Secretariat organized the Regional Expert Consultation of the Asian Network on Oilseed Crops at FAO/RAPA in Bangkok during 17-20 December 1991 (RAPA Publ. 1991/128). The objectives of the Consultation were to:

i) Analyse the status of production of important annual and perennial oilseed crops in individual countries of the Region and to identify major constraints to and suggest appropriate measures for improved production and distribution.

ii) Identify possible R & D support and to provide guidelines for future activities at country, sub-regional and regional levels to be undertaken by the member countries and FAO; and

iii) Spot out successful experiences on oilseed production in the Region and share them with the countries in the Region.

ANNOUNCEMENT

Logo of APAARI

The Logo of APAARI is proposed to be selected through an open competition. APAARI would pay a token award of US$ 250 to the winner. You are requested to bring it to the notice of all those who may like to enter in this competition. Logo must reflect the philosophy of Regional cooperation for agricultural research. The last date for sending the entry to the Executive Secretary is 28 February, 1993

Membership of APAARI

Presently, following 13 countries have become members of APAARI since 1991, whereas others in the Region are likely to join soon.

China, Fiji, India, Iran, Malaysia, New Zealand, Pakistan, Papua New Guinea, Philippines, Republic of Korea, Sri Lanka, Thailand, Western Samoa

Since APAARI is an association of agricultural research institutions, its membership is not restricted to only one institution in a country. Hence, leading research institutions, councils, organization, and universities in the Region are welcome to become its members.

Expert Consultation on Technology Assessment and Transfer for Sustainable Agriculture and Rural Development in the Asia-Pacific Region

A FOLLOW-UP TO UNCED

The First Meeting of the Executive Committee of the Asia-Pacific Association of Agricultural Research Institutions (APAARI), held at FAO Regional Office for Asia and the Pacific (RAPA), Bangkok, December 1991, had recommended that along with the meetings of the General Assembly of APAARI, a seminar/consultation on topic research and technology development issues should be organized. Pursuant to this recommendation, the Research and Technology Development Division (AGR), FAO, Rome, in close collaboration with RAPA and the Malaysian Agricultural Research and Development Institute (MARDI) is organizing an Expert Consultation on Technology Assessment and Transfer for Sustainable Agriculture and Rural Development in the Asia-Pacific Region, to be held in Kuala Lumpur, Malaysia, 14-18 December 1992. The Second Meeting of the General Assembly of APAARI is also scheduled during this Consultation on 17 December. The Consultation will discuss the Current status and future prospects of technology assessment and transfer for sustainable agricultural and rural development. The activity also constitutes a follow-up to UNCED Agenda 21.

Heads of national agricultural research systems (NARS) of 21 Asia-Pacific countries, namely Australia, Bangladesh, China, Democratic People's Republic of Korea, Fiji, Inidia, Indonesia, Iran, Japan, Republic of Korea, Laos, Malaysia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Samoa, Sri Lanka, Thailand and Vietnam have been invited to participate. Representatives of several regional and international organizations, such as UNDP, ADB, ESCAP, AIT, IARCs of the CGIAR, IDRC, ICIMOD, SEARCA, IRETA, and IFAD have also been invited.

The objectives of the consultation are the development of concepts, indicators and guidelines for technology assessment and the elaboration of a complementary approach to technology assessment and transfer through sectoral linkages and capacity building. More specifically, the consultation will seek to develop indicators of sustainability on the basis of agro-ecological and production system characterization, to effect technology identification, generation and transfer for perceived problems of unsustainability and to integrate various actors, i.e. research, extension, private sector, communities, FAO and international centres in a systems approach for sustainable development.

Sustainability itself is somewhat an elusive concept. In order to concretise the concept and to render it operational, it is suggested to develop a methodological approach that builds on the description of agro-ecological zones, production systems, resource endowments and their management and socio-economic environments, with special reference to rural development. For this Consultation, the following definition of sustainable agricultural development, as adopted by the FAO Council in 1988, has been used:

> "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".

The Consultation would work essentially through Working Groups, whose terms of reference are given below:

(i) agree on the *major* agro-ecological zones (AEZs) in the Asia-Pacific Region and the minimum data set required for AEZ characterization;

(ii) describe *major* production systems within the AEZs;

(iii) define the minimum data set for resource endowment characterization and describe its variation within AEZs;

(iv) list and describe sustainability/unsustainability indicators and critical areas for the AEZs land production systems identified under (i) and (ii) given various resource endowments;

(v) based on the analysis under (iv), define objectives and propose technological options, keeping in mind the distinction between material-input-based and information/management-based technologies;

(vi) propose a priority assessment methodology for the choice of sustainability enhancing technologies;

(vii) describe major institutional requirements for technology assessment and transfer capacity development, existing gaps and shortcomings, and propose criteria for the evaluation of institutional efficiency in technology assessment and transfer;

(viii) propose arrangments for sectoral linkages, technology dissemination strategies and collaboration between international/regional/national agencies and institutions; and

(ix) identify priority project ideas and prepare their profiles for pilot projects/programmes.