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SUBSTANTIVE PREPARATIONS FOR THE CONFERENCE

Activities of the relevant organs, organizations and bodies of the United Nations system in the field of new and renewable sources of energy

Addendum

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

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FAO's Past, Present and Planned Activities in Energy for Rural and Agricultural Development

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1. FAO's ROLE

The activities of FAO in the field of energy stem from the fact that agriculture is a dominant factor in the energy systems of rural areas, both as the main economic activity using commercial and non-commercial energy, and as one of the supplies of energy for rural households, rural industries and services and its own use. Ever since FAO's creation, these activities have been an important part of the Organization's work where energy for rural and agricultural development form an integral part of FAO's mandate. The rising energy crisis and decreasing security of supply have led FAO to examine critically the use of energy in agriculture in recent years and identify specific areas for assistance to the developing countries.

Agricultural production uses only a very small portion of the total consumption of fossil fuel. FAO's benchmark survey estimates that in 1972/73 agricultural production was responsible for about 3.5 percent of the total world use of commercial energy; the developing countries (including China and the other Asian centrally planned economies), with more than two thirds of the world population, used only 18 percent of the above total in 1972/73. It seems unlikely that this proportion has greatly changed since then. However, with present technologies and pressing food demand, this small proportion is essential for the rapid increase in production required by the growing population.

It is, therefore, important not only that agriculture should be assured the quantities of fossil fuel energy that it requires, but also that it should contribute to its more efficient and economical use. However, in the longer run, non-renewable sources of energy must be replaced, or at least very substantially supplemented, by renewable sources. Here, the agricultural and rural sector can itself make a contribution for, in addition to being a user, it is also a producer of energy, not only of the dietary energy in food, but also of fuel in the more conventional sense. Lately, a great deal of attention has been given to the possibility of growing crops especially for the purpose of providing fuel. Of much more importance, however, is the fuel derived from wood and from crop and livestock residues. These play so large a part in the fuel supplies of both urban and rural areas of the developing countries that it is essential to look at agriculture and forestry in the wider context of rural energy systems. At the same time, it is also important to carefully analyse the implications of producing energy from crops on world food security and supplies.

Therefore, from the above, it can be seen that agriculture and rural energy problems impinge on many different parts of FAO's field of competence and relate to a number of FAO regular and field programme activities of the Agriculture, Forestry and Fisheries and of Economic/Social Policy Departments, including those promoted by the Regional Offices.

2. SUMMARY OF FAO's PAST AND PRESENT ACTIVITIES

FAO is providing assistance to member countries in the field of energy saving and development and promotion of renewable sources of energy through its regular and field programme activities.

2.1 In the agricultural sector, technical assistance is provided to a number of developing countries in the following fields:

- Efficient use of chemical fertilizers in order to optimize the use of this input by the larger number of small farmers in developing countries and increase their income by cutting the cost of production;

- Development and promotion of bio-fertilizers based on renewables such as nitrogen fixing organisms (rhyzobia, green and blue algae, azolla for rice production), recycling of organic materials, biogas technology which can also provide gas and electricity for rural household needs;

- Improved production and utilization of draught animal power;

- Integrated pest control for food and industrial crops in order to make available the limited amount of pesticides to a larger number of small farmers and reduce the cost of production;

- Application of solar energy for pumping and drying;

- Application of wind energy in agriculture;

- Improvement of data on agricultural residues and biomass for developing and promoting the appropriate mix of renewables to supplement the energy needed for food and agricultural production;

- Review possibilities and competition between food and alcohol production from crops.

2.2 In the field of forestry, FAO is executing about 40 national or regional field projects concerned with fuelwood or charcoal production. These projects deal with the various phases of fuelwood production and utilization such as fuelwood plantations, charcoal production, utilization surveys, improvement of wood-burning stoves, industrial energy production and general forest sector planning with due regard to energy aspects. Major components of most projects also deal with sociological and environmental issues.

2.3 In the field of fisheries, FAO is providing assistance on the use of solar energy for fish drying; the application of wind energy for ice production; fuel savings through increased use of propeller nozzles, particularly for trawlers; the use of alternative propulsion systems, including sail, for small craft; replacement of petrol outboard motors by low powered diesel engines; development and demonstration of energy-saving fishing gear.

2.4 Research development and exchange of information takes place concurrently with the transfer of relevant technology in the field activities listed above and also through special programmes designed specifically for exchange of information and experience.

For example, the regional project in Asia and the Pacific "Improving soil fertility through organic recycling" includes an important component of exchange of experience and transfer of information on relevant technology, including biogas. This project lends itself especially well to the promotion of technical cooperation among developing countries. Training courses on organic recycling and biomethanation are also being organized in Africa, the Near East and Latin America.

Two regional projects are in preparation and a training centre for Africa on fuelwood and charcoal production. FAO assembles and disseminates national production and trade data on fuelwood. Information is provided on fast-growing species appropriate for energy production. Preparation of revision is under way on guidelines on charcoal production, wood based power installation, logging and transport equipment. Studies are also underway to develop information about the factors affecting rural use of wood fuels.

In the field of fisheries appropriate energy conservation technologies are being monitored and catalogued and results of experience with more energy efficient fishing are being compiled for dissemination to member countries.

2.5 Also, FAO is providing assistance to member countries in the preparation for the UN Conference on New and Renewable Sources of Energy (UNCNRSE) through its cooperation with the Conference Secretariat. FAO has the responsibility for the organization and maintenance of the technical secretariat for the Panel on Fuelwood and Charcoal which includes the provision of technical information, the study of results on the subject and the preparation of a subject matter paper including world map on fuelwood pressure on the vegetation cover. FAO has also assisted the UNCNRSE Secretariat in the preparation of the report on Draught Animal Power and in the organization of the Expert Group Meeting on Draught Animals (January 1981, Bangalore, India).

2.6 The FAO David Lubin Memorial Library continued to collect and process all FAO documents related to new and renewable sources of energy which are entered in the FAO data base and appear in the bi-monthly bulletin entitled "FAO Documentation - Current Bibliography". A selection of relevant documents falling into this category forms part of the FAO input into AGRIS. The Library offers, since 1980, computerized retrieval services from in-house and outside data bases, including those containing energy related information.

2.7 The international cooperative information system AGRIS has a special subject category devoted to energy resources including new and renewable sources of energy under which all countries participating in the system

provide input related to fuelwood and charcoal, alcohol, biomass, wind energy, solar energy, draught animals, peat, etc. By the end of 1980, around 5,500 renewable sources of energy related references had been included in the data base for computerized searching and selective dissemination of information. These also appear in the monthly printed bibliography Agrindex.

2.8 In recent years, FAO has convened or co-sponsored the following meetings on renewable sources of energy:

FAO organized and hosted the two meetings of the Technial Panel on Fuelwood and Charcoal of the UN Conference on New and Renewable Sources of Energy.

A series of meetings, sponsored jointly with SIDA, were undertaken to identify activities to meet rural fuelwood needs, and local needs for other forest-based outputs. This resulted in the establishment in 1979 of the SIDA-funded Forestry for Local Community Development Programme.

Together with other agencies, FAO has co-sponsored the (1) ESCAP symposium on Solar Science and Technology, (2) ESCAP Fuelwood meeting, (3) ECLA/OLADE Fuelwood meeting.

The matter of energy-cropping versus food was discussed first at the FAO Expert Consultation (July 1980, Rome) and later by member governments on the occasion of the FAO Regional Conference for Latin America (August 1980, Cuba).

2.9 FAO's Intergovernmental Committee Meetings on Action Programmes on Energy and Rural Development

The Committee on Forestry [1/] (26 - 30 May 1980) discussed and formulated recommendations for the development of a plan of action to promote and develop fuelwood and charcoal programmes.

The Committee on Agriculture [2/] (25 March - 3 April 1981) will discuss the aspect of energy use in agriculture and formulate recommendations for a programme of action for the short and medium term on the efficient use of commercial energy and promotion of renewables for agriculture and rural development.

The Committee on Fisheries [3/] (26 - 30 May 1981) will have the opportunity to consider energy issues in fisheries based on a background paper on Energy and other Costs in Fisheries.

The FAO European Commission on Agriculture (23 - 27 June 1980) discussed and developed a programme of action for a wider use of renewable sources of energy through a network approach by using national institutions.

1/ COFO; 2/ COAG; 3/ COFI

The results of COAG, COFO and COFI, together with the recommendations of the UNCNRSE on energy matters will provide the basis for the FAO programme on energy in agriculture, forestry and fisheries for 1982-83 which will be discussed with the 21st FAO Conference, November 1981.

Within FAO, the Inter-Departmental Working Group on Natural Resources and the Human Environment has been entrusted with the coordination of FAO's contribution to the Secretariat of UNCNRSE.

2.10 FAO's publications in the field of Energy

Following are some major recent publications on energy:

- Energy and Agriculture. Reprint from "The State of Food and Agriculture 1976". FAO, 1978.

- Energy for World Agriculture. FAO Agriculture Series No. 7.

- Directory of Institutions and Compendium of Technologies related to agricultural by-products utilization. FAO Agricultural Services Bulletins Nos. 21 (Rev. 1) and 33.

- Rice Husk as an Energy Source. FAO Agricultural Service Bulletin No. 31.

- China: Recycling of Organic Wastes in Agriculture. FAO Soils Bulletin No. 40.

- China: Azolla Propagation and Small-scale Biogas Technology. FAO Soils Bulletin No. 41.

- Organic Recycling in Africa. FAO Soils Bulletin No. 43.

- Report of the FAO Expert Consultation on Energy Cropping versus Food Production (Rome, 2 - 6 June 1980).

- A Global Reconnaissance Survey of the Fuelwood Supply/Requirement Situation - a report prepared for the UN Conference on New and Renewable Sources of Energy.

- Wood Energy and Rural Communities - report to the 8th World Forestry Congress, 1978.

- Assessing Rural Fuelwood Needs and Supply Possibilities (in preparation)

- Draught Animal Power as a source of Renewable Energy (commissioned to FAO for the UNCNRSE).

- New and Renewable Energy in Agriculture (Report for the 22nd session of the European Commission of Agriculture, Rome, June 1980).

3. FAO's ACTIVITIES IN THE FIELD OF ENERGY PLANNED FOR 1982/83

An expansion in the importance of energy is to be expected in the light of the mounting problems of developing countries in relation to energy supplies and their optimal use for their agriculture and rural development. Therefore, FAO's programme activities in the field of energy will be strengthened to assist, in particular, developing countries in the following areas.

3.1 Energy policy and planning

An urgent need is to integrate energy considerations into all aspects of agriculture and rural development, and assist countries in the formulation of related medium- and long-term energy strategies, plans and programmes. To achieve the above task assistance to developing countries in the following major areas of work are planned.

(i) better understanding of the energy flows in local, rural, economic and social units, including villages and small market towns for effective development and management of rural energy use and production within the framework of rural energy systems.

(ii) development of methodologies for the analysis and management of rural energy systems in order to integrate energy planning for rural areas with overall agricultural planning.

(iii) assessment in selected cases of the implications of changing relative energy prices for agricultural production and consumption and the adjustments which take place in them.

(iv) monitor and analyse impacts of energy prices and availability in the production, exports, imports and prices of agricultural commodities.

3.2 Conservation and wider use of new and renewable sources of energy to increase and sustain food and crop production

Emphasis on energy in agriculture will be placed upon:

1. The conservation and more efficient use of energy-based agricultural production inputs through improved use of fertilizers and methods of land and water development, crop production and harvesting.

2. The utilization of energy-efficient product handling, drying and storage methods.

3. The assessment of technologies for conversion of agricultural crops and other biomass into energy and in the development and utilization of appropriate crop production, harvesting and handling methods for these crops.

4. The application of technologies for utilizing alternative sources of energy in agriculture, including solar and wind-power for water

pumping and other on-farm applications, solar grain drying particularly in the humid tropics, and biomass derived fuel such as biogas, vegetable oil, alcohol and producer gas to power stationary and mobile engines used in agriculture; wider utilization of draught animal power.

5. Regional cooperative networks for research and development of rural energy systems.

Specific activities in the above areas during 1982-83 will be geared towards monitoring and assessing the applicability for developing countries of the new developments on energy-related technologies through a network of national institutions and TCDC approaches. Since a number of technologies and processes in the more efficient use of energy in agriculture and in the utilization of agriculture to produce more energy are expected to become technically and economically feasible in the near future, missions will be mounted for the formulation of projects and to advise governments in these areas.

3.2.1 Programme to maintain soil fertility through efficient use of fertilizers and organic substitutes

Increased and more efficient use of fertilizers will be promoted through field programmes with special attention to multiple cropping systems and development of data for national fertilizer recommendations.

The organic recycling programme will aim at supplementing fertilizer demand by promoting compost-making from plant, animal residues, night soils, household refuse and from city waste; mulching, green manure and use of aquatic plants as manure, biological nitrogen fixation (symbiotic and non-symbiotic with emphasis on azolla and blue-green algae), and the use of the biogas digestor effluent as manure.

Among specific activities planned, the following could be mentioned:

(i) Organic recycling practices of different types will be integrated more into general soil management programmes.

(ii) A second phase of the FAO/UNDP Regional Project in Asia on Improving Soil Fertility through Organic Recycling is under preparation. Regional projects with similar objectives as that in Asia are under consideration for the Near East and Africa Region.

(iii) Trust fund consultancies, including training, will be carried out in six countries in the Near East region and in the countries of the Sahelian zone.

(iv) A Soils Bulletin on Blue-green Algae and Organic Recycling in Africa will be published.

3.2.2 Modernization of draught animal power

Draught animal power (DAP) is and will continue to be for a long time the main source of energy for small farmers and small scale transportation in many developing countries. There is a need to improve its efficiency through modernization of equipment of breeding, feed and health programmes and to integrate it with other systems such as crop production, meat, milk, fibre, fuel and fertilizer and to promote its use into new areas.

The planned programme aims at promoting appropriate use of draught animal power in agriculture and rural development through:

- a review of animal power potential in the world for expanded and improved use as complementary source of rural energy.

- technical assistance to governments in the promotion of DAP.

- organization of workshops on draught animal power in Africa and Latin America.

- consideration for the establishment of a DAP applied and research training centre in Africa.

Increased technical assistance projects, for example, two project ideas for promoting wider use of DAP in the Asian region have been submitted to UNDP.

3.2.3 Use of renewable sources of energy in small scale agro-industries

Planned activities will focus on three areas to more efficiently use non-renewable and renewable energy inputs. The first area will be the saving of energy in the agro-industries of developing countries through increasing the efficiency of burners, insulation of heat sources and equipment, operation of plants at full capacity and the recycling of waste heat. Consideration will also be given to the optimum location and capacity of agro-industries in view of the relative increasing cost for transport. The second area is the introduction of low-energy technologies such as sun-drying, smoking, salting, pickling, fermentation and natural sublimation. The third area of emphasis is the use of renewable energy derived from biomass. Consideration will be given to both utilization of residues such as bagasse, peanut shells, rice husk and animal wastes and to biomass grown especially for energy such as vegetable oils, sugar and starch crops and cellulose. Particular attention will be given to biomass conversion processes such as direct combustion, gasification, fermentation and biogas production. Also, attention will be given to the possible utilization of solar and wind energy as power sources for certain types of agro-industries in specific locations.

A project proposal for an inter-regional project on conversion of agricultural residues to energy has been submitted to UNDP for possible financing. Also, a proposal for a global project on solar drying of

agricultural crops has been made for UNDP financing. The application of solar energy for livestock production and milk and meat production is also under way and will be further developed in 1982-83. An Expert Consultation on Alternative Fuel for Agriculture will be held and collaboration between national and international institutes on agricultural energy matters will be promoted.

Specific activities will also include the monitoring of ongoing research in the above areas to identify promising results for application in the developing countries; the mounting of missions to identify and formulate projects on biomass conversion to energy and more efficient energy utilization in agro-industries. A publication will be prepared on Biomass Energy Profiles and the Compendium of Technologies and Bibliography for Residue Utilization will be updated.

3.2.4 Energy related to marketing and credit

Increased energy cost has added a new dimension to marketing costs and has created the need to modify marketing policies to provide energy savings and increased overall efficiency. The planned programme will develop specific practical criteria for revision of input supply and marketing arrangements to achieve the optimum balance of energy conservation and the attainment of other essential policy goals. Special consideration will be given to price incentives in developing countries to reduce seasonal transport pressure; decentralization of transport arrangements to provide the maximum opportunity for full return loads; complementary activities with draught animal power; and location of market, processing and storage facilities to minimize overall transport costs.

Specific activities that will be undertaken in 1982-83 biennium include:

1) Analytical studies of the re-organization of input supply and agricultural output marketing systems to reduce energy use.

2) Discussion of the results of the above studies with representatives of developing countries at regional meetings which will be organized.

3) Provision of consultants who will work with developing country governments in reviewing their input supply and marketing system with the objectives of identifying consumption of energy that could be avoided and recommending appropriate policies for improving energy efficiency in these supply and marketing systems.

3.2.5 Production of energy from agriculture

In recent years, increasing emphasis has been placed on producing energy from agricultural crops, including food crops. The potential implications of this development could be significant especially in the light of the growing need for diversification in energy sources. Energy cropping from agriculture on a substantial scale could divert food and feed crops from human consumption and livestock production and have a negative impact on world food security, food supplies and food aid

availabilities. In view of the importance of this aspect of energy cropping, it is planned to closely monitor developments in this field and to assess the impact of the utilization of food and feed crops for producing energy on world food security, with particular attention on the food security of the low income developing countries.

3.3 Fuelwood and Charcoal Programme

The Forestry Department has established recently a Forestry and Rural Programme to which one donor country has already committed its financial support. The main purpose of this programme is to support overall programmes in countries most in need of assistance to forestry actions in order to meet the fuelwood needs especially of the lower income groups. In addition, the Forestry Department is currently participating in joint efforts with the World Bank and other multi- or bi-lateral institutions in the identification, formulation and implementation of fuelwood programmes and projects.

In the forthcoming programme of work for 1982-83, it is proposed that high priority be given to wood energy-related activities. This priority was recommended by the governing bodies which also requested FAO to extend its assistance capability in this area to member countries. The amount of resources dedicated to wood energy activities is expected to increase three-fold in the biennium 1982-83 as compared to 1980-81. In line with the recommendations of the Committee on Forestry major programme elements will include:

- appraisal of wood-based energy resources for the development of rural energy production from forest lands;

- design and preparation of appropriate fuelwood programmes for typical fuelwood deficit situations;

- selection and collection of seeds from tree species suitable for the combined production of energy and food, particularly at farm level;

- evaluation of the impact of fuelwood shortages and the implications of utilizing agricultural residues for fuel;

- analysis of the socio-economic costs and benefits of energy plantations and the preparation of guidelines for investment projects;

- use of wood for industrial energy in developing countries through the design of wood-based energy generating plants for the wood industries or for electricity generation in rural communities;

- energy conservation in forest industries.

Special emphasis will be placed on the training of manpower and strengthening of institutions as these are key factors to intensifying wood energy-related programmes on a scale required by the magnitude of the

potential of the forest biomass and the needs for rural energy. The strategy being developed by the Forestry Department aims at further integrating the production and use of wood for energy in overall forest management and at enhancing the contribution of forestry to meeting rural energy needs through improving the supplies of renewable wood energy within the framework of integrated rural energy systems. In implementing this strategy, special attention is attached to the role and participation of local communities, particularly the women, and to the exchange of experience and cooperation between developing countries in the design of suitable solutions.

3.4 Energy-saving Programmes for Fisheries

Over the last few years, dramatic increases in the price of petroleum-based fuels have rapidly altered the costs and earnings picture for most fishing and fish processing enterprises, fuel now being one of the most important factors in the cost of production. The high cost of energy and uncertainties in the supply of petroleum fuels have led to an increasingly intense search for ways to decrease the costs and vulnerability of energy supply by decreasing the reliance on petroleum fuel in fisheries-related operations. This is being done on the one hand by increasing the energy efficiency of the production operations, both by finding ways to decrease the absolute energy needs of the production unit (as for example developing more energy efficient fishing vessel propulsion or different, less energy demanding strategies for catching or processing fish) and by increasing the yield from a given amount of fuel (e.g. by reducing the number of vessels exploiting overfished stocks). On the other hand, there is also a growing interest in using alternative energy resources directly under national control, the advantages being decreased reliance on fuel imported with hard currency, possible absolute savings in cost, and increased security of supply. For the fisheries in most developing countries the accessible alternative energy sources are predominantly wind, sun and biomass and their increased use holds promise particularly in the small-scale sector.

The work to be undertaken will be closely coordinated with operational field programmes, particularly at the regional level, and will provide the data and information base required for an accelerated and directed research effort and the introduction of suitable regulatory and technological measures after extensive field trials by ongoing and future field projects. It will cover the following main programmes:

- Studies of energy consumption patterns in selected existing fishing and processing operations, leading to both physical and economic evaluations and comparison with alternative operations patterns which may have significantly different mixtures of fuel, labour and capital investment and thus, an improved costs-and-earnings profile under current conditions. This work would include improved definitions of economically optimal fishing vessels and gear for selected regions.

- Investigation and provision of advice on the possibility of reducing overall energy costs and improving profits through reduction of over-capacity in certain specific fishing and processing sectors;

- Promotion of the use of alternative energy from renewable sources, especially in propulsion (sail) and processing (solar heat/biomass);

- Identification and stimulation of required additional R and D work to be supported on a longer-term basis by extra-budgetary resources;

- Publication of study reports, including economic and technological assessment and evaluation, planning parameters, dissemination of field test results, data sheets, specifications, catalogue of available energy-saving technology systems suitable for fisheries applications.

The work will involve, inter alia, studies to identify problems and possible approaches for their solution at Headquarters and in the regions by FAO staff and consultants; investigation and evaluation of field trials carried out by ongoing FAO field projects; consultancies and short-term research contracts; travel for Regular Programme and non-staff personnel for expert consultation; dissemination of results through publications, sub-regional and regional support programmes, through extra-budgetary workshops and advisory technical consultancies.

In view of the high proportion of fishery operational costs resulting from the use of conventional liquid fuels, the main thrust of fisheries work in the energy sector will be concerned with containing these costs without jeopardizing the level of global fish catches and their increase where the fish resources permit. This is particularly important for the artisanal fisheries sector in developing countries.

3.5 Information Base

The FAO Library and international systems AGRIS and CARIS will continue to cover the subject of new and renewable sources of energy as related to agriculture. The CARIS Centres will collect and disseminate information on current research projects in this field in developing countries. The AGRIS participating centres in both developed and developing countries will be requested to intensify their efforts to improve the coverage of their literature in this field. More precise indexing and retrieval will result from the use of the multilingual thesaurus AGROVOC in the preparation of which particular attention was given to energy resources. Access by users will be improved through appropriate training and wider dissemination of outputs.
