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United Nations Industrial Development Organization
Department of Industrial Operations
Industrial Operations Technology Division

AGRO-BASED INDUSTRIES

The technical assistance programmes
in the sector of agro-based industries

MARCH 1992

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The following selected papers are also available

**Who's Who
New Challenges and Opportunities
Chemical Industries
Engineering Industries
Metallurgical Industries**

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INTRODUCTION

The Agro-based Industries Branch concentrates mainly on better valorization of the existing structures in developing countries and on the improvement of the quality of products that conforms to the norms and qualifications required by the demands of the international market. Special emphasis is laid on transferring technology and exchanging managerial and marketing experience, with a view to reducing to a minimum the dependency of industry on imports; introducing high technologies in large scale centralized production plants and towards the technical and economic improvement of small and medium scale production units. The main sub-sectors covered by the units of the Agro-based Industries Branch are:

- Agro-based food processing;
- Animal-based food processing;
- Textile and garment industries;
- Leather and leather products;
- Wood processing and wood products industries.

Common topics to agro-based industries concerning improvement of the quality, environment protection and energy conservation are also actively pursued by the Agro-based Industries Branch, with high priority accorded to:

- industrial effluent treatment;
- development of cleaner technologies;
- processing of industrial wastes
(aimed at valorization or elimination);
- utilization of by-products.

The Branch also provides supporting activities towards marketing of agro-and animal-based products, including standardization, products and packaging quality control, storage of agriculture or animal sources raw materials or processed commodities, transportation, distribution, etc.

The economic and political needs for the development of small-scale rural activities are recognized as important factors in private industry development in developing countries. Special efforts are being made for the integration of women in the industrial production process.

The animal-based food processing unit concentrates on the modernization of the dairy industry, the improvement of the fish processing industry, in developing work for the utilization of new species of fish meat and improving the quality and production of processed marine products. Large scale projects are developed by this unit for upgrading the food industry research institutes and establishment of quality control laboratories. Studies are carried out on alternative value-added food products of animal origin to reduce imports of food commodities in developing countries, e.g. baby food based on local milk powder and flour.

The agro-based food processing sector aims mainly at substituting imported agricultural raw materials with local products, at increasing the availability of low cost protein in countries where protein from animal sources remains inaccessible for the low income population, by making edible

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sources remains inaccessible for the low income population, by making edible detoxified raw material and establishing pilot vegetable and fruit processing plants, and giving assistance to food technology institutes in developing production methods and adapting technologies to the market needs. Activities are also undertaken at the village level such as in establishing solar drying centres for fruits and vegetables.

The activities of the textile industries unit are characterized by large scale institution building projects focusing on high technology, R and D and fashion in the textile sector, by replacing conventional manufacturing methods in developing countries with new technologies, extensively based on the use of computer-aided design/computer aided manufacturing/computer-integrated manufacturing techniques (CAD/CAM/CIM). Finally, the development and application of appropriate technology for the processing of local raw materials, e.g. the spinning of short staple cotton or assistance in research and development for jute and unconventional indigenous fibres.

A large part of the work in the leather sector concentrates on the improvement of hides and skins, as well as leather and leather products, and the development and reinforcement of regional leather centres in China, Indonesia, Regional Africa, and the Philippines; the introduction of software for computerized costing systems in the footwear and leather industry and production control of shoe factories; and, finally, in expanding the application of tannery effluent treatment programmes on a world-wide scale.

The wood products and processing unit deals with secondary wood processing, mainly furniture and joinery production, and the rational and efficient use of wood in construction. Efforts are concentrated on improving productivity, design, process and quality control at the plant level and on developing, promoting and demonstrating appropriate timber structures and building components. Common technologies such as drying, gluing, preservative treatment, surface finishing as well as the selection of woodworking equipment and processes are also covered, as is consideration of the need to protect the environment through ecologically sound technologies. Human resource development is covered through either on the job transfer of know-how or through short technical courses on specific topics.

The activities of the units are oriented to technical assistance through transfer of technology, expertise, design of industrial units, establishment or upgrading of pilot centres, modernization and rehabilitation of industrial plants, quality control structures, setting up of research and development laboratories, identification of market demand and new technologies, professional training and upgrading of management skills.

In particular, the projects/programmes involve one or more of the following activities:

- Preparation of master plans and techno-economic studies for the establishment of new production facilities;
- Institution building, i.e. establishment, upgrading or restructuring of technical, research and development and training centres and institutions, etc;

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- Strengthening of existing capacities, modernization and rehabilitation of plants; relocation and sizing of production units based on actual market demand; introduction of appropriate and cleaner technologies;
- Establishment of pilot plants, demonstration units and quality control facilities;
- Provision of direct technical support (trouble shooting) to solve immediate problems;
- Product and process design; Marketing aspects including standardization, storage, packaging, transportation, distribution;
- Product rationalization and automation;
- Maintenance of tools and machinery;
- Environmental monitoring and control including effluent treatment, utilization of by-products.

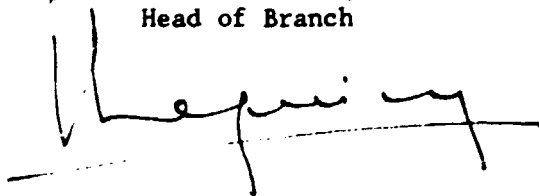
The technical assistance activities are supported by:

- Convening of workshops and expert group meetings;
- Issuance of Manuals and other documents;.
- Development of human resources through on-the-job training, fellowship training, short courses and study tours;

Various technologies are applied to reach the desired project outputs and objectives. These include:

- Conventional semi-industrial technologies;
- Modern industrial technologies, including CAD/CAM/CIM;
- Modern integrated sectoral development;
- Ecologically clean industrial technologies;
- Flexible manufacturing systems;
- Artificial intelligence/expert systems.

Jean G. A. Lequien
Head of Branch



AGRO-BASED INDUSTRIES BRANCH
 ORGANIZATION CHART
 Head: J. Lequien

Agro-based food processing unit

Mr. A. Sabater de Sabates	Unit Chief	Unit Chief, Cereals, oils and fats, spices, by-products, wastes technology.
Mr. U. Antinori	Industrial Development Officer	Vegetables, fruits, tobacco
Mr. S. Miranda da Cruz	Industrial Development Officer	Cocoa, sugar, beverages, R + D
Ms. L. Guigou	Junior expert	

Animal-based food processing unit

under recruitment	Unit Chief	
Mr. B. Galat	Industrial Development Officer	Meat and dairy products
under recruitment	Industrial Development Officer	Fish industry

Leather and leather products unit

Mr. J. Berg	Chief	Footwear and leather products
Mr. J. Buljan	Industrial Development Officer	Tanning and finishing of leather; clean technology and effluent treatment.
Mr. F. Schmel	Industrial Development Officer	Footwear leather and rubber products
Ms. A. Calabro	Junior expert	

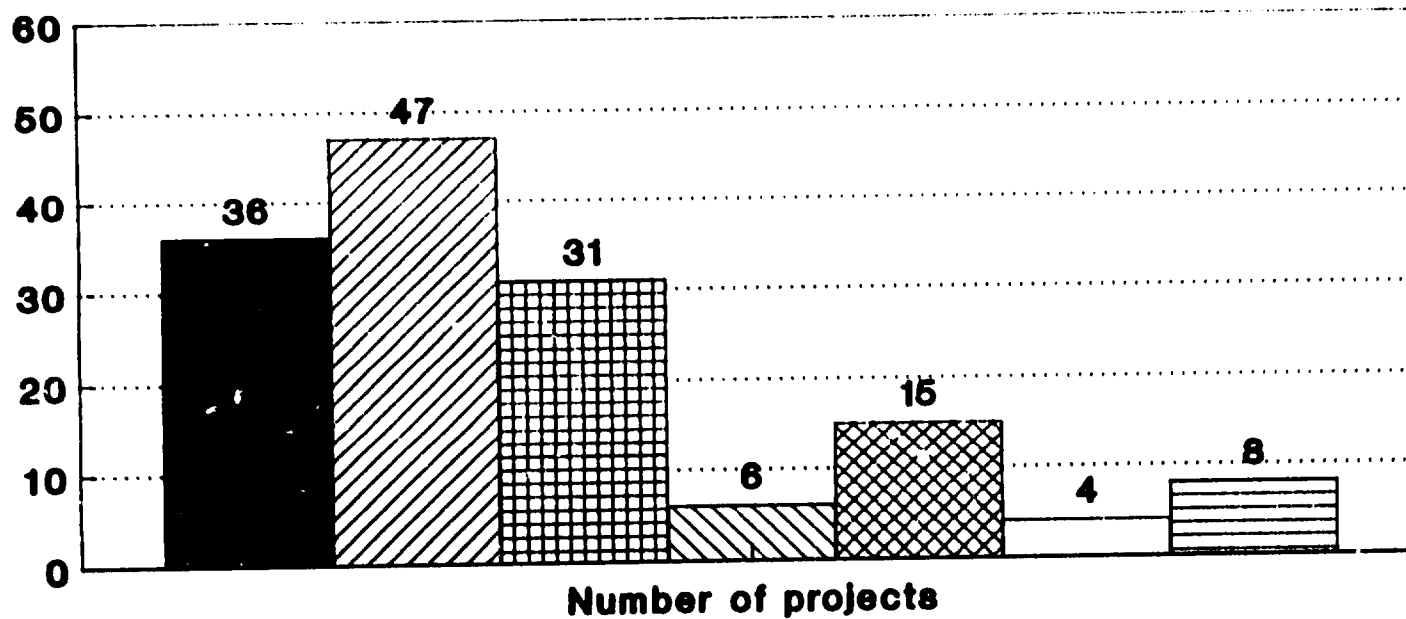
Textile and garment industries unit

under recruitment	Unit Chief	Cotton, jute, man-made fibres, silk, wool
Mr. J.P. Moll	Industrial Development Officer	Cotton, jute, man-made fibres, silk, wool

Wood products and wood processing unit

Mr. A. V. Bassili	Unit Chief	Non-structural uses (furniture and joinery), ligno-cellulosic based panels from agricultural residues
Mr. R.M. Hallett	Industrial Development Officer	Structural uses, incl. grading, design codes, preservation, solar drying, wood technology research

Projects within AGRO 1991



Africa
 Asia & Pacific
 Latin America
 Europe & Med.

African Arab
 W. Asia Arab
 Global/Interregional

By region

ANIMAL-BASED FOOD PRODUCTION

The technical assistance programme focuses on the dissemination of technological knowledge, provides expertise and the application and transfer of modern technologies and know-how to animal-based processing industries in the dairy, meat, fish and poultry sub-sectors including baby food and animal feed. The programme is involved in all phases of development and implementation of technical assistance projects:

PROJECTS AIM AT:

- ▣ Restructuring and modernization of the animal-based food industry sector according to mid-term market perspectives and with a view to privatization which is one of the top priorities in developing countries;
 - ▣ Application of modern animal-based food production technologies and quality control in conformity with new market standards;
 - ▣ Establishment of pilot demonstration and training facilities;
 - ▣ Rehabilitation and modernization of existing plants; the relocation and proper sizing of the animal-based production units considering the actual market demand and the profitability for the private sector;
 - ▣ Development of new, cleaner technologies for the production of food products of higher quality; utilization of by-products and wastes for human consumption and as animal feed;
- Industrial processing of effluents, by-products and wastes thereby protecting the environment.

IN THE AREAS OF:

- Dairy industry
- Meat industry
- Fish industry
- Poultry industry
- Baby food industry
- Animal feed industry.

PROJECT AREAS

Examples of the areas covered by the programme's projects are:

○ Dairy industry

- Milk processing;
- Milk storage;
- Quality control;
- Distribution of milk and dairy products.

○ Meat industry

- Animal slaughtering;
- Meat processing;
- Meat storage;
- Quality control;
- Distribution of meat and meat products.

○ Fish industry

- Fish processing;
- Fish storage;

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- Quality control;
- Distribution of fish and fish products.

O Poultry industry

- Poultry and egg processing;
- Poultry and egg storage;
- Quality control;
- Distribution of poultry, meat and eggs.

O Baby food industry

- Baby food production;
- Baby food formulation and storage;
- Quality control.

O Animal feed industry

- Animal feed production;
- Animal feed formulation;
- Storage;
- Quality control.

TECHNOLOGY SELECTION

The industrial processing technology applied in the projects and programmes depends on the scale of the production programme; suitable technologies are selected from a wide range of available options. These include conventional (and so-called appropriate) technologies on the one hand, and more modern ones, such as automated or computer-controlled on the other hand. Integrated development of e.g. the fisheries industrial system is promoted provided that the infrastructure is favourable and that the environment of a specific programme permits.

PROJECT EXAMPLES

The following typical project examples are either based on completed or ongoing projects or reflect recently manifested interests or requests by developing countries which in the future need to be pursued.

O DAIRY INDUSTRY

*** Assistance to the dairy industry and cheese production through improvement of raw milk testing and quality control**

Problem: The output and thus the economic revenue of the dairy industry in developing countries is often very low. Substantial industrial improvements need to be introduced, particularly modern testing and quality control techniques. Testing laboratories and skilled manpower are often lacking or inadequate.

Project: Establishment of a fully functioning laboratory for modern analysis of raw milk including analytical equipment at a selected dairy plant; detailed test instructions and training analysis for milk and dairy products. This would enhance the knowledge of the national staff in order to perform tests according to guidelines on the milk quality requirements for processing into dairy products, particularly for cheese production. Elaboration of a report containing an analysis of the existing dairy industry performance, including state of available raw milk and recommendations for future improvements. Senior technical staff from dairy factories will be trained in modern dairy processing methods to enable them to improve local processing technology.

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ANIMAL BASED FOOD PRODUCTION

* **Techno-economic study on the activities of the national dairy industry**

Problem: The national dairy industry often faces economic, managerial and technical problems and requires a strategy for strengthening its industrial capabilities in order to upgrade the production and increase the varieties of locally manufactured dairy products, ensuring international standard and quality level.

Project: Based on a field analysis of the sector, consultants will elaborate a report, containing the technical, managerial and economic appraisal of the dairy industrial sector. This report will outline the production capacity, equipment and technology used, the system of transportation of milk and dairy products, storage, quality control and distribution, the availability of training facilities, the effectiveness of management, the coordination and inter-linkage activities with the programme, guidelines and recommendations for upgrading and modernizing the industry in production technology, quality control, staff training and plant management.

O MEAT INDUSTRY

* **Identification of alternative meat products for export**

Problem: To increase the economic output of the national livestock production and of the meat processing industry, the developing countries need to develop alternative industrial processing methods of meat products free from foot and mouth virus. To meet this aim, the potential varieties of

processed meat products to be developed for export during the forthcoming years have to be identified, based on the availability of raw materials and the demand of foreign markets. Expertise is required in selecting the technology and in the design of meat product samples for the meat processing lines.

Project: Research will be carried out and expert assistance offered with regard to the availability of raw materials and the needs and limitations of the meat market, including prices, qualities, hygienic sanitary standards, norms for packaging, market size, etc. Know-how for processed meat products (free from foot and mouth virus) will be transferred.

* **Assistance in the establishment of a national utilization scheme of slaughterhouse by-products**

Problem: To increase the economic revenue and output of the national food industry, in particular the meat processing industry, full utilization of animals in the slaughterhouse industry must be the objective. By-products and residues can become the raw materials for existing processing factories to be modernized and expanded and/or new plants yet to be established. Assistance is required to assess and evaluate the slaughterhouse industry's operations with regard to varieties, quantity and quality of by-products and residues produced and their present and potential utilization in the food processing industry as well as in other industries for the production of quality products for local consumption and export. National professional staff often lack experience in modern meat processing technology, including

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ANIMAL BASED FOOD PRODUCTION

full utilization of animals in the slaughterhouse industry.

Project: Preparation of a detailed and comprehensive study report containing the work programme for short and long-term improvement actions, equipment specifications and other necessary procurements divided into local supplies and import along with an investment and production cost analysis. Meat processing technologists and engineers will be trained locally and abroad.

O FISH INDUSTRY

*** Canning and quality control of marine products**

Problem: The effective absorption of transfer of processing technology, and ability to test export marketing of canned marine products requires the establishment of a pilot base. Such a plant will act as a model quality control system for commercial handling and/or processing of fishery products.

Project: Institution building through establishment of a pilot canning plant and quality control laboratory producing canned seafood tested in local and export markets.

*** Establishment of a central control laboratory for industrially processed seafood**

Problem: Most developing countries are eager to increase exports. This is often hampered by inadequate central systems for quality control of industrially processed seafood. Assistance is required for establishing a control laboratory for the development, dissemination and control of analyses carried out in laboratories and in production factories, for improving the

quality and for assuring compliance with standards for finished products. This is of particular relevance for countries aiming at meeting the requirements of the common European market in 1993.

Project: Establishment of a fully equipped central control laboratory. Training of professional staff in various fields of quality control tailored to the markets envisaged. Elaboration of a final report reflecting the results achieved and containing recommendations for improved quality control of fresh and processed seafood.

*** Assistance in the development of marine resources-based industries in selected countries of a region**

Problem: A regional approach to identify the common requirements and to formulate several projects for the development of marine resources-based industries in a given region or in selected countries thereof, e.g. the Pacific islands, may prove an economic way of allocating scarce project resources.

Project: Several project proposals on the marine-resources based industries which are on the basis of preliminary techno-economic studies and may include pre-feasibility studies on the establishment of fish processing factories. A terminal report containing specific information on marine resources-based industries by country.

*** Redeployment and modernization of the fish manufacturing industries sector**

Project: Promoting the modernization of the private fish processing industry sector requires

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the establishment of appropriate strategies in order to adapt it to international technology standards, and to improve the quality control production methods. This is of particular relevance for companies envisaging exports to the European common market and meeting European standards.

Project: Elaboration of a new development strategy for the fish manufacturing industries, an assessment of the existing fish canning plants and a redeployment and modernization programme to support investments in new fish products. Local experts from the competent authority (e.g. Ministry of Fisheries) will be trained to ensure the project continuation and post-evaluation after the departure of the experts.

O BABY FOOD

*** Assistance to milk products factory in the production of baby food**

Problem: Highly nutritional baby food which will supplement mothers' milk is required to improve the health situation of children in a number of developing countries. This requires the preparation of a comprehensive plan developing baby food production according to international standards. Before taking a final decision on the investment, it is desirable to establish baby food production on an experimental stage.

Project: Elaboration of detailed guidelines and recommendations on the improvement of baby food production according to international standards. Establishment of an experimental technological baby food production unit, capable of mixing and dosing

out the various components of baby food. Training a number of senior technical staff in modern baby food production technologies in order to carry on the production cycle efficiently and to be held responsible for the technical aspects of the future development programme.

O FOOD QUALITY CONTROL

*** Upgrading the food testing and quality control capabilities of governmental control and metrology departments**

Problem: In a number of developing countries the strengthening/upgrading of the capabilities of governmental quality control departments is decisive to enable the development and implementation of more effective quality control programmes through appropriate chemical, physical, microanalytical and microbiological testing of food for quality and safety reasons. Quality control branch laboratories and the network of the competent ministry will benefit through improved extension and advisory services.

Project: Upgraded laboratories for food testing and quality control, a training facility with the required equipment and materials and national staff trained in food testing and quality control methods.

O ANIMAL FEED

*** Elaboration of a technology for feed additive production**

Problem: To improve the national agricultural production through

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biotechnology-based improvement of livestock yields and development of fodder additives for animal feed.

Project: An experimental biotechnological pilot plant will be strengthened with modern fermentation facilities and laboratory equipment. A group of scientific senior research staff will be trained in modern biotechnological methods of producing microbial protein, anti-

biotics, etc. Also a number of junior researchers and laboratory personnel will be trained on the spot. A set of guidelines and methodologies will be prepared on the application of the advanced technology for the production of feed additives.

AGRO-BASED FOOD PROCESSING

The technical assistance programme focuses on substitution of imported agricultural raw materials with local products and gives assistance to food technology institutes in developing production methods and adapting technologies to the market needs.

PROJECTS AIM AT:

- Technology and know-how transfer;
- Quality improvement and standardization;
- Development of Food R+D Centres;
- R + D of new technologies for waste product utilization, effluent treatment, energy management and clean production;
- Improvement of productivity and efficiency;
- Commercialization and distribution of food products;
- Rehabilitation, restructuring and privatization of food industries.

IN THE AREAS OF:

- Fruits, vegetables and derivatives;
- Cereals, tubers and derivatives;
- Nuts and derivatives;
- Sugar and sweeteners;
- Fats and oils;
- Animal and vegetable proteins;
- Enzymes, flavours and natural colours;
- Cocoa, tea and stimulants;
- Hydrocolloids;
- Spices and derivatives;
- Drinking water;
- Alcoholic and soft drinks;
- Aquaculture.

**PROJECT
EXAMPLES**

The following typical project examples are either based on completed or ongoing projects or reflect recently manifested interests or requests by developing countries which in the future need to be pursued.

○ **Fruits and Vegetables**

* **Solar drying of fruits and vegetables**

*** Integration of women in the agro-industrial development**

Problem: Conservation of fruits and vegetables through sun-drying will prevent considerable losses of these perishable products during the seasonal overabundance, a problem common to many African countries, and will solve their shortage on the local market during the rest of the year. Involvement of women in the processing operations will contribute to the improvement of their socio-economic situation.

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AGRO-BASED FOOD PROCESSING

Project: A project may be designed to assist the incorporation of women into activities connected with the utilization and processing of fruits and vegetables. By installing of solar dryers and training of women groups, it will demonstrate that such activities have an important socio-economic and commercial success and considerably improve the situation of women.

O Cereals

*** Assistance in the rehabilitation of the bakery chain**

Problem: Where other basic foodstuff is scarce, bread occupies an even more important position in the food production sector. There is often a need for the rehabilitation of an existing but rather deteriorated bakery chain to supply local markets with basic food products thus reducing the needs for imported raw materials and food products.

Project: To restore the production capacity of yeast plant(s) for the production of fresh yeast in the country and to upgrade the wheat mills through supply of necessary equipment, establishment of food analysis laboratories for quality control and training of personnel.

O Institutional building

*** Food Development Centre**

Problem: Population growth, limited arable land and steadily increasing imports of food products impose a heavy burden on the balance of payment of many developing countries.

Development of food industry through research, better utilization of indigenous raw materials, introduction of modern food processing techniques, quality control, upgrading of skills through training is essential to quantitatively and qualitatively increase food production to cover internal demand and enable exports, increase employment, raise living standard and ensure economic stability.

Project: Strengthening the technical capability of the existing Food Canning Development Centre by transforming it into a Food Development Centre with new laboratories capable of carrying out more sophisticated chemical, physical and microbiological analyses and testing of raw materials, finished products and packaging materials. Establish/upgrade a pilot plant for development of new products and their introduction in regular production and train personnel in specific skills. Once fully operational the Centre would provide services to both the public and private sector in the field of preserved food (canning, refrigeration, freezing, dehydration), soft drinks, edible oils and other local products such as ghee.

O Standardization

*** Development of Food Industry through Standardization**

Problem: The majority of small- and medium-scale factories in the private sector of a given developing country require assistance in improving the quality of their products in general, and the hygienic practices in particular, to meet the standards of domestic and export markets.

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Since a large number of women is usually employed in this sector, the development of the food processing industry will create even more employment possibilities for women and thus contribute to a better economic situation of the families.

Project: Strengthening the technical capability of the national standards institute through the establishment of new food analysis laboratories. Upgrading the staff's knowledge through training abroad to enable them to provide technical and advisory services to the private sector in the field of standards compliance, improvement and development of quality of food products, certification of food products and surveillance of marked products. Testing of certain items in accordance with national and international standards and transfer of appropriate know-how on food quality and hygienic practices by training food manufacture staff through workshops and seminars. Development of a model programme and technical guidelines for food quality and achievement of hygienic practices in the selected food processing plants.

O Oils and fats

- * Introduction of small rural units for the production of shea butter.
- * Integration of women in rural development.

Problem: Shea butter obtained from a nut produced by a Sub-Saharan tree is a basic component of the daily household diet in some areas. It may be the main source of income for village women who produce it manually and need two to three days to obtain about seven kgs of butter from 50 kgs of nuts.

Project: By installing a number of small rural units for the production of shea butter and by training of groups of women, the project will demonstrate that the manufacture of shea butter is technically and economically practicable. Project promotion, on the sub-regional or regional level, may be considered.

LEATHER AND LEATHER PRODUCTS INDUSTRIES

Hides and skins are by-products of the meat industry, so their supply largely depends on meat consumption. Therefore the leather and leather products sub-sector is part of the Agro-based Industry Branch (see attached organogram). Almost all developing countries with substantial animal livestock consider hides and skins a natural resource providing them with much needed hard currency income and an opportunity for increasing employment and value added. The animal livestock grows at a much lower rate than the human population which increases the gap between the availability and demand for raw hides and skins. On the other hand less than half of the protein substance of hides and skins is transferred today into leather products - the rest is wasted in conservation, collection, storing, transporting and manufacturing. At the same time the process technology has become very sophisticated by extensive use of chemicals and electronics. Today, tanning and, to some extent, leather products manufacture face significant difficulties related to pollution.

The above problems challenge all involved in industrial development. Footwear, leather goods, leather garments, leather upholstery, gloves, saddlery, selected sports goods, should be produced in larger quantities, and at the same time their quality should constantly be improved. To meet the consumers' demand and to fulfil the increasingly strict environmental conditions the leather and related industry needs continuous technical development. The main mandate of UNIDO's leather industry programme is to provide technical assistance to developing countries requiring expertise and know-how in upgrading their leather processing or leather manufacturing industries, with due consideration to environmental protection.

PROJECTS AIM AT:

- Design and formulation of integrated (sub)sectoral development programmes and specific technical assistance projects;
- Implementation of such programmes and projects including execution arrangements, monitoring, (self)evaluation and reporting.
- Identification of problem areas in the whole production cycle and/or in production systems;
- Assessment and development of capabilities of the leather-related industrial sub-sectors;

IN THE AREAS OF:

- Hides and skins improvement;
- Leather processing;
- Design, product development, pattern engineering; manufacturing technology of footwear and other leather products;
- Development of support industries;
- Environmental protection;
- Natural rubber processing (special area).

AGRO-BASED INDUSTRIES

LEATHER AND LEATHER PRODUCTS

PROJECT AREAS Examples of the areas covered by the programme's projects are:

- Quality control and testing;
- Plant management;
- Marketing;
- Professional training.

O Development of support industries

O Hides and skins improvement

Upgrading of:

- Flaying;
- Curing;
- Conservation technology;
- Collection and forwarding systems.

- Industries working for the leather-based sub-sector, e.g. chemicals and component manufacturing, equipment, moulds, shoe lasts, tools.

O Environmental protection in the leather and related industries

O Leather processing

- Tanning, including wet processing and manufacture of semi-finished leather such as pickled, wet-blue and crust leathers;
- Finishing of light (grain, suede and split) and heavy (sole or vegetable tanned) leather;
- Special leather processing technologies (e.g. fur-, fish-, game- and reptile skin manufacture).

- Implementation of cleaner technologies such as hair-saving liming, carbon dioxide deliming, high chrome exhausting tannage, chrome recycling and recovery, organic solvent-free finishing and utilization of wastes as valuable by-products (e.g. glue, gelatine, dog chews, leather board, etc.);

- **End-of-pipe treatment:** design, installation and operation of pilot and industrial scale waste water treatment plant; setting up common treatment of effluent for tannery clusters; safe disposal of potentially harmful solid wastes and sludges.

O Footwear and leather products

These products include handbags, fancy leather goods, travel goods, gloves, leather garments, upholstery, saddlery, sports goods, work safety equipment, technical leather articles.

Development and upgrading of:

- Styling and design;
- Product development;
- Pattern engineering;
- Component manufacturing;
- Technological operations such as cutting/clicking, stitching, bonding, vulcanizing, injection moulding, finishing;

O Natural rubber processing

- Latex and compounded product manufacture (special area) specifically for the footwear industry.

TECHNOLOGY SELECTION

The technical assistance projects implemented aim at developing knowledge and

skills through transfer of appropriate, at the same time, up to-date technology. The main objective is to build or enhance leather processing and leather products manufacturing capacities in the target area(s) in terms of human and physical resources. In order to achieve this goal the recipient leather sub-sectors, their institutions or production plants are assisted to achieve a level which puts them in a better position in the market. Apart from conventional technologies, modern industrial technologies including CAD/CAM are applied.

The strength of the sub-sector lies in the practical, mainly product and production oriented approach. Its special features are marketing, product development, process technology, effluent treatment and computer applications. Within the sub-sector a number of personal computer programs have been developed. These are designed for tanneries, shoe and leather goods manufacturing plants and can be used directly in production preparation and control.

**PROJECT
EXAMPLES**

Some of the projects within the programme are grouped below according to project areas and activities.

 † Sub-Regional Integrated Development Programme

Problem: A sub-region with a large livestock population and good potential availability of raw hides and skins has during past decades started several tanneries and footwear plants. However, they could not achieve the originally

planned production capacities; the main reasons being the lack of a well defined development strategy, lack of incentives to primary producers, lack of trained people, and lack of investment capital in foreign exchange. International assistance is usually provided to the various sub-sectors including hides and skins improvement, industrial production in tanning, finishing, footwear and other leather products manufacture and marketing, without any sectoral development plan. On the basis of the recommendations of UNIDO Consultations in the Leather and Leather Products Industry and the UNIDO Leather Industry Panel an integrated programme for selected countries should be launched.

Project: The large-scale Regional Hides and Skins, Leather and Leather Products Improvement Scheme is a joint effort of three agencies namely the Food and Agriculture Organization of the United Nations (FAO), the International Trade Council (ITC) and UNIDO. UNIDO is the executing agency. Inter-agency agreements with FAO and ITC provide expertise in their respective areas of competence. Such an umbrella project ensures maximum benefits from the international inputs for the participating countries while catering to their specific needs in providing complementary assistance to the various national projects. Thus, the programme

(a) establishes a regional pilot scheme to demonstrate, in practical terms, the process of hides and skins improvement from butchering and flaying to conservation, grading and collection;

(b) acts as a catalyst to national authorities to introduce incentives for improved quality performance;

(c) rehabilitates existing infrastructures and selected

leather tanning and processing plants by increasing their efficiency and capacity utilization, upgrading technical standards, operational methods and skills, product quality and marketing performance.

◆ **Integrated Development Programme for a Single Country**

Problem: A developing country with substantial livestock and a large sized leather related industry attaches high priority to promote further development. Besides efforts made by the local government, institutions, parastatal and private entrepreneurs and international technical assistance (expertise, establishment of new production capacities, marketing agreements) the problem needs to be addressed in its complexity, in order to avoid overlapping and/or duplication.

Project: In co-operation with national experts an integrated development programme will be elaborated. Essentially it would cover institution building (e.g. establishment of a footwear design centre; strengthening professional training facilities in a network, assistance to the national leather research institute), direct technical assistance (developing production capacities in the rural areas), transfer of technology (development of prototype production equipment based on documentation transferred from successful machine suppliers in industrialized countries) and marketing (strengthening the export potential by developing product ranges). Special attention is paid to incorporate standardization, support industries and environmental protection. Such a programme needs to be interlinked

with all other international, bi- and multilateral assistance.

◆ **Direct Assistance and Transfer of Technology (e.g. footwear manufacturing)**

Problem: (Private) footwear manufacturers in a developing country may wish to upgrade their product range to international standards. Such plants often lack appropriate manufacturing know-how. High quality footwear requires good design (fit, comfort, material structure), excellent workmanship and a market appeal (preferably a good brand name), obtainable only from those who established a strong position in the competitive consumer market.

Project: After assessing the potential local manufacturers UNIDO may sub-contract a reputed footwear manufacturing company with a reputable brand identity and long experience in international cooperation to transfer some of its products (styles, specifications, guidelines for quality assurance) and technology (operational sequence, machine layout, standard times, technological parameters). In this transfer of technology process managerial staff and key operators would be trained in the contractor's plant. Through the local organization of a seminar other manufacturers in the recipient country will have the opportunity to learn about the results achieved.

◆ **Clean Technology and Effluent Treatment**

Problem: To protect the scarce water resources rather stringent pollutants discharge standards are often introduced by the government.

AGRO-BASED INDUSTRIES

LEATHER AND LEATHER PRODUCTS

However, traditional tanners lack expertise to adopt suitable preventive measures.

Project: Following a detailed appraisal of the situation in several tannery agglomerations of a given country a wide range of interventions to reduce the amount of pollution at its very source can be proposed: strict process control, "good housekeeping", water husbandry, chrome recycling, utilization of chrome-free solid waste as fertilizer, etc. A semi-industrial chrome recovery demonstration unit may be set up for demonstration purposes. An important item is the design of a common effluent treatment plant (CETP) and sludge dewatering and disposal. Simultaneously, designs for very simple, low-cost type treatment units for isolated small scale vegetable and chrome tanneries may be provided. Guidance in carrying out the construction work, equipment specification, plant performance monitoring as well as the overall management of a CETP can be provided.

◆ **Institution Building**

* **Establishment of a Footwear and Leather Goods Centre**

Problem: A country may decide to enter the footwear and leather goods manufacturing industry, mainly to create employment, earn foreign exchange through exports and add value to the local raw materials. Although the country may have traditional skills in footwear and leather goods manufacture and ample labour available, the skills for operating modern footwear and leather goods industries are lacking and so is institutional support. Starting a specialized training institute for the footwear and leather goods

industry for such a country would not be cost efficient since the demand for trained people would be overwhelming within a few years.

Project: A multi-purpose footwear and leather goods centre may be established, which caters not only for the local training needs but provides training also at the regional level with internationally accepted certificates which are issued by an internationally reputed training institute from an industrialized country who provides the syllabi and moderation of the final exams. The institute will be equipped with a complete quality control laboratory, product development pilot plant, design and pattern making facilities, and a set of machinery for common facility services. The staff of the centre will be trained to a high level of professional competence to be able to instruct workers and technicians on modern technology and product development for exportable products. Regionalization may be envisaged.

* **Establishment of a Development Centre for Rubber Technology**

Problem: A developing country with substantial rubber tree plantations may encounter difficulties in its latex processing and rubber manufacturing industry. Plants often lack know-how in product development, technology, quality control and they have no trained personnel to run the industry. A well equipped physical and analytical testing laboratory, a compounding and latex processing pilot plant and a mould making workshop are often not available or need upgrading.

Project: Based on the design and structural recommendations made by UNIDO a Development Centre for Rubber Technology may be set up, with the national Government inputs

supplemented by UNDP/UNIDO in terms of expertise, an extensive fellowship training programme overseas and equipment. The laboratories provide the local manufacturers with formulae and cost estimates, assistance in product development, testing and quality control services, as well as extension and facility services. Apart from that such a Centre will comprise a training department and an information unit with relevant technical literature on rubber technology.

Feasibility Study and Rehabilitation (e.g. footwear industry)

Problem: Footwear factories in developing countries are often faced with rather old, worn-out and inefficient equipment. The demand for shoes in the country cannot be met by the low supply. While trained and experienced labourers and some of the raw materials, e.g. genuine leather for shoe uppers and linings, as well as canvas may be locally available, many of the other inputs have to be imported.

Project: Preparation of a techno-economic opportunity study to assess the feasibility of rehabilitating the existing plant. Based on market research a new product range may be created together with the specification (including style designs, construction, costing) for each type of footwear. Taking into account the given conditions (e.g. building, infrastructure), the study will also recommend a new plant layout, the equipment to be installed, and staffing requirements. A financial analysis showing the cost structure, the projected balance sheet, the break-even point, the rate of return, value added etc. will be computed

allowing various alternatives for investment.

Computer Application in Technology

*** Introduction of preventive maintenance systems**

Problem: Various maintenance systems (from manually operated to computerized, from emergency to preventive) are in use by the industry. Their efficiency varies considerably. Even in a large scale African tannery where UNIDO introduced a comprehensive preventive maintenance system which was used as a model and kept the plant equipment in excellent working condition, the planning, scheduling and controlling maintenance actions, however, involved extensive administration. Manually operated control cannot optimize the workload of the maintenance department, which may cause inaccuracy in spare part stocking and reordering and may fail to synchronize repairs with production.

Project: Based on a well established manual maintenance practice a personal computer programme package can easily be created. The software may produce yearly and monthly plans for machine inspection, small and medium repairs, overhauling - taking into account the complexity of individual equipment. The schedule then may be modified interactively, whereby the impact in terms of maintenance workload and production breaks is communicated immediately to the operator. The system can also keep records of machine histories (i.e. planned actions completed, unexpected break-downs, use of spare parts) and offers full spare part stock control including reports on reordering requirements. The system can be developed for

operation by maintenance personnel without computer experience.

*** Introduction of Computer-aided Design (CAD)**

Problem: A problem that often confronts local footwear and other leather goods producers is increasing competition from cheaper imports. With a good supply of locally made genuine leather the potential for export of shoes and/or other leather articles may be envisaged. The main problem in meeting the challenge is usually the shortage of trained personnel in design and pattern engineering.

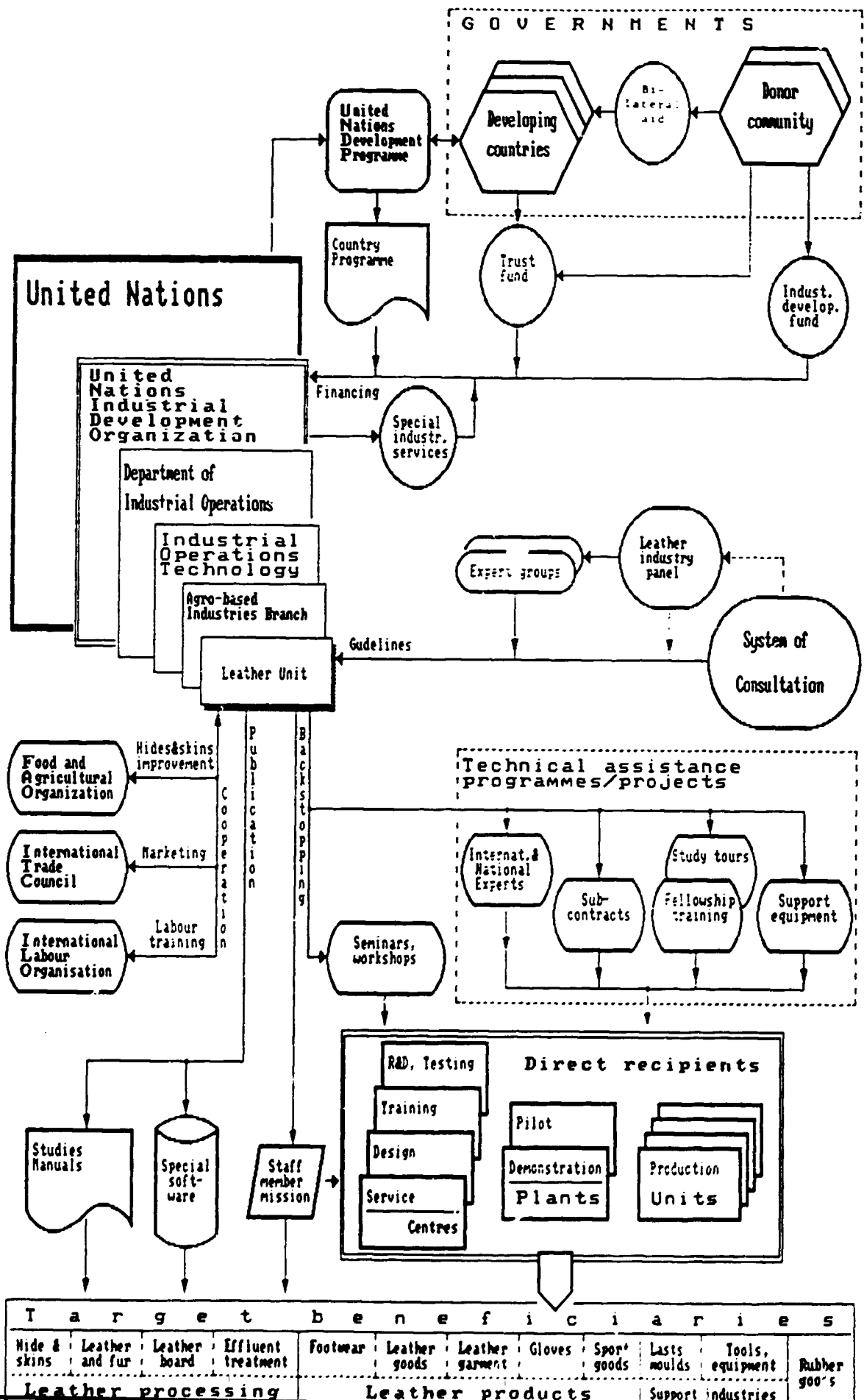
Project: Through local professional associations UNIDO may promote the conclusion of an agreement for setting up and contributing to the running costs of a design centre. A CAD system may be installed e.g. in the local leather institute to serve the whole industry on a contract basis. The centre would produce fashion information on leather, footwear and leather goods manufacturers using the computerized sketching facilities, leases machine time for shoe producers to prepare product ranges, patterns and assess material requirement. The system can be equipped with a pattern cutting table and may offer graphic (physical and software) interfaces to data prepared or postprocessed in other CAD systems.

*** Software for production preparation and control**

Problem: Development centres in the sectors of tanning, footwear and leather goods manufacture

are handicapped in obtaining up-to-date computer software for production preparation and control. Such packages are not available because of the relatively limited market, the enormous variety in production management systems and the fluctuations in leather products manufacturing (e.g. frequent fashion changes, irregularity of the genuine leather, variety in styles and sizes). While in administration, finance, stock control, billing etc., as well as in direct machine control (CAD and CAM) computers are becoming usual tools, functions related to technology preparation and plant operation have no appropriate computer assistance.

Project: Several special programmes were developed by sub-contracted institutions, as well as by UNIDO staff. The packages address such functions as costing of leather and leather products, determination of optimum product mix, simple pattern size grading, financial analysis of technical development opportunities, production and work-in-progress control of shoe and leather goods factories. A special software was developed for information control in technology development centres. Some of this software has been introduced in various developing countries. Sale and/or licensing of the developed computer programs has also started in private companies.



TEXTILE AND GARMENT INDUSTRY

The technical assistance programme focuses on the dissemination of technological knowledge, provides expertise and applications and transfer of appropriate and advanced technologies related to the primary textile as well as garment industry.

PROJECTS AIM AT:

- Product and process design;
- Pilot production;
- Production rationalization and automation;
- Optimum resource utilization (material and energy);
- Repair and maintenance of products and plants;
- Environmental monitoring and control.

IN THE AREAS OF

- Spinning, weaving, knitting and wet-processing;
- Assessment and utilization of unconventional indigenous fibres;
- Assessment of textile and garment technologies;
- Computerized productivity and quality systems;
- Waste reduction;
- Quality assurance and control.

PROJECT AREAS

Examples of the areas covered by the programme's projects are:

○ Assessment and utilization of unconventional indigenous fibres

- Fibre extraction technologies;
- Fibre preparation and degumming;
- Determination of physical properties;
- Blending;
- Prototype development for equipment and products;
- Non-traditional usages (technical fabrics and geotextiles);
- Cost-benefit analyses.

○ Assessment of textile and garment technologies

- Infrastructural requirements;
- Labour requirements and training needs;
- Cost-benefit analyses.

○ Development and implementation of quality control and quality assurance systems

- Standardization of test procedures;
- Establishing limits and tolerances;
- Assessment and review of processes and procedures;
- Establishment of test plan and frequencies.

O Computerized productivity and quality systems (software)

- Determination of needs;
- Review and assessment of applied mill practices;
- Training of counterparts;
- Software development;
- Debugging.

O Development and promotion of cleaner technologies

- Mill surveys and assessments;
- Energy audits;
- Testing and calibration of photospectrometers;
- Recipe optimization in regard to colour, cost and dyestuff availability;
- Utilization of printpaste remnants by reformulation;
- Establishment of computerized weighing and dispensing units;
- Assistance in dyehouse automation.

O Waste reduction by marker optimization

- Assessment of cutting room practices;
- Assistance in selecting CAD systems for the garment industry;
- Training in operation and maintenance of CAD systems;
- Cost-benefit analyses of CAD systems and computerized cutting.

TECHNOLOGY SELECTION

In designing, formulating and executing these projects, suitable technologies are selected from a wide range of available options. These include conventional (and so-called appropriate) technologies on the one hand and more modern ones such

as computer aided design and manufacturing (CAD/CAM) etc. on the other. High technologies such as computer-integrated manufacturing (CIM), flexible manufacturing systems (FMS) are also utilized where the infrastructure and the environment of specific projects permit.

PROJECT EXAMPLES

Some of the projects within the programme are grouped below according to their aims or outputs.

O Assessment and utilization of unconventional indigenous fibres

Covering e.g. Ramie, Banana, Pineapple, Abaca, Rosella, Kenaf, etc.

Project: Utilization of agricultural waste for the textile industry, for production of technical textiles (geotextiles);

O Assessment of new textile and garment technologies

Project: Waste reduction from cutting of textiles, by application of modern computerized pattern making techniques;

O Quality control and quality assurance

Project: Implementation of computer-based size grading for garments to ensure optimum fitting; Development and implementation of e.g. ISO 9000 systems.

▣ Training courses

Project: Development and implementation of international and external (fellowship and study tours) training courses.

▣ PC-based systems

Project: Application of PC-based productivity and quality monitoring for small and medium scale weaving factories.

▣ Cleaner technology programmes

Project: Development of cleaner technology programmes and optimum resource utilization in dyeing, printing and finishing by promoting and implementation of e.g. computerized colour matching, recipe optimization, printpaste reformulation and dyehouse automation.

▣ Waste reduction

Project: Reduction of cloth consumption through waste reduction and marker utilization.

▣ Product design in the garment industry

A key feature of product development projects is integration of the market requirements such as use and functionality of the products with the possibilities and limitations of production.

Development of product design capabilities leads to quicker response to changing market demands, and improves fitting of garments.

Computer-aided design (CAD) centre

Problem: Lack of efficient industrial design capability is a major gap in many developing countries. Although computer-aided design (CAD) is not a substitution for an experienced designer, it can improve quality and productivity in the design process. Furthermore, a large amount of standard design know-how can be provided to the designer by the CAD system.

Project: Creation of a CAD centre for demonstration purposes, training (both at the centre and in the industry using mobile training units) and as a service centre. The project can be implemented in a series of modules, the smallest being a single-microcomputer CAD set up to be used as a demonstration unit to increase CAD awareness in domestic industry. At the other extreme, large systems compose of multi-work-station local-area networks served by minicomputers. Each module is self-contained and can be designed, executed and upgraded as required.

WOOD PRODUCTS AND WOOD PROCESSING

The activities of the wood processing and products programme are complementary to activities carried out by FAO, with UNIDO being responsible for the secondary wood processing industries, i.e. manufacture of products from sawnwood and wood-based panels and production of panels from agricultural residues. UNIDO's assistance is concerned with all aspects of wood processing and manufacture of products at all production levels.

PROJECTS AIM AT:

- ▣ Restructuring and modernization of existing units;
- ▣ Shift from craft to serial production;
- ▣ New technologies and rational designs for saving wood;
- ▣ Better use of raw materials and human resources, and energy conservation;
- ▣ Using of a wider range of species through proper management and more intensive use of forests.

IN THE AREAS OF:

- Production of furniture and joinery;
- Use of wood in construction (housing, bridges, etc.);
- Production of miscellaneous wood products (consumer items, boat building, packaging);
- Research and development on wood technology;
- Maintenance of wood processing plants, machinery and tools;
- Waste utilization, such as production of panels from agricultural residues.

PROJECT AREAS

Examples of the areas covered by the programme's projects are:

○ Furniture and joinery

- Seminars covering technical management and marketing aspects;
- Introduction of serial production;
- Pilot plants;
- Tool and machine maintenance;
- Design of furniture and joinery for serial production;
- Advice on equipment selection and plant layout;
- Manpower development at all levels;
- Product development.

○ Structural use of wood

- Low cost wooden schools;
- Wooden bridges;
- Wooden piers/jetties;
- Use of rubberwood for glulam;
- Low-cost housing using coconut stem "wood";
- Promotional seminars on use of timber in construction.

○ Miscellaneous wood products

- Production of matches.

○ Wood Technology R and D

- Solar drying of timber;
- Wood preservation and fire performance;

- Establishment of grading rules and grading;
- Strength grouping for standard designs;
- Diffusion of information on lesser known species;
- Identification of end uses for hitherto unused species (e.g. coconut stem "wood").

O Maintenance of wood processing plants

- Survey of the state of the equipment and its tools;
- Establishment of priority lists for repairs;
- Establishment of preventive maintenance schedules;
- Assistance in establishment of tool maintenance centres. (Industrial serial production cannot be achieved with imprecise machines and poorly maintained tools. The majority of the smaller firms cannot justify investments in the full range of tool maintenance equipment: hence assistance is provided to establish tool maintenance centres in urban areas to cater for them).

O Panels from agricultural residues

- Techno-economic study on panels from esparto, cotton stalks, date palm fronds;
- Evaluation of existing plants producing panels from bagasse;
- Assistance to plants producing fibreboards from rice straw;
- Comparison and evaluation of bids for plants.

TECHNOLOGY SELECTION

The industrial processing technology selected for use in the projects

depends primarily on the level of development of the recipient of the assistance, the funds available for investment, the scale of operations, the intended markets (local or export). They are selected from a wide range of options, and include conventional ones, technologies suited to labour intensive low investment processes, technologies appropriate to small-scale production as well as state-of-the art technologies.

PROJECT EXAMPLES

The following typical project examples are either based on completed or ongoing projects or reflect recently manifested interests or requests by developing countries which in the future need to be pursued.

O Furniture and Joinery

Most of the following projects are addressed through the organization of short (2-3 weeks) technical workshops to familiarize owners, general and technical managers of plants with wooden industrial production methods. This helps them to identify their own priorities and make better use of their scarce financial resources.

The topics have been compiled in a Manual that has been published in E (English), F (French) and S (Spanish).

Problem: Production is still at a craft level.

Projects: Surveys of the furniture and joinery industries sector to better assess needs and priorities; Preparation of long-range development programmes to meet these needs.

Problem: Workforce trained as carpenters and not as machine woodworkers.

Projects: Survey of existing manpower development facilities and development of curriculae to train machine woodworkers.

Preparation of training manuals at the appropriate level. On-the-job training in machine woodworking.

Problem: Poor knowledge of design for industrial production and ergonomics.

Projects: The transformation of production from craft to serial most often calls for an adaptation of the designs. Assistance is given in this field, and local designers are also familiarized with correct construction, modern hardware fittings and ergonomic aspects.

A manual on value analysis has been published in E, F and S.

Problem: Poor tool and machine maintenance.

Projects: Survey the state of the equipment and schedule repairs.

Establish preventive maintenance schedules. (Industrial serial production cannot be achieved with imprecise machines and poorly maintained tools).

Train staff of factories.

Since the majority of smaller firms cannot justify investments in the full range of tool maintenance equipment, assistance is provided to establish tool maintenance centres in urban areas to cater for these firms.

Problem: Poor (or no) production planning and control and lack of knowledge on management-related aspects.

Projects: Provide assistance in production planning and control, costing, inventory control, etc. as well as on documentation for production.

Manuals covering these topics have been published in E, F and S.

Problem: Machines not used to their full potential.

Projects: Courses on criteria for the selection of woodworking machines. Documentation prepared and published in E and F.

A comparative study on options in the selection of woodworking machines has been commissioned. Advice is provided on equipment selection at the plant level, projects receiving assistance are often provided with machines that are new to the country.

Manuals on design and use of jigs and low cost automation (use of pneumatic devices) have been published in E, F and S and these techniques have been introduced at plant level in developing countries.

Local personnel trained in designing and producing jigs.

Problem: No knowledge of modern upholstery and surface finishing procedures and materials.

Projects: Introduction of hitherto unutilized materials in the production of upholstered furniture.

A manual has been published in E, F and S on this topic.

Introduction of modern surface finishing techniques comprising also aspects of layout of facilities, equipment selection, formulation, training of manpower and quality control.

Problem: Improvement of quality and testing of quality of products and their inputs.

Projects: Installation of testing facilities for testing of furniture and joinery to cater for the sector; personnel training in their operation.

Assistance to improve (and introduce) quality control in

furniture and joinery plants at all stages of production.

O Structural use of wood

Problems: Although timber is an accepted building material in a large number of developed countries, its acceptance in the tropics is far from being established in spite of the vast forest resources these countries have available.

Projects: Short (One week to 10 days) promotional seminars on the use of timber in construction aimed at familiarizing specifiers and engineers with modern timber construction practices.

Problem: The education of civil engineers in tropical countries does not cover the design of structures using timber.

Projects: Courses on timber engineering for architects and engineers.

Problem: The heterogeneity of the tropical forest makes the use of a single species for structural purposes difficult because of supply problems.

Projects: Expert group meeting on the grouping of species and timber grading.

Design of structures (low-cost prefabricated modular wooden bridges, piers, low cost prefabricated schools, trusses etc.) using strength groups.

Construction of prototypes and introduction of the production procedures.

Training at all levels.

Problem: Vast volumes of standing timber exist on plantations of such crops as rubber and coconut, yet they are not used due to lack of familiarity with the specific processing procedures they require.

Projects: Development of methods to produce glulam beams from rubberwood.

Construction of prototype low cost housing using coconut stem "wood" and convening a course to diffuse the production technology.

O Miscellaneous wood products

Problem: The production of matches calls for process and quality control and precise formulation of the various chemical compounds used.

Projects: Assistance in upgrading the quality of match factories and increasing their productivity.

Training of staff and establishment of quality control facilities.

O Wood technology R + D

Problem: Poor recognition of the importance of wood drying and lack of knowledge of the drying process, schedules and equipment for the artificial drying of wood.

Projects: Dissemination of information on all aspects of wood drying through short courses.

Advice on selection of kiln drying equipment.

Diagnosis of defects in kiln dryers and their correction.

Development of solar drying kilns and their introduction.

Problem: Poor recognition of the importance of wood preservation and lack of knowledge of preservation methods and products.

Projects: Diffusion of information on wood preservation including natural durability (graveyard) tests, equipment, products and processes available, training of operators, drafting of standards.

Introduction of mobile pressure impregnation cylinders.

Problems: Non-existence of local and/or internationally recognized grading rules and lack of personnel to apply them. Lack of information on methodologies for strength grouping species for structural uses.

Projects: Development of grading rules. Creation of CIB Working Group 18B to cater for the specific needs of developing countries in the field of drafting of timber design codes. Diffusion of information on these topics at workshops on timber construction.

Problem: Lack of information on lesser known species.

Projects: Compendia on properties of lesser known species have been compiled to facilitate their acceptance both on the local and overseas markets.

Problem: Lack of information on possible end-uses for hitherto unused species (such as coconut stem "wood")

Projects: Demonstration low-cost housing has been built to promote use of coconut stem "wood" in construction and a seminar held to diffuse the results achieved.

Rubberwood has been used in glulam to permit its use for structural purposes.

O Panels from agricultural residues

Problems: The technology commonly used for producing panels has to be adapted to suit the specific characteristics of the ligno-cellulosic material to be processed. Since these are annual crops the problems of bio-deterioration during storage have also to be addressed. Since the properties of these boards do not always meet those foreseen by the standards for wood based panels, an in-depth assessment of demand has to be made.

Projects: Assessing the suitability and viability of producing panels from coir, esparto grass, date palm fronds, etc.

Improving the quality of insulation board produced from papyrus on an artisanal level.

Improving the quality of fibreboard made from rice straw.