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02123

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TD/WG.257/20
8 December 1977

ENGLISH

United Nations Industrial Development Organization

Expert Group Meeting on Industrialization in Relation to Integrated Rural Development

Vienna, Austria, 12-15 December 1977

INDUSTRIALIZATION IN RELATION TO INTEGRATED RURAL DEVELOPMENT*

prepared by FAO

Development Organization and Institutions Service
Human Resources, Institutions and Agrarian Reform Division

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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id.77-8648

INDUSTRIALIZATION IN RELATION TO INTEGRATED RURAL DEVELOPMENT

1. Introduction

Industrialization is considered one of the crucial means to achieve socio-economic development objectives in developing countries. There is hardly any difference of opinion regarding the importance of promoting and sustaining an industrial sector in the developing market economies since, given the situation of low incomes, unemployment and under-employment prevailing in rural areas, the industrial sector is called upon to provide the employment and income-earning opportunities required for the absorption of the labour force eventually released by agriculture.

Because of the existence of a high degree of correlation between standard of living and industrialization, there has sometimes been a tendency to identify economic development with industrialization and thus to devote insufficient resources to the agricultural sector. Yet, recent experiences in a number of countries have demonstrated that a lagging agriculture may jeopardize industrialization and economic growth, and that agriculture and industry are mutually dependent.

A viable strategy for rural industrialization aiming at raising the growth rate of agro-industrial production and distributing the fruits of growth more fairly, implies greater interaction between the modern and traditional sectors, especially in the form of increased trade in farm produce and provision of technical inputs and services. Such a strategy calls for an integrated approach to agro-industrial development in order to achieve optimum utilization of limited resources and to ensure that every aspect of the development process from raw material production, local processing, storage, marketing, distribution, equipment, infrastructure, trained personnel and management requirements are adequately and systematically covered.

This paper attempts to analyse the main aspects of the inter-relationship between agriculture and industry within the context of integrated rural development, with emphasis on such aspects of the development process as the satisfaction of basic needs, the expansion of income and employment opportunities for the rural poor and the increased participation of the rural people in the decision-making and development process. The objective is to point out a few major problem areas needing solution, so that these could be discussed jointly to find out possibilities for concerted action.

2. Inter-relationship between Agriculture and Industry within the context of Integrated Rural Development

FAO's approach to Rural Development is based on the assumption that production increases and socio-institutional improvements are not mutually exclusive, but are both mutually reinforcing. As a result, rural development is intended to meet multiple objectives: a higher rate of growth of agricultural production, with special emphasis on increasing the productivity of subsistence farmers; better access to resources and services for production; expansion of income and employment opportunities for the rural poor; improved consumption patterns, particularly for the most vulnerable population groups; increased mobilization and motivation of the rural people to achieve wider participation in decision-making; and, of course, the satisfaction of basic needs.

Thus, the objectives of rural development extend beyond anyone particular sector: they include improved productivity, and thus higher incomes for the rural workers, as well as minimum acceptable levels of food, shelter, education and health services. Fulfillment of these objectives calls for an expansion of goods and services available to the rural poor, and institutions and policies that will enable them to benefit fully from the whole range of economic and social services.

Development strategies emphasizing the balanced growth of industry and agriculture have become increasingly accepted in developing countries; however, this has not always been the case. Over the last two decades priority has been consistently directed towards increasing industrial output in practice if not in theory, to the detriment of agriculture. The allocation of investment, of both domestic and international origin, has been indicative of this imbalance.

A rough measure of the past inadequacy of agricultural investment is that the current level of investment in agriculture is estimated at only about $8,000 to $10,000 million, or around half of what is required. 1/

Rather than being conflicting, industry and agriculture can be mutually complementary and can play an important role in moving a country to a higher level of development. For example, the establishment and expansion of sound agro-processing industries, through stimulating the improvement of quantity and quality of crop yields and speeding up the commercialization of the rural sector, can have a positive impact on agricultural and rural development.

1/ FAO, "The State of Food and Agriculture 1975", p. 85, Rome, 1976.

More generally, non-agricultural activities in rural areas can greatly help to modernise these areas and bridge the gap with the urban sector, and to spread organizational abilities and technical skills more widely. Such activities can provide substantial employment opportunities, particularly in the off-season period for agricultural production.

Since most non-agricultural activities, even when generated from savings in agriculture, are found in urban areas, programmes for rural improvement will require strong measures to bring about considerable shifts in the pattern of both public and private investment. This may not be very difficult in some areas where a good supply of manpower and favourable environmental conditions are already conducive to the establishment of agro-based industries. Where these conditions are less favourable, measures to promote a more active rural development policy should include incentives for decentralization of industries, especially those agro-based, as well as social facilities and infrastructural works.

The expansion of industrial and other non-agricultural employment is likely to increase the size of the population dependent on purchased food. It is therefore necessary that, parallel with the development of industry, there should be a sufficiently rapid increase in marketed supplies of food. If agriculture fails in this basic task of increasing marketed supplies of food in line with the demand of the industrial population, food prices will rise, with consequent pressure on industrial wages.

Persistent food shortages and the increasing extent of rural poverty are indicative of the insufficient utilization of the existing production potential in agriculture. The need for raising the rate of growth of food production in the developing countries is indicated by the fact that in the past decade it diminished to only 0.2 percent per capita a year, from 0.6 percent in the fifties. This low rate of growth, combined with the prevalence of inequitable patterns of food distribution and the sharp rise in food imports, has complicated the task of improving the already precarious nutritional situation of the poorest people. 2/

Intensification of agricultural production will be crucial if the present levels of per caput food consumption are to be maintained in developing countries. It has

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2/E.F. Szczepanik, "The Inter-relationship between Industry and Agriculture in the Process of Development"; Accademia dei Lincei, Roma, 1977, p. 44 .

been estimated that, without making any allowance for increases in demand following from a rise in living standards, yields per unit of area and labour productivity will, generally speaking, have to double over the next 30 years, to cope with demographic increases alone. 3/

This process of increasing yields per unit of land necessitates not only the use of high-yielding varieties of seeds and improved cultivation practices, but also the timely application of fertilizers, pesticides and other inputs of industrial origin, as well as investment in capital goods such as machinery, tools, implements and other suitable equipment produced by industry. Hence the need for a closer integration between agriculture and industry to cope with the problem of raising crop yields and total labour productivity.

To enable small farmers and peasants in the subsistence sector to benefit from an expanding domestic production, suitable marketing outlets should be provided, as well as transport, processing and storage facilities. Provision of these basic elements can contribute to the expansion of the domestic market and thus encourage shifts in the pattern of production to meet new demands.

Such a diversification process frequently leads to a number of labour-intensive farm productions which, when developed in specific well organized rural areas, can enable local small farmers to obtain higher incomes than those derived from traditional large-scale cultivation. Among these productions, are arboriculture, market-gardening, flower growing, spice production, essential oils cultivation, tobacco growing, coffee growing.

The experience of many countries indicates that economic linkages between agriculture and industry are particularly close in the food, beverages and tobacco manufacturing. It is estimated that this sector usually accounts for more than two thirds of all commodity flows between agriculture and industry. 4/

3/ United Nations Funds-in-Trust; FAO/UN/TF/-INT 142 (UPA). "Report on the FAO/UNFPA Seminar on Agricultural Planning and Population", Malta, 18 Nov-7 Dec, 1974. FAO, Rome, 1975, p. 9.

4/ See "Industrial Development Survey: Special Issue for the Second General Conference of UNIDO". (United Nations Publication. Sales No. 74.II.D.14)

As mentioned above, more advanced cropping techniques and improved farm practices are needed to raise productivity at the farm level (or its equivalent in fisheries and forestry) as agriculture continues its transition from subsistence-oriented production to market oriented production. Often new varieties of crops must be introduced which are not only high-yielding and suitable for storage over long periods, but also give a better quality finished product after processing. Also, particular varieties of crops or breeds of animals may have to be found to replace those no longer appropriate because of changes in consumer needs or expansion of processing activities.

The growing complexity of these problem areas requires increasing attention to the backward and forward linkages with primary production in the agro-industrial projects in which FAO and UNIDO are involved.

In examining how agriculture has performed its role in meeting the food needs of developing countries, it must also be noted that diets are often nutritionally inadequate in these countries, in quality if not in quantity. This has some bearing on industrial development, since working efficiency is reduced by an inadequate diet. Moreover, physical development is impaired by undernutrition and malnutrition during childhood, and reduced disease resistance and lethargy are caused by deficiencies in proteins and other essential nutrients in the current diet.

FAO's concern with rural development and, in particular, nutritional problems of rural people emerges clearly from its mandate which commits the Organization to "raising levels of nutrition and standards of living; securing improvements in the efficiency of the production and distribution of all food and agricultural products; and bettering the conditions of the rural populations and thus contributing towards an expanding world economy and ensuring humanity's freedom from hunger". 5/

The main thrust of FAO's current nutrition programmes is to assist developing countries in improving the nutrition of the rural and urban poor, especially the vulnerable groups not reached by traditional development approaches. Particularly relevant in this regard are the work on inter-sectoral food and nutrition planning, and on nutrition surveillance systems.

Such activities are increasingly linked with FAO's rural development work, since the numerous and scattered rural poor can only be reached through existing or improved rural development structures.

5/ Constitution of the FAO of the United Nations in "Basic Texts, Preamble" page 3, 1974 Edition, FAO, Rome.

In addition to its basic role as supplier of food and raw materials, agriculture contributes to overall economic growth through the expansion of agriculture's demand for capital and consumer goods. The basic condition here is increased purchasing power on the part of the farmers and of the lowest income groups of the rural population.

The consumer goods demanded by the rural population (e.g. textiles, leather goods, household goods, electrical appliances) are of great importance for agricultural development, since they provide an incentive to expand production for the market. It seems that in many developing countries there has been a tendency to neglect the potential role of the vast agricultural/rural sector as a market for industrial products, and to concentrate industrialisation on the products demanded by urban consumers, because of greater purchasing power existing in urban areas. As a result, the structure of the rural industry is often technologically inadequate to meet the rapid expansion of the rural consumer market. Programmes for transforming and upgrading the rural industry to meet the increasing demand for industrial goods therefore assume an important role in an integrated rural development strategy.

3. Role of Agro-based Industries in the Development Process

As well as providing food for the industrial labour force, agriculture supplies many of the raw materials for industry. In fact, in most developing countries, agricultural products, both food and non-food, are the most readily available raw materials for many industries.

A very large part of agricultural production undergoes some degree of transformation between harvesting and final use. National input-output records appear to vary widely in their definition of final and intermediate demand, so that detailed international comparisons are not possible. Generally, though not always, the place of agro-based industries in the industrial structure corresponds to the importance of agriculture in the national economy.

In developing countries, the industries based on agriculture (food, textiles, wood, leather and rubber), hold important positions in the industrial structure, contributing one half, or even more, of the "value added" by the manufacturing sector. For developed countries, only about a third of the value added in the manufacturing sector is derived from industries based on agricultural raw materials. 6/

6/ FAO, Cooperative Processing of Agricultural Products, p. 8, Rome, 1974.

Agro-based industries can make a substantial contribution to the improvement of the conditions for rural betterment. Developing countries with low labour costs and adequate supplies of raw materials have a competitive advantage in industries using labour-intensive, low-capital technologies, such as the primary processing of natural fibres, processing of fruits and vegetables, the tanning of hides and skins, rubber manufacture. Those commodities are often exported raw or after primary processing, and the producing countries do not obtain the benefits of employment and value added which would derive from full processing. The extent to which the benefits will be equitably shared may depend on the establishment of new forms of organization among the people concerned - processing cooperative societies, agricultural producers associations, transport pools, marketing boards and so on - all of which must be consistent with the central and local government structures and policy. In fact, the influence of agro-industry could be far from beneficial to the small traditional primary producers if there is not a declared national policy in favour of rural development and adequate institutions to provide officient advisory service, credit and an adequate price system in favour of small farmers. Otherwise, they may not be able to face the change required for supplying the processing industry and compete with large commercial farming.

The establishment of economically sound processing industries, especially in rural areas, can help the change from subsistence agriculture to commercial agriculture and stimulate the establishment of other industries. A clear example of this is the packaging industry where 70 percent of the output is used for food packaging. Thus, the development of agricultural processing encourages indigenous efforts to design and manufacture processing and packaging machinery, which in turn contributes to a more sophisticated engineering industry. 1/

Development of agro-industries and raw material production, therefore, cannot usually be treated separately. The FAO policy is thus to assist developing countries by an integrated approach to production, conservation, processing, distribution and marketing of crops, livestock, fish and forest products. Prerequisites for an integrated agro-industrial development are adequate quantities of these products of suitable quality and their availability at the right time. Inadequate supply of raw materials will inevitably jeopardize the viability of the processing plant; on the other hand, inadequate processing capacity will just as inevitably discourage the primary producers.

1/ H.A.B. Parpia "Transfer and Adaptation of Western Methods in Agricultural Processing", Development, Vol. 2, No. 2, February 1974, p. 100.

The low levels of capacity utilization that exist in many agro-industries in developing countries are indicative of the fact that the increase in raw material supplies, available as inputs into agro-industries, is not always forthcoming. This imbalance between the two sectors is due principally to either the rural sector's inability to increase production of raw materials for processing, or the establishment of agro-industries unrelated to the existing or potential production of raw materials in the rural sector. Thus the problem exists at two levels: the problem of inter-sectoral linkages and the problem of expanding rural productivity, which can be assimilated to problems of rural development.

Among the industries based on agriculture, the food-processing industries perform an important role in raising both the quantity and quality of food, since they help to reduce post-harvest losses, utilize by-products and produce composite foods which nutritionally supplement each other and can be enriched by vitamin and mineral additives. These industries have continued to expand considerably faster than population growth, since consumers tend to demand an increasing proportion of processed food as their income rises. Urbanization also tends to bring about an increase in demand for processed food, since urban dwellers have to purchase most of their food and consequently they are the more willing to purchase it in processed form.

In many developing countries there is tremendous scope for small-scale processing units designed to meet local consumption requirements, for example, in grain milling and edible oil extraction. The immediate impact on employment, income and nutrition of large numbers of such units serving limited areas can be far greater than that of a few large factories located in towns. India is a good example of a country where such small-scale enterprises have been successful. Japan, too, has made extensive use of them and they have co-existed successfully with the more advanced sectors of the economy.

Among agricultural processing activities, the primary processing of hides and skins and related animal by-products represents a major labor intensive manufacturing sub-sector of the livestock based agro-industry. Since its inception FAO has offered here a package programme of assistance covering production, processing, handling, storage and marketing. Thus, as far back as 1951, FAO realized that the value of hides and skins to many developing countries was such that with some very basic low-cost improvements in flaying, grading and marketing, the countries could greatly increase their revenue from what often were neglected by-products of livestock raising.

Training was initiated in India, Pakistan and later in Sudan, Libya, Mali, Turkey and Nigeria to improve flaying, curing, grading and marketing of hides and skins. At a

later stage, the improvement of indigenous tanning methods was introduced. Small applied research, demonstration and training tanneries were established in Sudan, Somalia, Nigeria, Libya, Rwanda, the Netherlands Antilles and Monserrat. These projects have increased employment as well as produced semi-processed materials of acceptable quality both for local and export markets, providing a further incentive for the livestock farmer to raise animals.

4. Industries providing inputs to agriculture

Modern agricultural production uses as inputs a great variety of industrial products. In traditional agriculture the use of such inputs is generally small, but a main feature of the modernization of agricultural production is the widening range of goods demanded from the industrial sector. In part this reflects increasing specialization in the economy, since many activities such as the manufacture and repair of implements, construction work and the preparation of animal feed, which were originally carried out largely on the farm, tend increasingly to be transferred to the non-farm sector.

These inputs originate from many different branches of industry. The chemical and pharmaceutical industries provide fertilizers, drugs, antibiotics, pesticides and herbicides. The engineering industry manufactures the tractors and other machinery, tools and implements, stationary power units, pumps and transport equipment.

Agriculture is also a major consumer of fuel and power, and of construction materials for farms buildings, storage facilities, irrigation plants, roads. Forestry requires specialized tools and equipment, and fisheries are an important customer, not only for the shipbuilding industry but also for industries ranging from the production of specialized gear to electronic equipment.

Among inputs supplied by industry to agriculture, fertilizers, pesticides and farm machinery are the most prominent. The world consumption of manufactured fertilizers in terms of plant nutrient has increased from 24 million tons in 1957/58 to 82 million tons in 1974/75. 8/ Since one ton of plant nutrients can produce about 8 tons of food grains, the increase of 58 million tons of fertilizer accounted for an additional 460 million tons of grain equivalent, an amount sufficient to feed 920 million people. Under the conditions postulated in FAO's Provisional Indicative World Plan, the consumption of

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8/ E.F. Szczepanik, "The Inter-relationship between Industry and Agriculture in the process of development". Op. cit., p. 52.

fertilizers in developing countries would have to rise from some 12 million tons in 1974/75 to 32 million tons in 1985. This almost threefold increase would perhaps set the most important industrial goal for the current decade.

The developing market economies still import almost half of their fertilizer supplies, and many of those with domestic fertilizer industries have to rely heavily on imported raw materials. The increased price of crude oil together with the increase in freight rates (which has now eased) contributed substantially to the higher cost of fertilizers. It was estimated that the developing countries would have had to spend an additional $1200 million in foreign exchange in 1974 in order to import the same quantity of fertilizer as in 1973. 9/ Thus, in addition to the physical difficulties of obtaining sufficient supplies, fertilizer imports have caused major balance-of-payment problems for developing countries. The situation has improved in 1975-76, but in 1977 fertilizer prices began to rise again. Thus, the instability of these prices is a serious problem of international concern.

In order to help meet the problems of the most seriously affected countries, an "International Fertilizer Supply Scheme" was established by FAO in July 74, with the aim to increase the availability of fertilizers for developing countries, including the establishment of a Fertilizer Pool, and to mobilize financial and technical assistance for the purchase of fertilizers. In addition, since fertilizer production capacity is underutilized in many developing countries, because of such factors as raw material and power shortages, equipment failure, obsolescence and poor management, the UNIDO, FAO and the World Bank have been co-operating since December 1971 in a programme to increase capacity utilization.

There are a number of ways in which chemical fertilizers can be used more efficiently in both developed and developing countries. Improved practices such as timely sowing and better water management can greatly enhance the efficiency of fertilizers use. Improved methods for the application of fertilizers, including proper placement in the soil, the timing of applications to coincide with the nutrient demands of crops, as well as better choice of fertilizer materials, can also greatly increase efficiency. Such improved methods are labour-intensive, and thus suit the rural employment situation in most developing countries. The breeding of high-yielding varieties of cereals and other crops, which are very responsive to fertilizer use, has contributed to the more efficient use of fertilizers, and has been a main factor in increasing the demand for it.

9/ United Nations World Food Conference, "The World Food Problem: proposals for national and international action". Rome, 1974, p. 41. E/CONF. 65/4.

The application of modern fertilization techniques must be accompanied by a regular and ample supply of water, particularly where the high-yielding varieties of seeds are used. With regard to this requirement, it is necessary to emphasize the need for a considerable expansion of the irrigated area and for the improvement of the existing irrigation systems in developing countries.

More efficient use of irrigation water, with savings in the energy consumed, appears both necessary and feasible in many areas. Many existing irrigation schemes are badly in need of renovation. The inter-dependence of land development methods, irrigation practices and systems of crop production is seldom fully appreciated.

Both increased efficiency in the use of irrigation water and higher cropping intensities can be achieved by improving water distribution channels and providing efficient drainage of the fields, improving fields lay-out, land grading and levelling, and improving cropping practices through the use of better implements and water application methods. Such improvements are likely to generate additional employment opportunities in rural areas.

Pesticides are another important element in the package of production resources required not only to increase yields and production, but also to reduce post-harvest losses. It is estimated that something of the order of a third of the potential crop production in developing countries may be lost as a result of pests, diseases and weeds at the production stage and in post-harvest operations.

Pesticides are, however, the most energy-intensive agricultural input; the commercial energy required to produce them can be very substantial. In addition to their energy-intensiveness, concern about possible detrimental effects to the biosphere from the use of chemical pesticides has stimulated the search for ways of economizing their use.

Weed control through better tillage and mechanical or hand weeding is in many cases still the best alternative to herbicide use. These methods may be especially appropriate in developing countries, where labour is usually abundant and cheap in relation to the cost of imported materials.

Like chemical fertilizers, farm machinery in its most advanced form of mechanical power is a comparative newcomer to the inputs used in agricultural production. In fact, human and animal energy still contribute a large share of the total power used for tractor in agriculture in the developing countries. The use of animal power has well established traditions, and it has been only recently replaced by tractors in some developing countries.

The number of four-wheel and crawler tractors at work in agriculture is projected to rise from 16.1 million in 1972/73 (9% in developing countries) to 20.6 million by 1985/86 (13% in developing countries). 10/ In addition to tractors, the farm machinery industry manufactures tillage, planting, cultivation, harvesting and other equipment. The rapid tractorization of agriculture in the developed countries that has characterized the last 50 years, combined with the more recent spurt in the use of mechanical power technology in the developing countries, has led to a substantial rise in agriculture's use of commercial energy.

More effective use of human and animal draught power could reduce the need for mechanized power in many developing countries. Where ecological and social conditions are favourable, and especially in the areas with inadequate road systems, attention might therefore be given to increasing the number of draught and transport animals and to a corresponding adaptation of agricultural equipment and means of transport manufactured by industry as well as by village artisans.

The effectiveness of all these power sources may also be increased by combining their use in developing countries. Mechanized power is often the most effective method for tilling the soil, but animal power may then be used for planting and secondary cultivation, and human labour for inter-row cultivation and harvesting. Power mechanization in the developing countries should thus be used to complement rather than replace human and animal power.

The package of inputs for "modernizing" agriculture has been rapidly increasing both in quantity and in sophistication and this has frequently put to a disadvantage the small producer, with limited land, cash and know-how. The consequences, to be seen in quite a few developing countries, have been the increased number of marginal farmers and landless labourers, widespread unemployment and massive exodus from rural areas; such consequences were hardly offset by the increased industrial employment. Hence the need for a choice of appropriate technology and industrialization, as discussed in this paper in chapter 6.

10/ FAO, "The State of Food and Agriculture 1976", p. 100, Rome, 1977.

5. Other Types of Industries

The industries that can be established in rural areas are not, of course, confined to those processing agricultural products or supplying inputs for agricultural production. Tourism, including that based on wildlife resources, is an important example. But in suitable circumstances many other industries, some of which may be totally unconnected with agriculture, can be set up in rural areas.

In areas where building materials are available, the exploitation of these materials could lead to the establishment of new enterprises, such as cement manufacture, brick-laying, metal-working, carpentry, wooden furniture, where tools and machines could be largely accessible to workers. The technology in such industries being rather flexible, these could be developed initially on small-scale basis and then gradually expanded.

Ancillary industries to large-scale industries could also be started on a small-scale basis for the production of components to be assembled in larger, usually urban manufactures. This kind of industries (e.g. manufacture of automobile spare parts, electronic components, construction materials, etc.) could be established in countries which have achieved a fairly high level of technology and can rely on good physical infrastructure facilities, and, of course, manpower.

In many rural areas, given the availability of rural skills of a high degree, cottage and handicraft activities (including artistic handicraft) could be organized and further developed by improving the design and quality of these products. These activities have traditionally provided substantial employment opportunities, although frequently only of a seasonal nature. They are, however, rather vulnerable in competition with mass production from modern factories.

In the countries endowed with forest resources, forestry and forest industries are an important source of employment in many rural areas, often offering employment in the off-season for crop production. It has been estimated that, including the indirect effect on employment in wood-based secondary and tertiary industries, such as furniture, paper converting, containers and housing construction, the forestry sector could generate additional employment opportunities of the order of 30 to 40 million jobs in the developing market economies between 1961-63 and 1985. 11/ These calculations are based on a multiplier of 7 to 10 for the indirect employment effects of the expansion of production in forestry and primary forest industries.

11/ FAO Provisional Indicative World Plan for Agricultural Development Vol. 1, p. 325.

One action to promote more stable employment is the vertical integration of forest industries and forestry, to make the best use of scarce land resources and abundant labour. Fuelwood and charcoal production can also provide employment opportunities, directly or indirectly. Moreover, the establishment of local fuel-wood plantations, small sawmills and cottage-level secondary forest industries can contribute to the creation of job opportunities and the expansion of the market economies of the villages and other rural centres.

Activities related to the fishing industry can provide substantial employment opportunities for the population of the coastal areas. Such opportunities can be created through the establishment or expansion of industries which supply inputs or utilise the output of fishing. Among the latter are fish processing industries and among the former are activities such as shipbuilding, gear manufacture and the manufacture of processing equipment.

In addition to the above types of industries, vast potentials exist in many developing countries for the manufacture of products from natural fibres (cotton, wool, silk). These products represent culture, tradition, art and means of livelihood for a substantial portion of the world rural people, besides meeting their clothing, packaging and other needs.

Natural fibres can be used to produce high quality fabrics by mixing them with artifical fibres. These two types of material do not necessarily compete with each other, since in modern industrial processes they can be complementary, as in the manufacture of textiles composed of both natural and artificial fibres.

An activity of the natural fibre industry which deserves particular attention is sericulture, since it can provide remunerative employment and foreign exchange with relatively little investment. World demand for natural silk has increased constantly in the last decade because of the trend to use more silk in luxury fashions and the inability of many high-income producing countries to engage in sericulture because of rising labour costs. This has provided a good opportunity to developing countries to undertake or expand silk production.

FAO carries out an active programme to promote and assist sericulture by establishing close links with the major Institutes that work in this field to help the transfer of appropriate technology and the provision of expertise.

Other rural industries that can bring good economic returns in developing countries include: the rubber industry (demand for natural rubber continues to rise in spite of increasing competition from synthetic substitutes); the tobacco industry, especially the manufacture of tobacco on a cottage and small scale basis; and the beverages industry (tea, coffee, cocoa, and by-products such as caffeine) where the processing, packaging, storing and transport of these products can provide substantial employment.

An improvement of employment prospects along these various lines, combined with measures to make life in rural areas more attractive, can prevent or even reverse the uncontrolled drift to urban areas.

6. Choice of Technology

In order to maximise its developmental impact, the technological advance in all industrial activities related to agriculture, as well as in other industries of the developing countries, must be appropriate to social and economic local conditions. Such technology should rely - as much as possible - on local entrepreneurship and other factors of production, aim at satisfying primarily local demand, draw on the experience of other developing countries.

The major issue here is the very complex one of mechanization, for mechanization is a principal means of raising labour productivity and the income per head of those involved in it, and also of reducing the drudgery of agricultural work. Because of the need to maximise agricultural employment opportunities in the developing countries for a long time to come, it has been generally agreed that these countries should pursue more "selective" or "appropriate" mechanization policies than most of them have in the past.

Such policies have so far found little application in practice, and it is to be hoped that one of the beneficial results of the energy crisis will be a more rational approach by developing countries to the use of their scarce capital and foreign exchange resources for agricultural mechanization. However, it would be disastrous if the increased costs of the manufacture and operation of farm machinery should slow down its application in the many areas where it is essential for a rapid growth of food and agricultural production.

In these circumstances, it is imperative to examine ways of improving the efficiency of farm machinery use. In the developed countries attempts have been made in recent years to promote minimum tillage practices, 12/ and energy requirements have also been reduced by combining operations such as planting and fertilization. Economies in fuel consumption can also be made by better maintenance and tuning of engines, keeping implements in good condition, using diesel engines, and using the right appliance for each operation.

There are many cases in developing countries where defective planning and management have resulted in as many as half of the country's tractors being out of operation, while the other half is operating well below capacity. More attention is also needed to the design and manufacture of farm machinery that is better suited to the conditions of developing countries. Labour productivity could often be increased by better design and use of hand tools, and by planning farm operations to avoid unnecessary seasonal peaks in labour requirements. Group farming should also be seen as a way to reduce the requirements of total machinery capital per area unit.

Many traditional technologies are available within the developing countries which are artisanal in nature and need transformation through research into modern science-based technologies. In addition, specialized knowledge and above all experience is needed for selection, modification, development and utilization of appropriate technologies. This may not exist at present in many developing countries or even at regional and international levels to which immediate reference can be made for advice. Some examples of areas in which new or modified technologies have had to be evolved for the processing of agricultural products of developing countries are in the production of coconut oil and high protein oil cake directly from fresh coconuts, date syrup, palm oil, sisal waste and the industrial milling of millet and sorghum.

Every developing country needs, therefore, a minimum infrastructure for research and development in order to identify, develop and maintain the required technologies. FAO has given great attention to setting up adequate institutional structure for this purpose, in relation to both the private and public sectors.

12/ It has been estimated that in the United Kingdom reduced tillage consumes about 62% and direct sowing 35% of the fuel required for traditional methods, while in the United States reduced tillage requires 57%, minimum tillage 46% and "zero" tillage 17% of that for conventional methods.
See "The Use of Energy in European Agriculture" (document prepared for the European Commission on Agriculture, Twentieth Session, Rome, 17-23 June 1976), Rome FAO, March 76, p. 6 ECA:20/76(5).

Recently, FAO has initiated a survey of the competence of institutes in food science and technology in order to establish a network among them for the promotion of Technical Cooperation among Developing Countries (TCDC). With funds from UNDP, assitance was given to some of these institutes, particularly in Latin America. Thus, the Technology Section of the Centro de Pesquisas e Desenvolvimento in Brazil was strengthened to develop new methods of handling, storing and processing, including sundrying and dehydration of fruit and vegetables, and to carry out techno-economic feasibility studies. In Iran, in-project training was given to provide the Ministry of Cooperation and Rural Training with technical personnel capable of identifying and developing rural industries that are essentially agro-based. Under FAO's own Technical Cooperation Programmes (TCP), assistance was given to Mexico for setting up a Coordination Centre in Food Science and Technology to select, transfer and develop technologies for agro-industries.

FAO also attaches considerable importance to the promotion of research in the field of appropriate technology for rural women. In spite of all relevant research carried out, this is still a neglected sector.

Rural women work with primitive tools and follow primitive methods of production; modernization has hardly touched them. Village technology suitable for them must therefore be concerned with simple improvements in tools, in practices and equipment for both production and consumption processes.

Although rural women are often the main contributors to agricultural production (women's task include weeding, threshing, harvesting, food production and raising of small animals) they do not receive the technical support necessary to become more effective producers. In addition to agricultural production, they perform other economic activities which are not directly amenable to measurement, such as food processing for domestic consumption, household maintenance, production of handicraft goods. Yet, the income provided by these activities still remains small.

Better employment and income-earning opportunities should therefore be made available to rural women, to enable them to make a fuller contribution to the socio-economic development of their own country, especially through the establishment of village level small-scale enterprises in food processing, cottage industries, consumer goods and light engineering goods, all industries which are labour-intensive and which require a simple technology as well as minimal financial investment. Rural women should be involved in these enterprises not only as unskilled or semi-skilled operators, but should be properly trained in various skills and responsibilities, such as repairs, maintenance and store-keeping.

FAO is stepping up its efforts to promote greater participation of women in agricultural and rural development. This work focusses on increasing agricultural and other rural production, on better food utilization, and on improved family, village and community welfare. A number of countries such as Benin, Mali, Nicaragua, Sri Lanka and Upper Volta have been assisted in establishing home economics extension programmes. Since rural women are heavily burdened with time-consuming tasks of extreme drudgery, efforts are being made to introduce labour-saving techniques and equipment that will free some of their time for learning new skills and for improving their participation in community affairs outside the home.

Another area where relatively little research has been carried out, is that of designing of appropriate technology for road construction work. In this field, the adoption of inappropriate technology has particularly serious repercussions since government investment in this sector often amounts to as much as 30 - 40 per cent of all public expenditures. Moreover it is one of the sectors most amenable to the use of "appropriate technology". Various alternative, efficient, more labour-intensive construction techniques already exist, so that the usual reliance on capital-intensive methods cannot be justified on the ground that no alternative has been developed.

The ILO, the World Bank and a number of private institutions have recently been working on the development of equipment used in the main types of road construction work. The results of their research suggest that the road construction sector could become a major generator of employment if appropriate technologies were adopted.

7. Organisational and Institutional Factors in the Context of Rural Industrialization

The inter-dependence of agriculture and industry, the main aspects of which were outlined at the outset of this paper, is now generally recognised and understood, but its implications are still only rarely reflected fully in economic planning and policy making.

The promotion of rural industry in the broader context of rural development merits special attention. In many developing countries, existing rural crafts and skills are disappearing rapidly, while modernization of agriculture creates a demand for new inputs and consumer goods which could often be produced locally.

If these two trends can be combined through more efficient planning and support measures, the outcome might be the modernization of local industrial structures, geared to serving the rural areas and with linkages to the national industry as well.

However, attempts to make rural development more effective through development of rural industries, decentralisation of industrial growth, popular participation, more equitable income distribution, including the non-material benefits of production, have sometimes been disappointing.

A principal reason for the lack of progress has been the pursuit of sectoral programmes independently of each other and without a proper grasp of their inter-relationship.

An understanding of the complex nature of agro-industries and the manner in which they interact with agriculture and with other aspects of socio-economic development is essential, if a large number of disparate activities must be brought together to make a functional systems. Some countries have been able to solve this problem by establishing Development Councils for food and agricultural industries, in which the concerned ministries, development corporations, finance institutions and the industry are represented. Such Councils have been able to identify areas of priority, indicate the resources required and constraints to be overcome, and this has helped to formulated more comprehensive policies.

Another reason for the unsatisfactory development of rural industries has been the neglect of the small-scale type of enterprise suitable for rural areas, because of the convenience and lower unit costs involved in the planning and implementation of industrial projects for larger undertakings, which are better suited to the urban environment or can enjoy better interurban transport connections.

Inadequate transport is often one of the most important constraints in agro-industrial development. In particular, processing industries in developing countries face many problems of transport, e.g. high costs and delays in delivering containers and other equipment as well as spare parts for plants located in distant production areas, or in assembling raw materials over long distances on roads of poor surfaces interrupted by seasonal rains. The use of refrigeration is especially dependent on good transport facilities including a complete "cold chain" from the point of origin to the point of retail sale. For frozen products originating in developing countries, this represents a major investment, with difficulties and risk in maintenance. Major transport investments to help a single agro-industry may not be justified, but much can be done to eliminate delays and bottlenecks in existing transport systems.

Water management - i.e. regulation of flow, water supply for irrigation and power - will also play a vital role in national and regional industrial development programmes. Hence the need for timely examination of the training, manpower, as well as administrative implications of all relevant activities, ranging from the construction of major dams, irrigation systems, electrification networks, to the execution of small rural works and the maintenance and repair of equipment. A number of developing countries (e.g. Mali and Niger) are already developing a wells administration and maintenance organization with appropriate training activities.

For some of the larger developing countries - where water is already a serious limiting factor - the establishment of agro-industrial complexes supported by nuclear energy, is a possible solution. The availability and exploitation of this form of energy is likely to receive increased attention in view of the rising price of fuel oil.

For rural industrialization to be effective, the provision of the physical and infrastructural facilities such as roads, transport, communications network, power, markets, banking services, etc. must be accompanied by the simultaneous development of the relevant institutions. Particularly important in rural industrialization programmes are such elements as the availability of education and training facilities to upgrade the existing local skills, the provision of industrial extension, the development of co-operative self-help in all its forms, the decentralization of industrial enterprises. These aspects will be examined below.

Local institutions, such as farmers' associations and co-operatives, have obvious potential advantages for coping with the problems of agricultural production, processing, marketing and credit. On the one side, they provide some measure of participation through the involvement of their members. On the other, they perform intermediary functions (arrangements for the supply of production inputs, delivery of

marketed supplies to the appropriate agencies, better access to credit, provision of market information, etc.) which benefit individual producers both as cultivators and as entrepreneurs engaged in agro-business.

The role of co-operatives is particularly relevant in the field of processing and marketing of agricultural products. The impact they can make on the rural community and the national economy has been examined in several FAO studies and reports. 13/ These studies have clearly shown that cooperative processing, storing and marketing have made a substantial contribution to modernising traditional agriculture and raising the incomes of small farmers. These activities can benefit producers and consumers in numerous ways.

The first benefit is due to the impact of cooperative processing on the marketing arrangements for the agricultural produce. Because of processing facilities, the transport and storability of many agricultural raw materials are facilitated. This enlarges the market for these products, over time and over space, and ensure producers a better bargaining position particularly in the case of perishable commodities, e.g. milk, fruits and vegetables.

Secondly, in commodities where processing changes substantially the agricultural product by incorporating into it a number of new utilities and services (for example, when sugarcane is processed), there is relevant value added to the raw product. The co-operative organisation of processing activities enables small agricultural producers to retain a part of "value added" which otherwise is appropriated by the processors.

Thirdly, the joint effort of the producers, which gives them the advantage of large scale buying and selling operations, can also have a significant impact on the stability of commodity prices. The stabilization of incomes and/or prices, is also possible because producers can extend their selling operations to far-off places within their country or even abroad.

Apart from their direct impact on agricultural production and marketing, co-operative processing units established by producers often create new employment opportunities in rural areas. This helps to relieve unemployment and under-employment in agriculture and to diversify the rural occupational pattern. In fact, in some developing countries there are examples of industrialization process originated by the cooperative movement starting from the processing of local agricultural products and then widening its scope to embrace other enterprises. For instance, the sugar cooperatives in some

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13/ See, for instance, "Operational Efficiency of the Co-operatives in Developing Countries", FAO, Rome 1975.

parts of the Maharashtra State of India have created what might be called a co-operative industrial complex. Such type of industrialisation ensures a balanced development of agriculture and industry.

The reservoir of potential skills - technical and entrepreneurial - in rural areas is often large. Without special efforts, however, to upgrade the skills, to diversity production and to evolve a technology appropriate to the needs of the small-scale village industry, this important asset threatens to disappear.

Trained and skilled workers at all levels are an essential component of a viable industrialization process. They are, however, in short supply in many developing countries. This shortage could be removed by providing appropriate training programmes and facilities and by re-orienting or upgrading the existing ones. This in turn requires the building-up of a suitable programme for educational planning at the national level and the use of more effective training methods.

An important element in such programme would be the establishment of industrial training institutes at the school and college level, so that the skilled labour force, having the required attitudes for working in small-scale industrial units, is regularly made available.

Another basic element would be the improvement and expansion of non-formal methods of education and training, and a more extensive use of in-service and on-the-job training in the various trades and crafts, both for wage-earners and self-employed. It would seem natural to upgrade the skills of rural artisans, such as blacksmiths, carpenters, shoemakers, woodworkers, so that they could assume new manufacturing and service roles in modernizing rural communities. Efforts should also be made to provide adult training at the grass-root level in such areas as rural crafts, repair and maintenance of machinery, transport, refrigeration, building.

Considerable emphasis should also be given to the training of field and administrative staff so that the local skills and administrative capability for planning and implementing agro-industrial programmes may be increased accordingly over time. Manpower training is crucial to achieve production targets, as well as to broaden participation.

A further important consideration is the determination of the most suitable location of industrial enterprises. This problem should be tackled within the context of a clear-cut policy regarding industry and rural development, in the general framework of national development planning.

Where there is technical freedom of choice, industries have normally tended to be established close to the consumer markets in the urban centres, to take advantage

of the more efficient labour supply, better infrastructure and lower distribution costs. The concentration of industrial, administrative and service activities in sufficiently large centres has undoubted advantages for individual enterprises. On the other hand, it has become increasingly clear in recent years that excessive growth of large urban agglomerations entails higher costs to society as a whole and involves very difficult and intricate management problems. In such circumstances, the chances of a self-sustained national economic development diminish and the risk of increasing social injustice expands.

As far as possible, industries should be decentralized to small townships in rural areas. This would probably entail fiscal incentives to reinforce the attractions of cheaper labour, as well as measures to provide the necessary infrastructure. The rural areas could also be made more attractive to industry by deliberate policies to encourage the expansion of decentralized rural towns, either by the construction of new towns, or by upgrading the existing ones. Rural industries could thus be encouraged to be settled in these towns, which would function as centres for the necessary extension, credit, marketing and other services to farmers, as well as for the provision of the necessary amenities and facilities to the surrounding rural areas. This would permit a more rational spatial distribution of agro-industrial activities than might otherwise occur.

A consistent policy is also needed concerning state and private participation in industry. In some cases the governments of developing countries have themselves participated directly in the establishment and operation of industrial enterprises. More often, however, government action in this regard is confined to the various measures of assistance to the private sector, and the provision of the necessary infrastructure.

One of the most important areas of government responsibility is research. As already noted, research is particularly needed for the development of industrial technologies better suited to the conditions of developing countries, and into appropriate processing equipment. Governments may also need to assist new industries with credit and subsidies. In some cases, governments may find it advantageous to seek investment from foreign sources, which also bring in technical knowledge, business management and trained personnel. In order to match such an increased dependence from abroad for marketing, know-how and capital, Governments can establish suitable institutions such as Marketing Boards, with the aim of strengthening the national bargaining power, of expanding the return from export and increasing the efficiency of the marketing and processing system. This should not, however, be obtained at the expense of the small agricultural producers.

Finally, a sustained agro-industrial development requires a systematic evaluation of its technical, economic, social, financial implications, with a view to assessing their impact not only on the national economy, but in particular on the socio-economic condition of the lowest income groups, among which the rural poor normally represent by far the majority.

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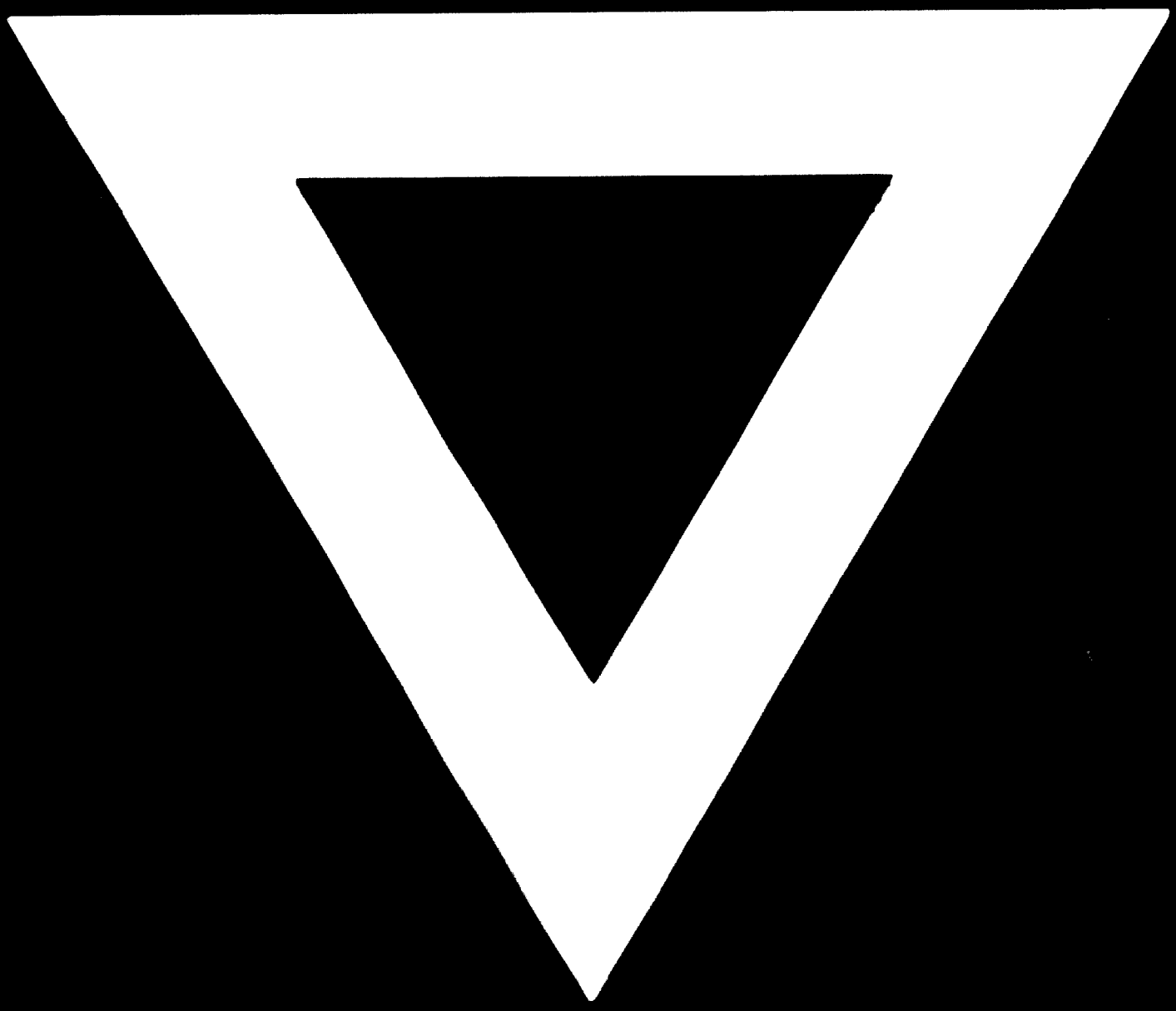

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