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Third Consultation on the Capital Goods Industry
with Emphasis on Rural Transport Equipment

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TRANSPORT EQUIPMENT FOR AGRICULTURAL AND
RURAL DEVELOPMENT IN DEVELOPING COUNTRIES

Discussion Paper*

Prepared by

UNIDO Secretariat

* This document has not been edited.

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I. INTRODUCTION

1. The First Consultation on the Capital Goods Industry ascertained the unbalanced production of capital goods between developed and developing countries and called upon UNIDO to give priority in assisting those developing countries with an embryonic or no capital goods industry. UNIDO was requested to carry out studies to identify barriers hampering the entry of those countries into the capital goods sector and to formulate possible strategies to remove those barriers. In pursuance of that mandate, the Second Consultation examined the conditions of entry into the sector and, in view of the importance of energy in the industrialization process, the development of the electric power equipment sub-sector. To that effect, UNIDO was asked to promote activities related to the development of small hydropower plants to meet the priority need of rural electrification and to further the potential uses of electric power in agriculture.

2. Indeed, Governments in developing countries have given significant importance to the development and strengthening of their agricultural base with a view to generating the surplus needed for the growth of industry and other services, while achieving better integration between agriculture and industry. It is therefore important to develop those industries that can contribute to agricultural development.

3. Transport is not only a key sector of economic activity and investment but also an important catalyst in economic and social development. As such, the improvement of the transport situation and the means to strengthen this sector's contribution to the industrialization process in developing countries deserves careful attention.

II. Rural transport requirements for industrial and rural development

1. Economic growth in most developing countries depends on the performance of their agriculture. Rural sectors in these countries provide subsistence to the majority of the population. The output from these sectors, however, remains insufficient to meet their needs. For the low income countries, especially those of sub-saharan Africa and South Asia, where the majority of the 800 - 850 million poor of the world live, the highest priority has been given to agriculture, broadly understood to include crops, livestock, fisheries and forestry, and to a lesser extent to mining. The development of rural areas will require better transport infrastructure and more transport equipment alternatives, especially for the large number of small farmers usually identified as target groups.

a: Present status, problems and prospects

2. The last three decades have seen an unprecedented expansion in the road system and motor vehicle stock of most developing countries. The general expectation is that future growth will be somewhat slower. All available data implies that transport facilities available in rural areas remain few and inappropriate. There are large numbers of people living in developing countries with limited access to motor vehicles. These people are dependant on traditional means of transport; these are walking or headloading, backloading for goods, with a shoulderpole or yoke as a less common alternative. Sporadic use is to be found of bicycles, handcarts and wheelbarrows, and in some areas, animals and animaldrawn carts.

3. Adequate, reliable and economical transport is an essential, although not in itself sufficient, requirement for the social and economic development of rural areas of developing countries. Government policy-makers and planners as well as aid agencies involved in the preparation, financing and implementation of rural transport investment programmes at present tend to focus on infrastructure projects, assuming that private initiatives would respond to the demand for transport services. However, a UNIDO analysis has revealed a number of other

factors and problems that hamper the development and operation of an appropriate and adequate total transport system, especially for many small farmers in Africa, Asia and in Latin America, usually identified as target groups for the benefit of rural transport and rural development.

4. In view of the scarcity of resources and current standards and costs of rural construction and improvement, only slow progress can be expected in extending the geographical influence of motor vehicle transport services to all productive, or potentially productive agricultural areas. In Brazil, for example, less than 20 % of rural roads can be expected to be improved within the next 15 to 20 years. In some countries, public transport services operating on improved rural roads are out of reach of the poor half of the rural population because of the high fares charged for their use. Many proven basic vehicles and transport means (e.g. pack-animal, bicycles, chee-kees, trailers, handcarts etc.) are found in different countries; however, these are very often unknown or not accepted in other areas where they could be of considerable advantage to those without physical or financial access to motor cars, trucks or buses. Also, current planning emphasizes road construction without full account being taken of existing requirements on the specific needs of rural transportation. In addition, hindering the development of rural areas are foreign exchange restrictions, transport regulations, and terms and conditions of credit available to farmers. Rural transport is an activity which cannot be isolated from a country's economy as a whole. The main objectives of most rural transport investments are to increase agricultural production and to improve the welfare of small farmers.

5. Therefore the common lack of attention given to the transport system, affects the whole economy. Transport requirements for agricultural products should be given priority in line with the importance generally assigned to the agricultural sector in most developing countries.

Figure 1.1.

Typical chain of production

	Collection	Consumption
Primary production	Selection	Manufacture
	Treatment	Export

This chain of production as a system singles out the role of transport of agricultural products in (a) rural environment, and (b) in distribution (fig. 1.1.).

6. In general, transport of agricultural products has an appreciable industrializing effect and there is an underdeveloped potential owing to the lack of specific studies and policies for promoting particular types of transport equipment that would provide appropriate handling of potentially exportable products, which in some countries represent the main source of foreign exchange earnings. Striking features of the production of rural transport equipment are the simplicity of design involved and the ease with which the technology can be mastered as well as the intensive utilization of locally produced materials. The development of the iron and steel and metallurgy industries in most Latin American countries for example, advances with the rise in the technical level and the mechanization of the agricultural and rural transport sectors, the latter of which has enormous potential for development and for large-scale dissemination of techniques and equipment used by innovative entrepreneurs in relation with export crops.

7. The dynamic industrialization potential inherent in the manufacture of equipment for transporting agricultural products in rural areas can be seen by the example of Brazil, which in 1986 produced 51,289 units of various types of equipment, as against 26,937 and 23,384 units in 1984 and 1985 respectively (see table below).

Brazil: Production of rural transport equipment
(units)

<u>Product</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Sugar-cane loaders	734	880	950
Grain hoppers	423	483	1,088
Fixed or tipping carts and trolleys	13,346	16,529	23,265
Elevators	6,134	4,861	16,341
Shovel loaders	3,314	127	5,683
Platform trucks	2,986	504	3,962
Total	<u>26,937</u>	<u>23,384</u>	<u>51,289</u>

Source: Economics and Statistics Division, ABIMAQ - SINDIMAQ

8. In Asia, based on local requirements, improved designs should be developed in each country for local manufacture of tricycles, trailers for bicycles, motorcycles etc. Manufacturing of tractors, trucks and other capital equipment in various Asian countries are in different stages of development. At present most of the countries have already set up heavily protected import substitution industries. However, as manufacturing sectors become more mature, each country will become more specialized. Intra-regional trade in manufactured goods should then grow, creating an environment conducive to regional co-operation.

III. Prerequisites for integrated development of the rural transport equipment sub-sector in developing countries

a) Transport strategies and policies

1. Past strategies were more concentrated on provision of roads in the majority of developing countries. Since track and vehicle are complementary and mutually dependant parts of the road transport system, most developing countries should consider the possibilities of local manufacture of the vehicles and other capital equipment they need for their transport infrastructure, particularly for rural areas. For that purpose, it is necessary to:

- Identify the transport needs of rural communities, bearing in mind the characteristics and requirements of agricultural production as well as geographical locations:
- Make decision-makers broaden planning procedures so that they reflect transport and vehicle-oriented, as well as road-oriented, viewpoints:
- Include, whenever possible, in transport policies the manufacture of vehicles from low-cost to more expensive ones, wherever appropriate, as part of the effort to develop small- and medium-scale industries.

b) Transport modes and typologies for rural areas

2. Considering the characteristics of the system of agricultural production and the need for product distribution and final consumption, the transport equipment used can be classified in two clearly differentiated categories:

- (i) Transport equipment used to move agricultural products from the place of production to the rural collection or storage points or the processing centres (agro-industry) that are located in the agricultural areas themselves, the plantations or close by, for which short-distance transport equipment is required;

(ii) Transport equipment with which agricultural products are moved from the rural collection or storage points to the urban centres, ports or export destinations for their processing or final consumption. Such medium- and long-distance transport equipment should be considered owing to its importance for the operation of the agricultural production system and its influence on the generation of surpluses and capitalization in the rural environment^{1/}.

3. A variety of transport means and modes are used to meet marketing and other needs. In African as well as Asian rural areas, headloading is by far the most common means of transport. It is used for on-farm transport, gathering of firewood, water and trips to and from marketing outlets. Wheelbarrows and animal-drawn carts or sledges are used by some farmers for on-farm transport and gathering of supplies over short distances. Off farm transport comprises trips to market centres or certain social amenities, such as health clinics and schools. This relates more to the conventional transport with motorized vehicles.

4. In most developing countries, where certain crops have gained a dominant position and make a significant contribution to the national economy by way of exports (for example fruit in Chile, grain (wheat and sorghum) in Argentina and sugar-cane in Mexico), increasing specialization is found in the use and production of appropriate transport equipment to convey these products to the processing and storage centres. Typical equipment used includes trailers, fruit trucks, bin carriers, roller or belt conveyors, agricultural trucks and rural utility vehicles, such as four-wheel drive and pick-up trucks. It should be noted that there is a growing need for silos and appropriate systems for the storage and the processing of most agricultural products. Indeed, in most developing countries, crop losses are due to spoilage resulting from lack of adequate storage facilities and unreliable transport, especially for

^{1/} See Annex 1 for a list of the main types of transport equipment used in rural areas.

large volumes of goods over long distances. Requirements for the conveyance of goods at this stage are usually met by road and rail to centres of consumption. At present, road transport is the most important mode. For instance, 60 per cent^{2/} of such traffic in Chile is undertaken by road transportation.

IV. Development and promotion of rural transport equipment

1. In order to realize the potential for self-sustaining industrialization in the operation of an articulated production structure, it is necessary to consider not only the production of inputs and capital goods to meet the requirements of agriculture but also demand for transport. It is necessary to develop appropriate transport equipment suited to the proper handling and carriage of agricultural products in rural areas as well as the transfer of these products to market centres and for export: efforts should concentrate on those products that constitute the most characteristic chains of production in each country.

2. For that purpose, and to ensure proper planning and development of rural transport equipment, it is suggested that:

a) Each country should prepare specific diagnoses of the situation relating to transport of the main crops in the rural environment and their carriage over long distances (large volumes of products).

b) Concerted programmes be established for the manufacture of special types of equipment, by specific products, with participation of Government, industry, research institutions and users of transport services which may be the farmers themselves. These programmes should include establishing a framework whereby producers and consumers are encouraged to enter into contractual arrangements for the production, procurement and financing of such transport equipment.

2/ Source: Rural transport equipment in Latin America by
J. Arturo Portocarrero B., June 1986.

c) The framework should determine in each country the responsibilities of each body in the implementation of the concerted plan between agricultural and industrial sectors and the transport sector; provision should also be made for the technical and financial support, service and other promotion instruments that are considered necessary, such as tax, credit and customs incentives for the procurement of the equipment included under the programme. The existence of technological design and research institutes as support elements for the programmes is of fundamental need in implementing the programmes, in addition to standardization in the uses and local manufacture of appropriate equipment. To this end, it will be necessary to consider the setting up of a steering body to co-ordinate and implement the programme, including representatives of entrepreneurs, and government representatives from agriculture, industry and transport.

3. The success of such programmes, however, depends to some extent on efforts to build up an autonomous industrial and technological core which can be sustained and constantly strengthened. In most developing countries, and especially in those least developed, the problems of design, manufacturing and operation of machines, and organization of production, represent the most sensitive points in the production process. There is a need to develop and/or improve national technological capabilities in those countries. In this connection, flexible manufacturing units for production of capital goods products is relevant in most developing countries. The flexible small- and medium-scale units offer a number of advantages, inter alia:

- (a) Flexibility between product and technological process of production;
- (b) Technological process of manufacture based on universal machinery capable of different basic operations (cutting, welding, machining, in which labour plays a determining role;
- (c) Production of small quantities of a great variety of products of a relatively low technological complexity;
- (d) With proper design, the production processes can be simplified and thus made more appropriate for conditions existing in the developing countries;

- e. Plant lay-out can be designed to permit the production of small quantities of different products by universal machines;
- f. Horizontal integration achieved with the domestic technological infrastructure.

4. The flexible units permit the manufacture of a great variety of machinery and equipment including spare parts needed to develop key sectors, such as agriculture, food, construction, transport. They are also able to maintain imported equipment. Moreover, they permit more rational utilization of existing installed capacity. In addition, because of the small investment needed, relative to that for big specialized production units, new plants can be installed. This line of production can also play an important role in promoting the development of the domestic technological infrastructure and a national engineering capacity, which can help to generate a more self-reliant development.

V. International co-operation

1. In developing countries various possibilities of co-operation exist as regards promotion of the capital goods sector in general and the rural transport equipment sub-sector in particular. For example:

Co-operation among developing countries would encourage exchange of information on national strategies of developing countries so that an overall analysis is carried out to find global solutions for common problems and at the same time to analyse the complementary areas at the regional level. This co-operation could be developed in the areas of

- (i) exchange of experiences in the field of design and production technology that would permit an increase in the productivity of existing plants and develop new types of machinery and equipment,
- (ii) training of manpower to master the production process and other activities, such as operation, repair and maintenance etc.

2. Co-operation between developed and developing countries could be oriented towards sustaining in various ways the efforts of developing countries to improve their national technological capabilities and train the required skilled manpower to reinforce the domestic engineering. To that effect, efforts should be made to facilitate the participation of small- and medium-scale industries producing capital goods in developed countries in the transfer of technology towards developing countries. Thus, interested developing countries could benefit from a large number of suppliers of technology.

VI. Final considerations

1. In the light of the current situation described above, the UNIDO Secretariat proposes that issues for the Third Consultation on the Capital Goods Industry with Emphasis on Rural Transport Equipment be selected from the following:

a) Strategies for integrated development of the rural transport equipment sub-sector in developing countries

In most developing countries there is a lack of co-ordination between the development of the agricultural sector with that of industry. This structural problem is one of the main reasons for the relatively poor performance of agriculture in several developing countries. UNIDO-studies have shown that industry provides at least 50 per cent of all direct inputs and another 25 per cent of indirect inputs to agricultural development.

2. Transport as a service and as a branch of industry can make a major contribution to increasing and sustaining agricultural production as well as industrial output in developing countries. To that end, transport planning should start with the various needs of farmers and develop transport equipment or aids within the context of the capital goods industry as a whole, that would also contribute to achieving the development objectives in such priority areas as rural development, reduction of rural exodus, social and economic inequalities, and better utilization of local resources.

3. Since transport needs vary in each country or region according to the vast geographical, economic and social diversities, it would be essential to develop specific strategies for each country or region. These strategies should pay attention to integrated sector-wide and multimodal planning of the transport sector. The planning should include the institutional machinery to ensure its effectiveness and continuity in order to use the scarce resources more rationally and to the maximum development benefit.

b) Promotion of local manufacture of rural transport equipment

4. For many developing countries the importance of providing appropriate rural transport equipment is recognized and governments and private enterprises in most of these countries are making the necessary efforts to overcome the problems associated with the provision of transport services/equipment and implements for the rural industrial development.

5. Indeed, rural workshops as well as urban industries engaged in the development of the capital goods sector are facing technological problems, such as lack of: appropriate raw materials and proven design, standardization in production operations, skilled manpower, training system for the development of national capabilities required in mechanical engineering; they are also confronted with the question of demand for a great variety of simple equipment/aids in limited quantities etc.

6. In view of this situation, there is a need to increase human and financial resources devoted to research and development as regards design and technical studies, and to encourage the development of consulting services and licensing arrangements for transfer of technology to be adapted to local conditions. In this endeavour, the most fundamental requirement should be an appraisal of the needs of small farmers and their requirements for transport services suited to the main crops produced in the country or in the region.

7. Owing to the fact that the majority of developing countries have small and scattered markets with diversified requirements, specialization in

production - although it is a progressive mode of production practised in almost all developed countries -- could not be applied to the majority of developing countries, especially those with an embryonic capital goods sector or contemplating entering thereto. Thus, there is the need to establish forms of production that can meet diversified requirements (rural transport equipment/aids, agricultural machinery and implements, spare parts etc.) of the agricultural sector as well as industry. For that purpose, the small- and medium flexible units, as described above, could be one of the ways to overcome some of the main technological problems.

c) Transport equipment for rural development - prospects for international co-operation

8. Agriculture, understood in its general sense, is the backbone of the economy of the majority of developing countries and deserves priority attention from governments. This should be reflected in appropriate policies, financing, budget allocations and in specific action by various public and private institutions.

9. For the development of each of the principal crops of agricultural products it is necessary to assign to each product of significance to the national economy the degree of priority that will maintain the complete chain of production.

10. The production of capital goods for the chains of production defined by rural products, not only reduces dependence on the international market but also provides a net saving in foreign exchange as well as indirect savings owing to the countless links between this sector and the rest of the economy.

Owing to the importance of transport services and their impact on the efficient functioning of the corresponding agricultural production system, specific studies should be undertaken on transport equipment associated with each product of significance to the national economies of a country or a region. These studies should identify the most important characteristics of equipment for the transport of the product at its

different stages. Special attention should be devoted to the handling of the product, the conditions of rural roads, the special environmental requirements of product, loading and unloading machinery, and storage requirements, as well as transport in larger volume to the market or export centres.

12. Emphasis as to the principal lines of action in promoting and improving the national manufacture of equipment will vary from country to country according to the level of industrial development achieved in the field of metalworking production. In view of the problems confronting most developing countries, as described above, co-operation could be developed in the areas of design and prototype exchange, and human resources development. Moreover, regional organisations such as ARCEDEM in Africa, RNAM in Asia and the Andean Group in Latin America, could act as focal points to exchange information on developments equally adaptable to other countries of the region. In this perspective, international organizations such as UNIDO could provide technical assistance, for example in the design and local manufacture of low-cost transport equipment in small- and medium-scale enterprises.

13. It should be noted that small- and medium-scale enterprises of developed countries, because of their ability to adapt their production to a specific demand and their capability to manufacture a wide range of products, have the necessary flexibility to transmit many innovative ideas to meet the diversified needs of developing countries using new forms of industrial co-operation.

Annex 1

Principal types of equipment used in rural transport

Handcarts

Wheelbarrows

Animal-drawn carts

Trailers and semi-trailers

Bicycles, bicycle carts

Simple motorized transport equipment

Tractors and vans

Trucks and platform trucks

Roller or belt conveyors

Basket elevators

Shovel loaders

Four-wheel-drive

Pick-up chassis

Road transport equipment

Truck chassis

Vehicle bodies

Railway equipment

Locomotives

Waggons