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17421

Distr.
LIMITED
ID/WG.482/1(SPEC.)
13 February 1989
ENGLISH
ORIGINAL: SPANISH

United Nations Industrial Development Organization

Global Preparatory Meeting in Preparation
for the Consultation on Capital Goods with
Emphasis on Rural Transportation Equipment

Vienna, Austria, 29 May - 1 June 1989

STUDY ON THE RURAL TRANSPORT EQUIPMENT INDUSTRY
IN LATIN AMERICA*

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* The views expressed in this document are those of the authors and do not necessarily reflect the views of the Secretariat of UNIDO. This document has been translated from an unedited original.

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FRAMEWORK OF THE STUDY

This study confines itself to an analysis of the present status, production and most important characteristics of the transport equipment used for carrying the main agricultural products for domestic consumption and export in selected Latin American countries, namely, Chile, Argentina, Brazil and Mexico.

Bearing in mind the characteristics of the system of agricultural production and the need to move products for distribution and final consumption, the transport equipment used can be classified in two clearly differentiated categories:

(i) The first comprises the 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) The second comprises the 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 is included in this study owing to its importance in the operation of the system of agricultural production and its influence on the generation of surpluses and the capitalization of the rural, especially the agricultural, environment.

OBJECTIVES OF THE STUDY

This study constitutes an approach to the problem of rural mechanization in the area of transport and sets out to present:

- A comprehensive and objective view of the situation in the sector of rural transport equipment in the countries analysed;
- An indication of future lines of action in dealing with the sector for the transport of agricultural products;
- Recommendations regarding policies directed towards promoting and developing the local manufacture of the equipment involved in rural transport in Latin American countries;
- Suggestions regarding planning methods for developing the manufacture of rural transport equipment;
- An indication of lines of production that can be developed in the national framework and types of plants for the production of the transport equipment selected;

- An indication of possibilities for international co-operation between developed and developing countries as well as among the latter, with the aim of increasing the output of rural transport equipment.

I. THE MOST IMPORTANT CHARACTERISTICS OF RURAL TRANSPORT

1.1 Transport and the chain of production

The principal rural products are derived from agriculture, stock farming, mining and fishing and have to be carried from the fields, deposits or places where catches are landed to centres for collection and primary processing (sorting, washing, treatment for long-distance transport) where, after suitable treatment, they are transferred to the domestic processing or consumption centres as well as to ports or export destinations.

All these processes and operations make up the complex operating system of the corresponding chain of production (agriculture, stock farming, mining and fishing), comprising the relevant primary production activities (cultivation or extraction), industrial processing and those activities that make possible the transfer of products from one process to the other and their intermediate or final consumption (transport).

Figure 1.1
Typical chain of production

	Collection	Consumption
Primary production	Selection	Manufacture
	Treatment	Export

This system for the functioning of a chain of production makes clear the role played by the transport of the products, primarily in the rural environment itself (a), and in later distribution (b), as schematically presented in figure 1-1.

It is clear that an efficient chain of production depends not merely on the bounty of nature in endowing a country with abundant natural resources, nor on the intensity of the capital and technology applied in primary production or

manufacture but also on the appropriate management and operation of the services that are linked to the chain of production, in which context transport of materials and manufactures assumes special importance.

The operation of a number of typical chains of production in each country constitutes its characteristic production structure. The historical development of the economies, the interaction of socio-economic forces, agents and other historical situations that affect them have, owing to the specialization derived from the international division of labour, led to the emergence of chains of production that are properly, or unsatisfactorily, articulated.

The proper articulation (harmonious functioning), or the opposite, of a particular chain of production depends on the efficiency of linkages within the system constituted by the chain. The provision of production resources for the primary sector, preferential attention to production and manufacturing processing, which are normally the subject of careful planning and priority treatment, can generate a disarticulated chain of production if equal attention is not given to the need to transport products and inputs, that is, to transport, as an associated activity in the chain of production.

Normally, the disarticulated nature of chains of production for rural products in Latin America determines the performance of the entire economy, and nullifies efforts to give priority to certain sectors, for example, agriculture, which are a matter of chief concern to the majority of Governments in the area. This highlights the common lack of attention to the transport system, its characteristics, equipment and maintenance (rehabilitation), which are the weak links in the chain of production, affecting the whole by their inefficiency and nullifying the efforts made and the priority rightly given to the rural production sector.

1.2 The transport of agricultural products

As was stated earlier with regard to rural production, needs for the transport of agricultural products arise in the strict sense in the actual area of cultivation and relate to the transport of agricultural products from the place of harvesting and collection to the centres of consumption, processing and export.

With regard to cultivation and in the case of the characteristic crops of a country, in which a certain crop has gained a dominant position and makes a significant contribution to the national economy by means of exports, as is the

case with fruit in Chile, grain (wheat and sorghum) in Argentina, coffee and soya beans in Brazil and sugar cane in Mexico, growing specialization is found in the use and production of appropriate transport equipment to carry these products to the processing and storage centres. Typical equipment used

includes trailers, fruit trucks, bin carriers, roller or belt conveyors, basket elevators, cableway systems, agricultural trucks and rural utility vehicles: four-wheel drive and pick-up trucks.

Transport becomes more developed technically and more mechanized as the crop becomes more important to the country and generates a sufficiently dynamic market to support sustained national production, in which context specialization and the ability to cope with requirements as to maintenance, servicing and spares are characteristic of firmly established industries that make intensive use of national components and materials.

Needs for the transportation of agricultural products from the collection centres to the consumption and export centres, as far as the main crops of the Latin American countries are concerned, are met by the use of trucks, tractor-trucks, trailers and semi-trailers, the railway system and marine and river transport (coastal trade). Land transport by road is the preponderant form, while the other modes of transport are becoming less important; though they are more economic for the transport of rural products, they are less flexible with regard to routes and the frequency of services, particularly in view of the seasonal nature of agricultural production.

In Latin America, the production of such transport equipment has been developed and is fairly well integrated in the relatively more advanced countries. Especially with regard to trucks, locomotives, and bodywork parts, production has been adequately developed in almost all of the countries analysed, even in countries in which the production of trucks has not been encouraged, as in Chile.

1.3 Transport and priority in development

Transport requirements for agricultural products should be given priority and specific attention in line with the priority generally assigned to the agricultural sector in most Latin American countries. The various interviews and analyses of the economic policy implemented in the countries visited revealed that the weak link in the chains of production is the transport of the products in the rural environment and especially transport to the centres of consumption

and export. The inefficiency of the system ultimately nullifies the efforts and priority accorded to the agricultural sector (loans, subsidies, insurance, mechanization) because the transport system is deficient and excessively costly, having problems with regard to storage infrastructure, co-ordination in the availability of properly equipped vehicles, frequency of services and the compatibility of load-carrying capacity with seasonal agricultural activity, among others.

Latin American countries should grant the same priority to activities and equipment in this sector as they do to the production of the goods transported, in keeping with the efforts and resources devoted to production activity. The result of not granting such effective priority would be that the national effort in the primary sector would be wasted and that the surplus would be transferred from the agricultural sector to the urban sector owing to the difference in transport and associated services, causing defective functioning of the relevant chain of production.

1.4 Modes of transport in the rural environment

The main methods and modes used in the transport of agricultural products in the Latin American countries are suited to the characteristics of the crops, and their degree of development depends on how modern the enterprise is - a factor usually associated with entrepreneurial innovation - and on the requirements as to quality and productivity with regard to the principal export products, which are clearly taking the lead over traditional crops and products.

So, in Chile, the fruit-growing sector is dynamic in introducing methods and equipment for transporting fruit to the sorting and packing stations intended for international markets and domestic consumption. The types of equipment traditionally used are carts drawn by animals, tractors or vans, as well as vans and light trucks; export requirements, which call for better handling of fruit in the field, have encouraged the design and production of special trailers with a low centre of gravity and with coil or leaf springing, as well of bin carriers and light trailers that can be adapted to the requirements of the various agricultural products.

The transport equipment mentioned is of local manufacture and there are practically no imports, although the customs duty is only 15 per cent and there are no tariff barriers. In recent years, many enterprises have sprung up that are engaged in producing this type of equipment. This has been reflected in a

major expansion in the manufacture of metal products such as sections, coil springs, hoop iron, leaf springs, turntables, nails, etc., which supports the production of such goods and that of other equipment for agricultural mechanization, e.g. chisel ploughs, integrated and offset disk harrows, vibrating tine cultivators, etc., a line of products which has developed in the process.

There is a notable reactivation of metallurgy and mechanical engineering production hand in hand with the increase in the area devoted to industrial market gardening and the growth in the trade balance of forestry and agricultural products; an outstanding feature in this important achievement is the indispensable development of the chain of production associated with fruit and forestry production (see annex 1).

Argentina and Brazil are large-scale producers of cereals and grain, especially wheat, sorghum, coffee and soya beans. These products are transported mainly by motor vehicles in rural areas; it should be noted that there is an important need for silos and appropriate systems for the storage and the processing of these products. Often, the trucks used to carry the products are used as a substitute for a storage system, thus introducing an additional cost that has a negative effect on results and on the functioning of the chain of production. The principal problems in the transport of agricultural products arise in the transport of large volumes of goods over long distances, as will be seen later.

In Mexico, sugar-cane is transported to the sugar-mills largely by means of vehicles with appropriate bodies, and a well-developed system is applied in all such plantations.

In general, the transport of agricultural products in Latin America has an appreciable industrializing effect and there is an undeveloped potential owing to the lack of specific studies and policies for promoting types of transport equipment that would provide special appropriate handling of potentially exportable products, demand for which should expand in future, such as vegetables, flowers and fruit.

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 industry and metallurgy in the Latin American countries gains in strength with the rise in the technical level and

the mechanization of agriculture and especially of the rural transport sector, which has an enormous potential for new developments or for the large-scale dissemination of the techniques and equipment used by innovative entrepreneurs in relation with export crops.

1.5 Large-volume and long-distance transport

After agricultural products have been harvested and sorted in the rural areas, a major effort is necessary to transport them to the centres for consumption, or for loading on ships for export or to places at which they can be industrially processed. Requirements for the carriage of goods at this stage are met by road, rail, sea and river transport. At present, road transport (by truck) is the most important mode, accounting for 60 per cent of goods traffic in Chile, 75 per cent in Argentina and 56 per cent in Brazil. Rail transport has become less important and insufficiently interesting to the Latin American Governments in recent years, which has been reflected in a decline in the railway systems in Argentina, Mexico and Brazil. Coastal traffic and the domestic transport of goods by water are relatively small in scale as compared with the other modes of transport, but overseas traffic in export goods by sea is still important.

There is a very substantial industrialization potential in such transport equipment. Prominent activities are the manufacture of automotive vehicles, medium-sized and heavy trucks and tractor-trucks and the manufacture of railway equipment, especially in countries with greater economic potential and larger markets. In the latter countries, there has been considerable development of local industry with a high national content, using domestic resources and appropriate technology, particularly in the design and manufacture of vehicle bodies (ladder-sided, tank waggons, closed cars, grain carriers), in the manufacture of special waggons for the transport of agricultural products and other uses and in the development of ancillary equipment for special transport purposes. Some examples are refrigeration equipment (thermo-king) and preservation systems for perishable products, the technology for which has been progressively accepted and utilized by enterprises and entrepreneurs engaged in export and the dissemination of which must be promoted for the domestic market, developing its capacity for encouraging industrialization.

The industry for the manufacture of parts and components for the assembly of large vehicles (automobile parts industry), foundries, forges, heat treatment and machining of metallurgical products represents a major industrial effort that has evolved in the framework of development policies and programming of the

automobile industry; in Latin America, it has developed most in countries with a larger market to support it, as is the case in Brazil, Argentina and Mexico. In those countries, the volume of production makes possible the efficient and integrated manufacture of complex technical components such as internal combustion engines, gearboxes, steering systems, and propeller shafts. Activities of this type require appropriate scales of production, permanent technological research and major levels of investment, which are normally outside the reach of local capital, so that the importance of foreign capital and technology is a well-known fact.

II. EVALUATION OF EXISTING POLICIES

2.1 Rural agricultural transport policies

In the rural transport sector proper, there are no specific regulations or policies regarding transport, and those that are in force cover land transport in general, dealing with such aspects as dimensions and permissible weights for particular roads and bridges, power-weight ratios, the configuration of trailers and axles, minimum and maximum speeds, etc. As can be imagined, in rural areas they are practically a dead letter and their implementation is not verified; here local usages and customs prevail, except with regard to the carriage of goods close to urban centres or to collection or processing points located in cities. Consequently, it can be said that the implementation of regulations and policies regarding transport conditions is not relevant in the rural environment.

The need to modernize and mechanize agriculture in Latin America, in order to increase productivity and consequently improve the "terms of trade" between the countryside and the city, make it necessary to analyse in great detail the rural transport of agricultural products within the concept of a chain of production, so as to design specific policies and regulations that would make it possible to achieve these objectives.

For that purpose, the prime need is for specific studies, by crops, of the main agricultural products of the region and the manner in which they are transported in the rural environment, the transport equipment and modes used, the existing stock of equipment, its degree of obsolescence, identification of the best modes of transport appropriate to the needs of the product that will eliminate waste, loss of quality and waiting periods, ensure proper storage and take into account seasonal characteristics and regional specialization and suitability for particular crops. In the course of the mission, it was not possible to prepare studies of this nature directed towards rural transport, except in the case of the studies on the transport of large volumes of grain in Argentina, mainly for export.

On the basis of these studies, it is necessary to design specific national policies, including measures for regulating and promoting the use of transport equipment for agricultural products in rural areas.

2.2 Policies on the industrial production of vehicles and rural transport equipment

In the relatively more developed Latin American countries, agricultural products are transported by types of vehicles that are basically produced by local industries; the main types are carts, trailers and animal-drawn vehicles, tractors, vans and trucks. Such policies as exist for the production of such equipment are designed for and oriented towards the production of agricultural equipment and implements and automotive vehicles, and are contained in national policies governing the development of the mechanical engineering or capital goods industries.

The main policies in the Latin American countries can be divided into two dominant groups:

- Protectionist industrial policies;
- Market-oriented policies.

The first group is characterized by restrictions on imports from third countries, with differential treatment in the framework of Latin American integration agreements (ALADI, Andean Group, Central American Common Market). They contain provisions for promoting and guiding the development of a domestic industry and prohibiting imports of equipment when domestic supplies are available, with exceptions based on considerations of price, financing or bilateral negotiations.

Market-oriented policies are applied by countries that normally have small markets or that adopt liberal economic policies; however, though imports of goods are not prohibited, there are programmes and policies for the preferential use of national rather than imported goods, given equal price and quality, in the case of purchases by the State.

The main policies implemented in Latin America to promote the development of such production activities are:

- Various regulations giving preference to local industry in the framework of State purchases;
- The dissemination of information and mechanisms for bringing together customers and suppliers in sub-contracting exchanges, trade fairs, negotiating rounds, etc.
- Research and development with regard to technologies for capital goods, especially in priority sectors;

- Financial facilities for purchases of domestically produced goods, which can still not satisfactorily compete with imports in many countries, despite the development of appropriate machinery;
- The development of specialized institutes;
- The establishment of committees, technical teams and specialized bodies for the study and promotion of the capital goods sector.

It is in the context of these policies that the production of rural transport equipment and the transportation of large volumes of agricultural products develop. In the field of standardization and specialized design, it has been established that activities have been undertaken by technological promotion and development centres dealing specifically with rural transport equipment; these have concentrated on development achieved through the initiative of the most modern enterprises in the agricultural sector, which are basically export-oriented. That is the case with growers of fruit and cereals, cotton, sugar-cane and vegetables in countries that are developing such crops, when a substantial level of development has been reached and the volume of production and export markets justify such activity.

III. RURAL TRANSPORT MODES AND RELATIONSHIPS

3.1 Transport in the agricultural sector

The carriage of agricultural products and materials is a necessity that is met in plantations by using equipment and methods that have evolved throughout the history of the agricultural communities. Undoubtedly, from the invention of the wheel and the possibility of fitting wheels to a platform so that greater loads can be transported than can be done by one person, up to the revolution introduced by the use of propulsion machinery, the various types of transport equipment have developed dynamically from traditional animal draught to the use of self-propelled vehicles pulling a number of trailers suited to the nature of the products carried.

In Latin American rural areas, one can find a range of methods and equipment which fulfil that function, from the conventional to the modern and sophisticated, as well as the combination and co-existence of various carriage systems, depending on the degree of modernization of the plantations. Thus, we find traditional carts and special trucks designed for the rural transport of fruit that are suited to the needs of that product, avoiding damage in the course of its handling and transport to collection centres.

Similarly, there are vehicles specially designed for carrying grain and cereals to mills for primary processing and to silos.

Sugar-cane and oil-palm plantations run by modern large-scale agricultural enterprises have introduced self-propelled vehicles and carts appropriately fitted to ensure correct handling and to avoid wastage and damage to the product during transport to the sugar-mills and oil-extraction plants.

From the industrial point of view, such equipment and special bodies and devices such as chain conveyors, slat conveyors, cableways and pipes are supplied by local mechanical engineering industries in the majority of Latin American countries. However, their industrialization potential has not been properly developed owing to the lack of promotion and capitalization of the agricultural sector and because little attention is given to the proper handling of the product, which can reduce the effect of and even nullify any efforts made to improve cultivation methods.

Undoubtedly, a 10 per cent increase in production achieved through careful handling of the product each year can be more profitable economically than increasing the rate of agricultural productivity by means of sustained and costly campaigns for improving seed, fertilization and for rehabilitating

agriculture. To achieve proper handling of agricultural products requires a single investment that will yield results during the considerable period of the equipment's useful life, as compared with other investments associated with agricultural production, which represent variable costs for such production season by season.

3.2 Large volume transport

After agricultural products have been collected in the countryside, or industrially processed (agro-industries), they must be moved to their final destination for consumption or export, and the equipment required has different characteristics owing to the greater volumes and distances involved.

At present, the dominant mode of transport of rural products, especially agricultural and agro-industrial products, is by road, using carts, trucks, semi-trailers and trailers, with bodies suitable for the product being carried.

Road transport has been gradually replacing rail, coastal and river transport, which were widely used in Latin America in past decades. The process of substitution of equipment for the carriage of rural products has been basically due to the transport policies implemented by the Latin American countries, which in the last two decades have given preference to the construction of roads as a means of territorial integration. In the first place this has been motivated by the lower government investment aid involved, since the cost of road transport equipment is assumed by the private sector, which is organized on an individual or entrepreneurial basis; secondly, road transport entails lower costs because depreciation and maintenance costs for roads are not absorbed - unless toll charges are made - thus constituting a direct subsidy for road transport. The third reason is the greater flexibility of road transport, which can adapt to the seasonal nature of agricultural activity, to the climatic characteristics of the regions and their agricultural products, making possible complementarity in the utilization of transport equipment, and reducing dead freight. The final reason is the greater versatility of road transport in serving different markets on the outward and return journeys, combining loads and destinations, and the flexibility of management as compared with rail, river and sea transport within national boundaries.

3.3 Rail transport

In the principal Latin American countries, rail transport was one of the basic instruments in the policy for occupying and developing the territory.

In 1986, Brazil had a rail network of 29,037 km, with 2,015 locomotives and 69,756 goods waggons. It transported 212.7 million tonnes of useful load, representing 104.7 billion tonne/kms.

However, it is significant to remark that in 1982, with less kilometres of track (28,923 km) the fleet of locomotives numbered 2,152, which indicates relative stagnation in this form of land transport.

Argentina had a rail network of 34,115 km in 1985, consisting of 20,495 km of wide-gauge track, 2,780 km of medium-gauge, 10,840 km of narrow-gauge and 400 km of 0.70-m-gauge track; the country had 1,040 locomotives and 34,800 waggons, of which 9,630 were grain carriers, but in 1967 the fleet of operational locomotives numbered 1,194.

In general, in the Latin American countries with rail networks, one can note this mode of transport has become less important than road transport. An example is the case of Argentina, which shows the development of loads carried by various modes of transport, in which trucks play the preponderant role for long distances, although the country has a well-developed rail network.

Table 3-1
Argentina: Breakdown of goods carried

<u>Period</u>	<u>Tonnes (%)</u>		<u>Tonnes (%)</u>	
	<u>Road</u>	<u>Rail</u>	<u>Road</u>	<u>Rail</u>
1970/74	84.6	15.4	80.5	19.5
1975/78	86.1	13.9	83.1	16.9
1979/82	87.5	12.5	84.8	15.2

Source: FADEEAC

3.4 Coastal shipping

The carriage of products by water is used fundamentally in Latin America for export or for the transport of liquid and gaseous products for the domestic market, as is the case in Chile. This form of transport is not so significant in other Latin American countries, because pipelines are used to transport liquids and gases. We can note that in Latin America water transport is not significant for the domestic carriage of agricultural products and is only important for exports to overseas of primary and processed agricultural products.

In Chile, especially owing to its physical geography, the volume of coastal traffic is significant, as is shown by the following table:

Table 3-2

Chile: Coastal traffic

<u>Year</u>	<u>Total (tonnes)</u>	<u>Grain (%)</u>	<u>Liquids (%)</u>
1960	2,688,697		
1970	4,632,748	41.7	52.9
1980	5,318,151	44.8	50.4
1986	6,546,021	45.3	48.0

Source: Ministry of Transport

IV. PLANNING AND DEVELOPMENT OF THE PRODUCTION OF RURAL TRANSPORT EQUIPMENT

If the production of rural transport equipment is to be properly planned and developed, it must have a place in the programming of the system of the corresponding chain of production of the product for which it is used. Here, the various interacting aspects must be considered, with the development objective of achieving an articulated and harmonious production structure and of optimizing the production, traffic and consumption of rural products - in our specific case, agricultural products.

The principal aspects to be borne in mind should be as follows:

- The characteristics and requirements of agricultural production in the strict sense;
- The characteristics and systems for the carriage and storage of products;
- The supply of national or imported inputs and capital goods that are necessary for the production process and their transportation (transport equipment);
- The auxiliary services that supplement the operation of the system.

In order to realize the potential for self-sustaining industrialization in the operation of an articulated production structure, it is necessary to take into account not only the production of inputs and capital goods to satisfy the requirements of agriculture but also demand for transport. It is necessary to develop the provision of appropriate transport equipment that will make possible the proper handling and carriage of agricultural products in rural areas themselves and their transfer to centres for consumption and export and to concentrate efforts on the principal products that constitute the most characteristic chains of production in each country.

In the light of these considerations, and with the aim of ensuring proper planning and development of transport equipment for the carriage of rural products, the following measures are proposed:

- (a) The preparation of specific diagnoses of the situation as to the transport of the main crops in the rural environment and their carriage over longer distances (large volumes);
- (b) The establishment of concerted programmes for the manufacture and procurement of the principal types of equipment, by representative products, providing for the participation of those who are responsible for transport, that is to say, the owners who render the transport services, who may be the farmers

themselves in the case of carriage in the rural area, and transport entrepreneurs in the case of road transport for large volumes of goods over long distances:

In view of the necessity to use other modes of land transport, especially over long distances, the co-ordination and equipment of the rail system, under the responsibility of State enterprises, should be provided for in the programmes by establishing machinery for planning transport and related equipment for these other modes.

(c) These programmes should be put on a proper legal basis by establishing an appropriate legal framework that will make it possible to enter into contractual commitments for the production, procurement and financing of such transport equipment as is determined by the concerted work mentioned above to be necessary for the programme period;

(d) The legal framework should determine, in the light of the existing institutions in each country, which body is to be responsible for carrying out concerted planning between the agricultural and industrial sectors and the transport sector and for providing technical support for the requirements of the respective programme.

The programme for the co-ordination of transport equipment needs for agricultural products should establish close links among metalworking plants, generally small enterprises that operate in the rural areas in the case of transport in the field, as well as a link between producers or enterprises marketing major volumes of agricultural products and the industry for the manufacture of transport equipment: road, rail or ships. This programme should make it possible, especially in Latin America, to restructure chains of production, so that more harmonious and efficient operation will contribute to raising the level of development of agriculture, industry and associated services, helping to bridge the gap that separates them from similar chains of production in developed countries.

V. PRODUCTS FOR RURAL TRANSPORT

Most of the Latin American countries have developed the necessary and appropriate production capacity for the manufacture of rural transport equipment. Depending on their level of economic development, normally linked to the size of their domestic markets and their export capacity, mechanical engineering plants have developed a wide range of products that can satisfy transport equipment needs in the rural environment in most of the countries. However, in the majority of Latin American countries, this existing potential is not fully used, owing to the absence of mechanisms linking the modernization needs of agriculture with the utilization and manufacture of the equipment necessary for the appropriate carriage and storage of products from the field and for handling the product at the required speed and in the required volume, taking into account market demand and the inherent perishability of each product.

For this reason, the present study intends to explain and propose mechanisms for restoring transport equipment for rural products to its proper place in the development of the Latin American economies. This equipment is normally ignored in most studies, programmes and policies related to the mechanical engineering industry, for instance those devoted to agricultural mechanization or capital goods.

5.1 The main types of equipment for transport in rural areas

The main types of equipment used in the transport of agricultural products in rural areas are:

- a) Trailers and platform trucks Equipped with various types of hoppers suitable for the transportation of specific crops: grain, sugar-cane, oil-palm fruit, crates for vegetables or fruit, forestry products, etc.
- b) Carts, trucks or trailers Suitable for the bulk transport of various products, including tanks for liquids
- c) Conveyors Roller, belt, screw
- d) Elevators
- e) Tractor elevators and
shovel loaders

- f) Vans and trucks with various types of bodies

(See annex 1)

5.2 Principal types of equipment for long-distance land transport

(a) Road traffic equipment

Trucks and tractor-trucks

- Medium: 6-10 tonnes gross vehicle weight
- Heavy: More than 10-15 tonnes gross vehicle weight
- Super heavy: More than 15 tonnes gross vehicle weight

Body work

- Semi-trailers
- Trailers

Bodies: Hoppers
Ladder-sided
Platform
Refrigerator
Enclosed van
Tank (liquid)
Other vehicle bodies

The manufacture of vehicle bodies includes other types such as tippers, ready-mixed concrete carriers, garbage trucks, cranes, container trucks, automobile carriers, which are produced by enterprises engaged in this line of manufacture which normally also make vehicle bodies for public and inter-urban transport (buses).

(b) Rail equipment

- Locomotives
- Waggons
- Passenger carriages

5.3 Technical and economic characteristics of selected lines of products

Transport equipment for rural areas

This is one of the sectors with the greatest industrial potential, the results of which can be measured not only in terms of the production of equipment but also, or rather, by evaluating the impact on results of articulation between industry, agriculture and transport .

In Chile, the harmonious combination of agricultural production, appropriate equipment for agriculture, rural transport and transport to consumption centres has dynamized the agricultural sector, as can be seen by the following results:

- (a) Agricultural production grew faster than the gross national product in recent years, rising from a 7.7 per cent to an 8.8 per cent share, as shown in table 5-1;
- (b) The area of industrial market gardens rose from 85,400 hectares in 1980 to about 130,000 hectares in 1986 (see table 5-2);
- (c) The balance of trade in terms of forestry and agricultural products developed favourably in the period analysed, achieving a positive balance of \$US 923.6 million in 1986 as compared with \$US 186.4 million in 1980 and \$US 244.3 million in 1975 (see table 5-3).

Table 5-1

Chile: Gross domestic product (agriculture)

(In million 1977 pesos)

<u>Year</u>	<u>Total GDP</u>	<u>GDP (Agr.)</u>	<u>Percentage</u>
1980	363,446	27,927	7.7
1983	327,180	27,061	8.3
1986	376,627	33,275	8.8

Source: Ministry of Economic Affairs

Table 5-2

Chile: Area of industrial market gardens
(hectares)

<u>Year</u>	<u>Area</u>
1965	52,920
1974	65,670
1978	76,500
1980	85,400
1984	115,400
1985	123,800
1986 (projection)	130,000

Source: CORFO survey, prepared by
ODEPA

Table 5-2

Chile: Area of industrial market gardens
(hectares)

<u>Year</u>	<u>Area</u>
1965	52,920
1974	65,670
1978	76,500
1980	85,400
1984	115,400
1985	123,800
1986 (projection)	130,000

Source: CORFO survey, prepared by
ODEPA

The dynamic industrialization potential inherent in the manufacture of equipment for transporting agricultural products in rural areas is shown 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 5-4).

Table 5-4

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	<u>2,986</u>	<u>504</u>	<u>3,962</u>
Total	<u>26,937</u>	<u>23,384</u>	<u>51,289</u>

Source: Economics and Statistics Division, ABIMAQ - SINDIMAQ

The production of vehicle bodies and supplementary equipment for truck chassis, which is an industry associated with the production of the vehicles to carry products over longer distances and in greater volumes, is an activity with sustained dynamism, unlike the manufacture of vehicle bodies for public transport, which has experienced serious problems in Brazil (see tables 5-5 and 5-6).

Table 5-5

Brazil: Manufacture of chassis-mounted bodies
(units)

<u>Product</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Chassis-mounted bodies (all types)	10,302	9,808	15,901
Trailers and semi- trailers	<u>5,889</u>	<u>7,674</u>	<u>10,168</u>
Total	<u>16,191</u>	<u>17,484</u>	<u>26,069</u>

Source: SIMEFRE

Table 5-6

Brazil: Production of omnibus bodies

<u>Year</u>	<u>Installed capacity</u>	<u>Output</u>	<u>% utilization</u>
1971	n.a.	4,331	--
1974	n.a.	10,339	--
1980	21,000	11,301	53.8
1982	17,000	6,695	39.4
1985	13,500	5,505	40.8
1986	13,500	6,285	46.5

n.a. = not available

Source: SIMEFRE

The production of railway equipment for the transport of large volumes of goods over long distances has been losing momentum in recent years in the principal countries that have created large-scale rail networks. National policies for the development of transport and the priority given to investments in the sector and in particular to the rail mode of transport will affect the survival of a local industry for the manufacture of rail equipment, which has developed in the largest Latin American countries. It is clear that, at the moment, the domestic markets for replacement and the purchase of new equipment are not large enough to sustain this industry, and it is necessary to use mechanisms that will make it possible to expand the activities of plants, which are especially hampered by the lack of credit to finance the capital equipment of local enterprises. This situation, which constitutes the common denominator in the railway equipment industries, could be overcome if bilateral agreements were promoted, or in the framework of ALADI mechanisms for encouraging the production of capital equipment for countries with railway industries by other countries with developed industries and vice versa, establishing financial and production mechanisms that would help to restore the potential of this important mode of bulk transport and of an industry that has achieved an appropriate degree of development in the technological field and in the incorporation of local components and materials.

A recent ECLAC report ^{1/} indicates that ... "although the activity of Latin American railway enterprises cannot be referred to as dynamic, its total demand is significant and would reach the level in the 1980-1990 decade, only with regard to rolling stock, of more than 4,000 locomotives and 80,000 waggons." These figures eloquently suggest an appropriate programme at the Latin American level to make use of that demand in favour of industry in the zone.

To illustrate the situation of this industry, we have the case of Brazil, which has had a railway equipment industry since the 1940s, and where the postponement of investments in railway rolling stock led between 1950 and 1970 to a 12.5 per cent reduction in the railway network, whereas roads grew by 1.955 per cent.

^{1/} La Situación y las Perspectivas de la Producción y el Abastecimiento de Bienes de Capital en América Latina. E/CEPAL/SEM 13/R.2

An attempt was made to remedy this situation during the past decade on the basis of transport needs for agricultural products, raw materials and industrial products, which, together with the oil crisis, encouraged greater attention to railway equipment. A protocol of intent was signed between the enterprises operating railways and the manufacturers of railway equipment. With the purpose of co-ordinating investments and production, a programme was established for the delivery of a minimum volume of equipment per year for 1975 and 1979, reducing the prejudicial impact of excessive variations in output. Experience was good at the beginning, though cuts in Government plans affected the agreement.

The investments made for expanding installed capacity and the failure to carry out the planned purchases generated a high degree of idle capacity, as can be seen from tables 5-7 and 5-8.

Table 5-7

Brazil: Production of rail vehicles

<u>Year</u>	<u>Waggon</u> s	<u>Trucks</u>	<u>Locomotives</u>
1950	816	34	-.-
1955	2,031	5	-.-
1960	245	75	-.-
1965	825	40	-.-
1970	1,808	12	11
1975	5,025	100	107
1976	4,479	95	106
1977	2,908	131	110
1978	3,455	164	42
1979	2,549	337	47
1980	1,710	259	59
1981	1,086	274	56
1982	1,843	213	95
1983	1,411	202	24
1984	799	142	28
1985	1,869	154	28
1986	1,646	120	47

Source: SIMEFRE

Table 5-8

Brazil: Idle capacity in the railway industry

<u>Year</u>	<u>Installed capacity</u>			<u>Idle capacity (%)</u>		
	<u>Waggons</u>	<u>Trucks</u>	<u>Locos.</u>	<u>Waggons</u>	<u>Trucks</u>	<u>Locos.</u>
1971	5,000	300	90	62	91	34
1975	7,000	400	150	28	75	29
1980	9,000	800	200	81	68	71
1985	9,000	800	330	79	81	92
1986	9,000	800	330	82	85	86

Source: SIMEFRE

5.4 Manufacture of rural equipment

Rural transport equipment for the carriage of agricultural products throughout the respective chain of production can be grouped according to their utilization and the investment requirements that characterize their production.

(a) In the first place, we have the manufacture of transport equipment for rural areas, namely: trailers, trolleys, platform trucks and in general equipment whose constituent parts, longitudinal members, crosspieces, roller bearings, springs, tyres, nails and metal strip and the relevant production processes, i.e. bending, shaping, pressing, welding, bolting, riveting, sanding and painting are in general use and characteristic of the manufacture of other products such as ploughs, harrows, vibrating tine cultivators, seed-drills, fertilizer spreaders, rakes, etc. Thus, the basic equipment such as presses, chisels, welding machines, riveting machines, paint, general tools, baking ovens for paintwork, etc. are in widespread use and constitute a special line for the manufacture of agricultural machinery. Normally, the level of investment is in the range of \$US 100,000-1,000,000 and the work-force numbers 20-150, depending on the capacity of the enterprise. These investments are first carried out by small enterprises, which grow into large-scale enterprises later on the basis of their industrial development and level of sales, as has happened in various Latin American countries (see annex 3).

(b) Manufacture of conveyors and elevators

These products have wide applications in industry, mining, agriculture and other sectors. The manufacturing equipment involved is of greater power and capacity than in the case of the previous type of products, including activities of the boilermaking type. Such plants also manufacture storage equipment and can diversify to include other lines of products such as equipment for processing products, i.e. grain polishers, separators or pre-cleaning equipment for cereals, etc. The investment involved and the technico-economic characteristics are similar to those of the previous line (see annex 1).

(c) Manufacture of shovel loaders

This activity is carried out in more developed countries with domestic markets that can support it. Considerable levels of national content have been achieved, and enterprises such as assembly plants for truck chassis have been set up; they require technological support and considerable mobilization of capital and their products are necessary for the mechanization of agriculture (see annex 1).

5.5 Manufacture of long-distance transport equipment

(a) Manufacture of chassis for trucks and vans

In the smaller capacity versions (1.0 - 5.0 tonnes gross vehicle weight), trucks are much used in the carriage of goods in rural areas themselves. However, owing to their versatility, they can transport products over long distances. Together with trucks and road tractors (more than 15.0 tonnes gross vehicle weight), they constitute a line of manufactures that is important for the carriage of agricultural products and goods in general. They are made by large enterprises in the larger countries and by vehicle assemblers in the majority of countries at a middle level of development (see annex 2).

(b) Manufacture of railway equipment

This activity consists in the manufacture of waggons, passenger coaches and locomotives and is carried on only in larger countries. It is an important manufacturing activity for Latin America that should be consolidated by the establishment of concerted programmes between producers and enterprises in each country, as well as with the Governments of the region, by means of Latin American integration and industrial complementarity agreements (see annex 4).

(c) Manufacture of vehicle bodies

This is a specialized line of manufacture of equipment and fittings for installation on truck chassis: the manufacturing equipment is of a general nature and the enterprises that engage in this line produce both omnibus bodies and bodies of goods vehicles. This line of manufacture has great industrial potential, if agricultural needs are co-ordinated with the production of equipment specially suited to the transportation of agricultural products that require special handling - shock absorbers, cooling, freezing, etc. (see annex 2).

Prominent among the specialized lines of manufacture that have been analysed are the production of rural transport equipment in the strict sense and the manufacture of vehicle bodies: owing to their great versatility and the general-purpose nature of their equipment, these activities can be combined to promote enterprises in rural regions in support of agricultural mechanization and particularly the transportation of products within the production zone itself, thus strengthening decentralized industrialization.

VI. RECOMMENDATIONS REGARDING PROMOTION AND CO-OPERATION FOR DEVELOPING THE MANUFACTURE OF RURAL TRANSPORT EQUIPMENT

6.1 Rural forestry and agricultural production is one of the principal economic activities in all Latin American countries and deserves priority attention from Governments. That should be reflected in policies, financing, budget measures and in specific action by various public and private bodies.

6.2 It is necessary to assign to the development of each of the principal crops or forestry/agricultural products a degree of priority that is in keeping with the complete chain of production, which is defined by each product of significance in the national economies.

6.3 Transport, as a service and as a branch of industrial production constitutes an important element in the chains of production that are defined by the principal products of the rural economy, and appropriate attention and priority should be assigned to it with the aim of achieving the economic and efficient functioning of the relevant chain of production.

6.4 The forestry/agricultural potential of Latin America creates a substantial option for the development of the specialized equipment required for that chain of production. Local manufacture increases the degree of autonomy with regard to one of the principal components of the investment process, namely, capital equipment.

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

6.6 There should be specific analysis and treatment of the production of appropriate equipment for the rural transport of forestry/agricultural products, considering both capital goods and agricultural mechanization, owing to the importance of such equipment and its impact on the efficient functioning of the corresponding chain of production.

6.7 The specific studies on the transport equipment associated with each product of significance to the national economies of the various countries should precisely identify the most important characteristics of equipment for the transport of the product at its various stages. Special attention should be devoted to the handling of the product, the condition of rural roads, the special environmental requirements of the product, loading and unloading

machinery, and storage requirements, as well to transport in larger volume to the consumption or export centres.

6.8 After the principal problem complex of each characteristic product line has been identified, it is recommended that a concerted programme should be designed covering the potential needs for rural equipment that can be met by local production. The programme should establish specific commitments regarding supply, procurement, financing, technological support, service and the 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 a fundamental need for the proper implementation and development of the programmes, in addition to standardization in the uses and manufacture of appropriate equipment.

6.9 An appropriate legal framework should be set up for the programmes devised to stimulate rural transport and should provide for agreed commitments. For that purpose, it will be necessary to consider the creation of a steering body for co-ordination and implementation of the programme, including representatives of entrepreneurs and Government drawn from many sectors - agriculture, industry and transport.

6.10 The programmes carried out should be oriented, according to the level of development achieved by the country in question, towards enterprises manufacturing land transport equipment within the following special fields:

- (a) Simple metalworking: Manufacture of transport machinery and equipment for agriculture;
- (b) Manufacture of road transport equipment:
 - Factories for truck chassis;
 - Factories for vehicle bodies;
- (c) Manufacture of railway equipment:
 - Locomotives;
 - Waggon.

Co-ordination with local manufacturers of components of the finished products should be established by means of specific policies and regulations by which each country will regulate the corresponding activity.

6.11 Emphasis as to the principal lines of action for promoting and improving the national manufacture of equipment will vary according to the degree of industrial development achieved by each Latin American country in the field of

metalworking production. In the cases of relatively more developed countries, the programmes should devote more attention to the financing of capital equipment, to co-operation among the major countries with regard to the aspects of reciprocal interchange and the equipment of their mass transport (rail) systems, and to promoting the decentralized manufacture of rural transport equipment, thus realizing the potential of agricultural zones that are far from the decision-making or export centres.

In the case of countries at a middle level of development, the basic emphasis should be placed on the efficient production of rural transport equipment, on achieving levels of quality and local acceptability of products and on the precise identification of appropriate equipment that is manufactured taking into account their principal chains of production.

The less developed countries should promote the identification of the potential equipment needs and encourage the manufacture of such equipment by flexible production units, combining the manufacture of vehicle bodies in general with that of transport equipment appropriate for the principal crops of the country.

6.12 In view of the current situation in the Latin American countries visited, some possibilities for co-operation should be developed in the following fields: transport systems, intermodal transport, promotion of the manufacture of rural transport equipment, in which context the appropriate characteristics and agencies involved vary according to the countries and the degree of development attained.

6.13 An important example of (South-South) co-operation between Brazil and Argentina presents itself in the field of railway equipment. Both countries need to re-equip and expand their railway fleets and have local industries that manufacture such equipment using advanced technology and the capacity to supply domestic needs and to engage in export.

The sale of such equipment on the domestic market encounters difficulties owing to the lack of long-term finance that would enable the rail transport enterprises to meet these needs; on the other hand, financing is indeed available for export to other countries. Both countries are implementing an important economic complementarity agreement, so that reciprocal trade on a compensation basis might possibly solve their mutual needs. This would stimulate their industries and improve their rail transport systems - and rail

transport is one of the most economic modes for transporting large quantities of goods over long distances.

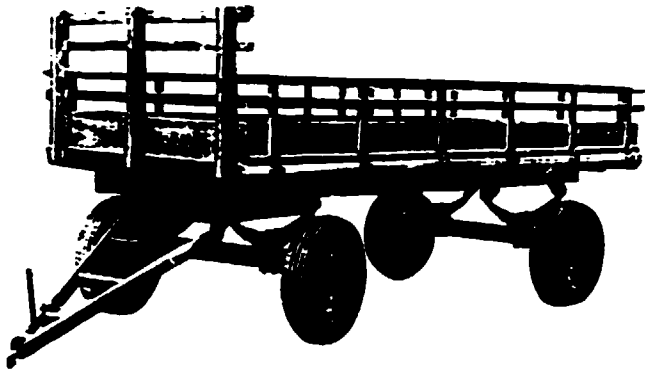
6.14 It is possible to stimulate North-South co-operation not so much in the field of equipment manufacture as in the evaluation and implementation of transport systems that would dynamize and optimize efficiency in the operation of the principal chains of production associated with the export products of the countries in the area, such as grain, meat, sugar and fruit. The need has been detected to reopen the question of the current modes of transport for the principal rural products; in this context, it is important to develop programmes for modernizing the transport of rural products that would constitute and bring into operation efficient chains of production.

6.15 Most of the relatively more developed countries have attained some degree of self-sufficiency, manufacturing their own rural, road and rail transport equipment and meeting current and potential needs for such equipment.

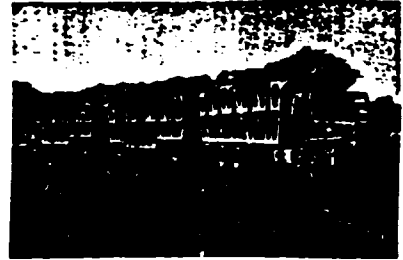
Co-operation between these countries and those of medium or low development offers an important field for development. For that purpose, institutional work is necessary in the field of Latin American integration, and this situation offers important prospects in view of existing agreements. The Andean Group and Brazil-Argentina should identify and promote in their specific areas action on transport equipment for rural products.

Annex 1

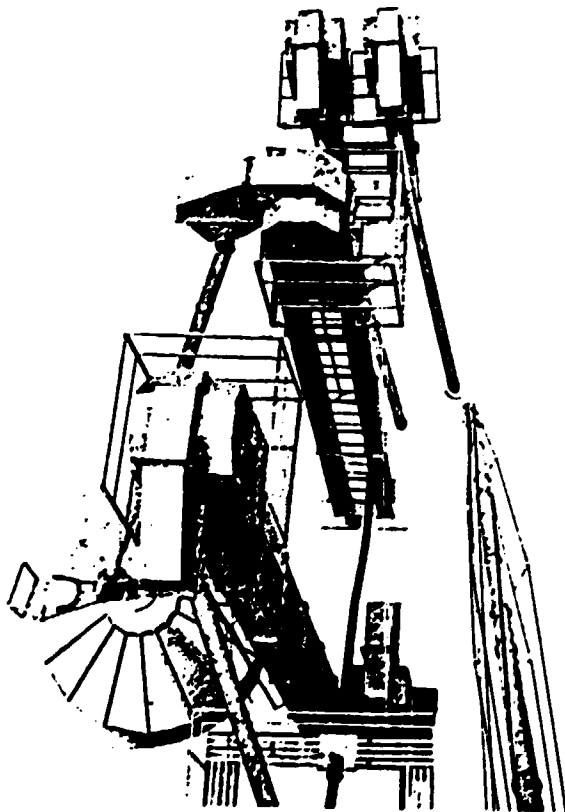
PRINCIPAL TYPES OF EQUIPMENT USED IN RURAL TRANSPORT



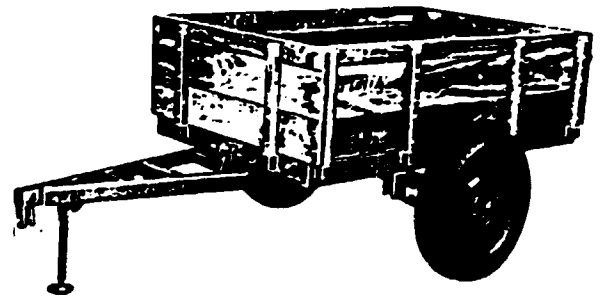
PLATFORM TRUCKS



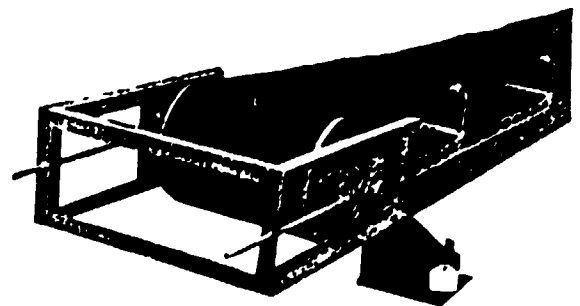
TRAILERS



GRAIN ELEVATORS

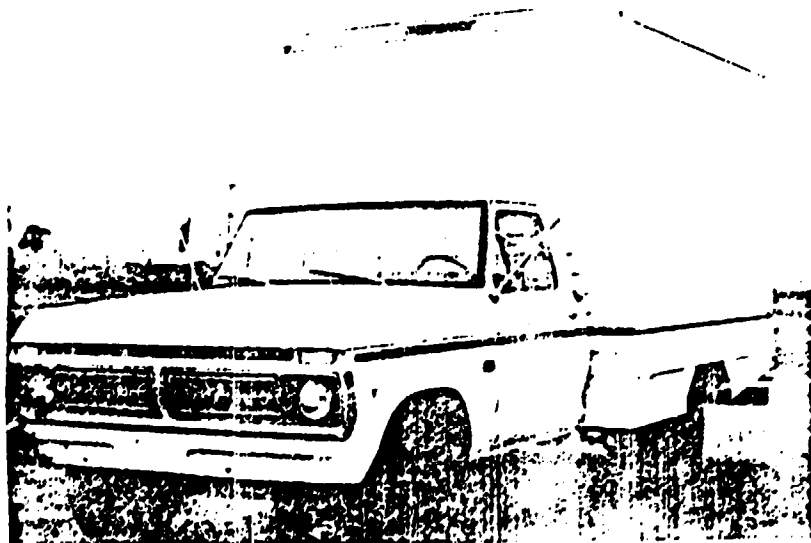
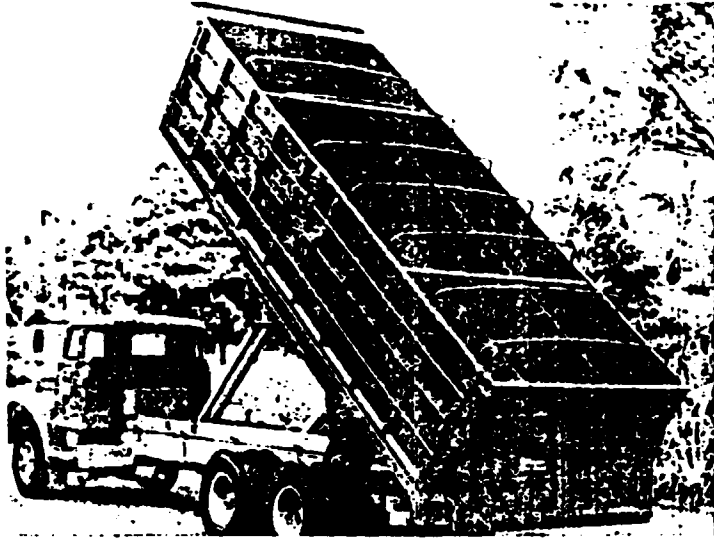


LIGHT TRAILER

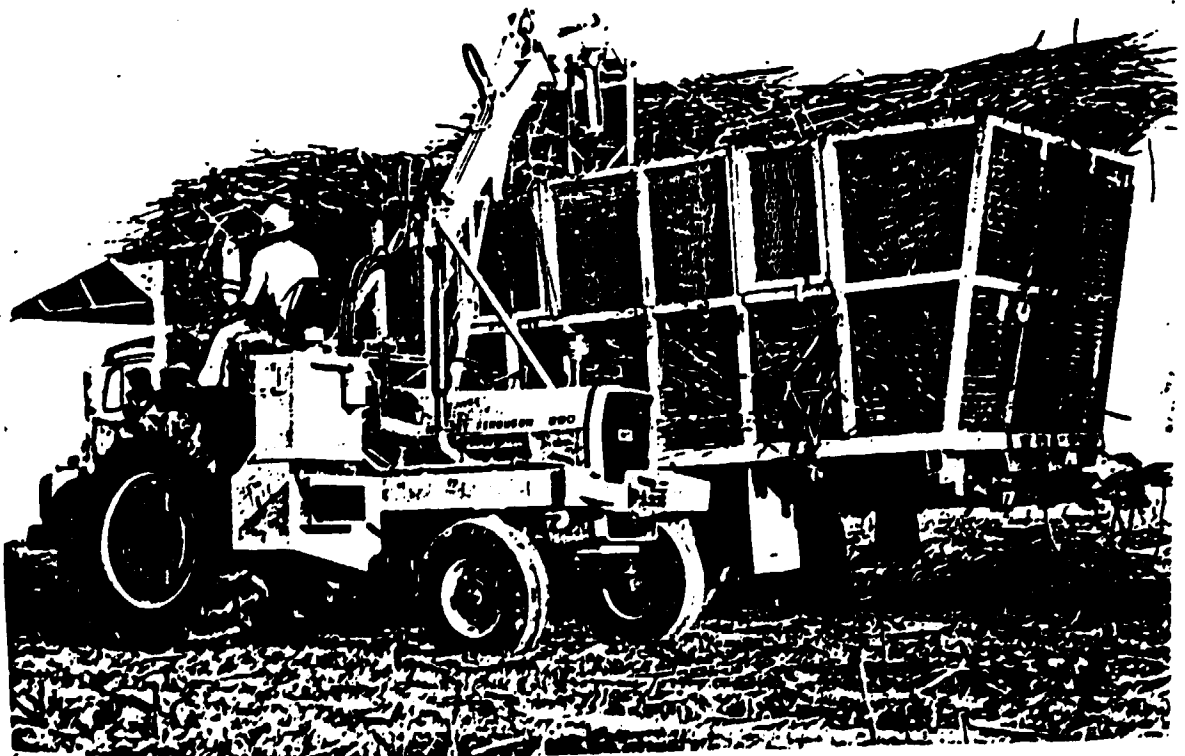
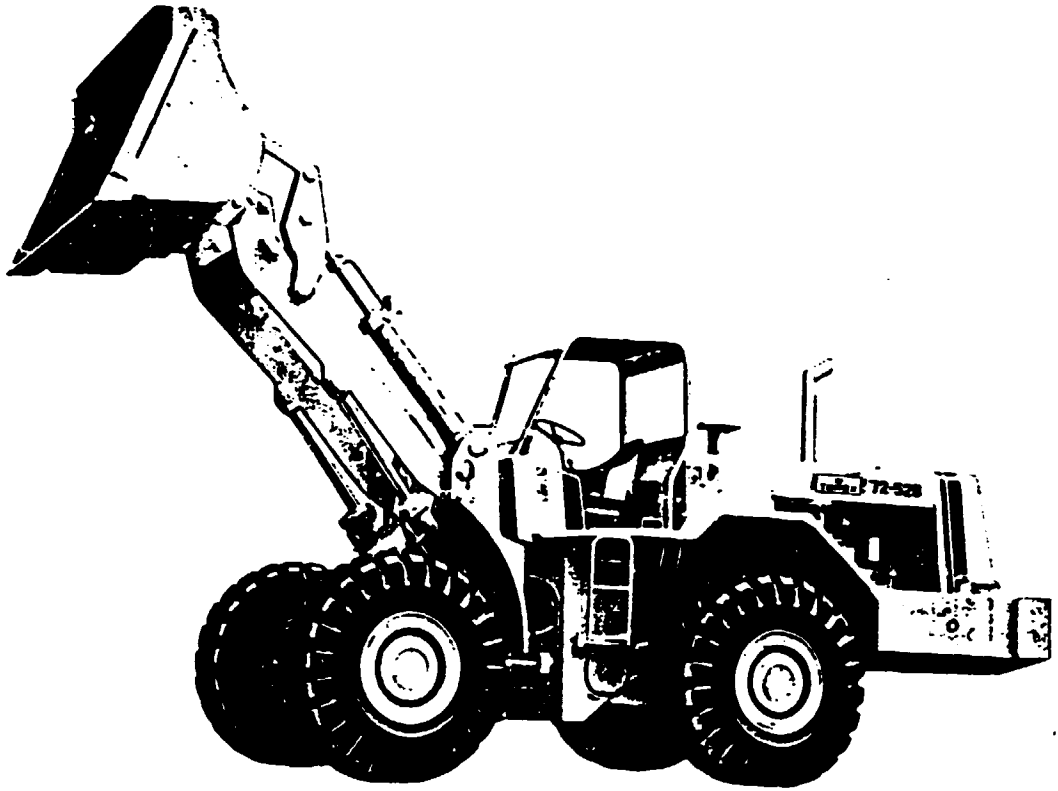


CONVEYOR

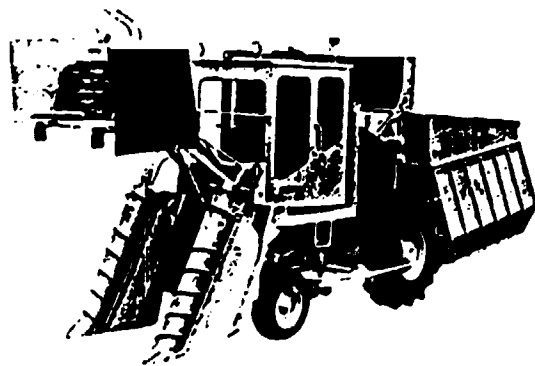
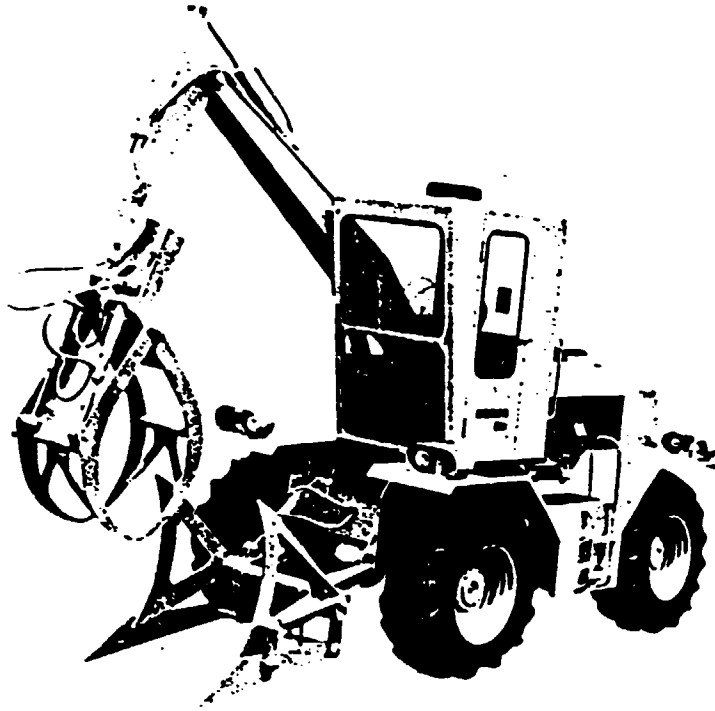
TRUCKS AND VANS



SHOVEL LOADERS



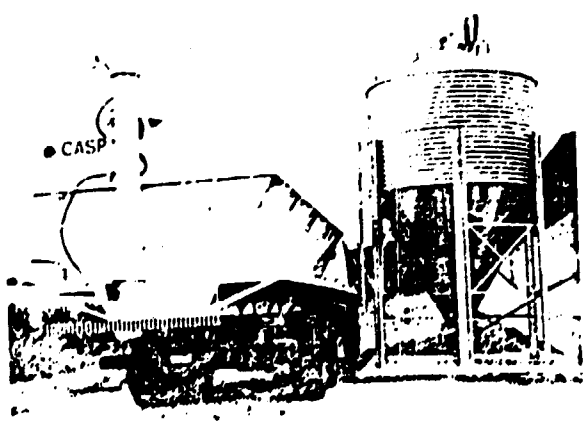
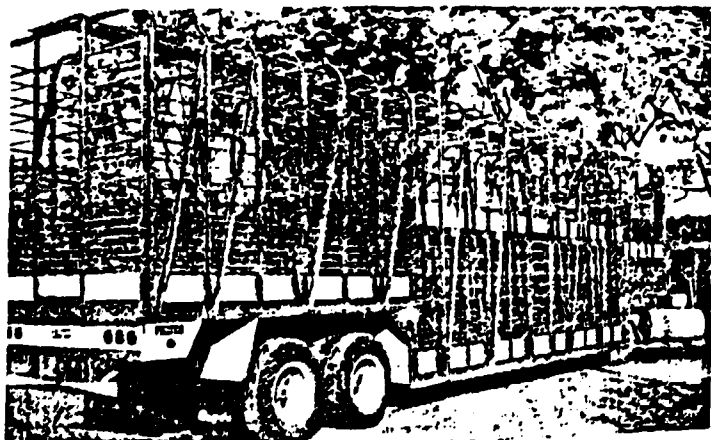
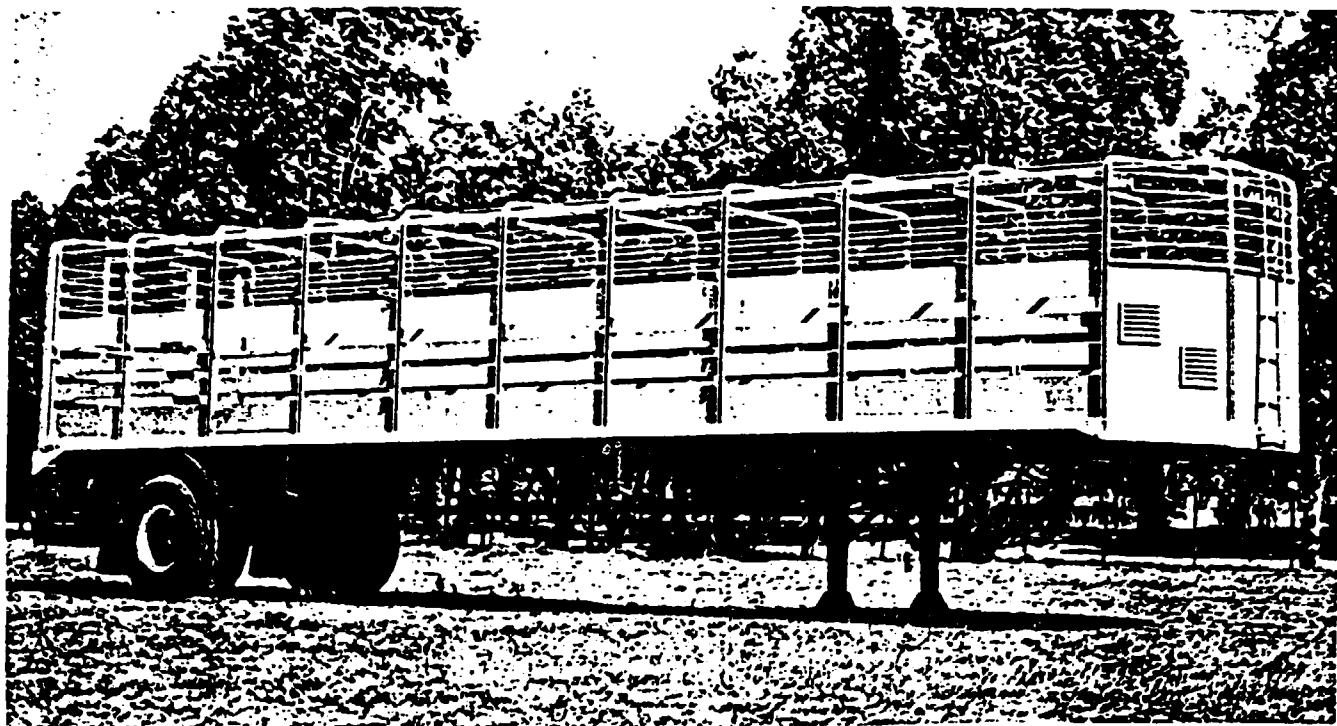
SUGAR-CANE CARRYING EQUIPMENT

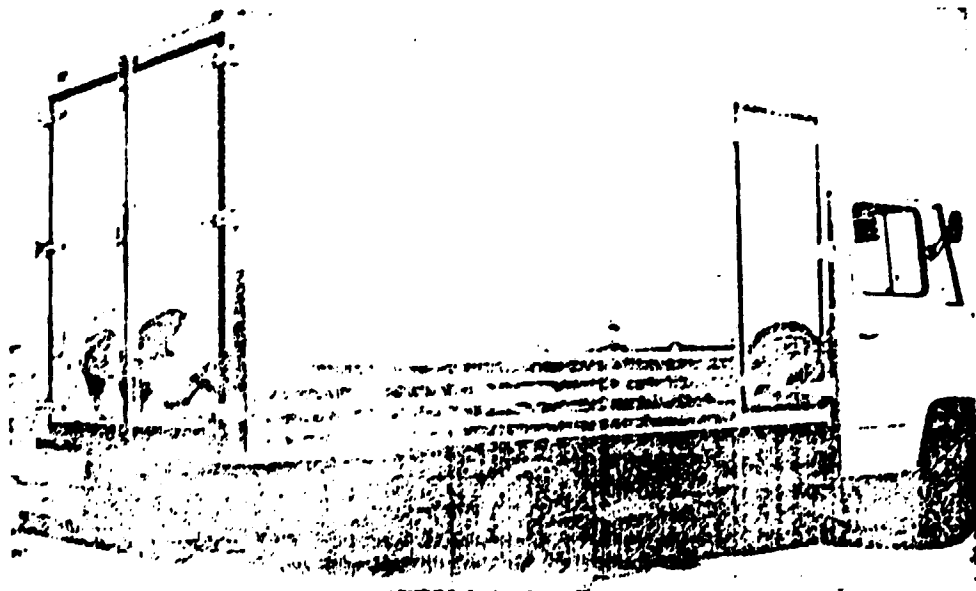
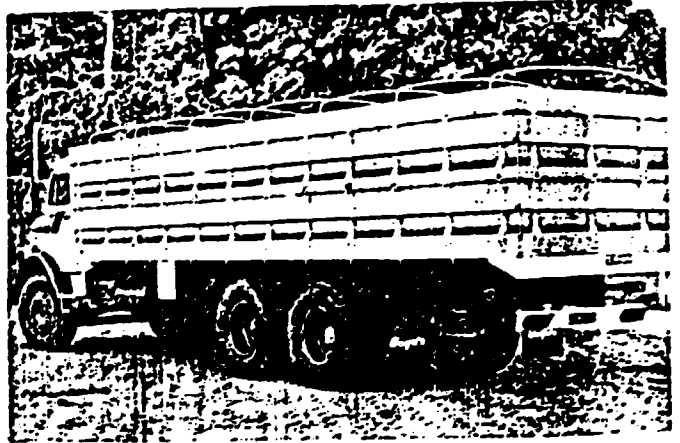
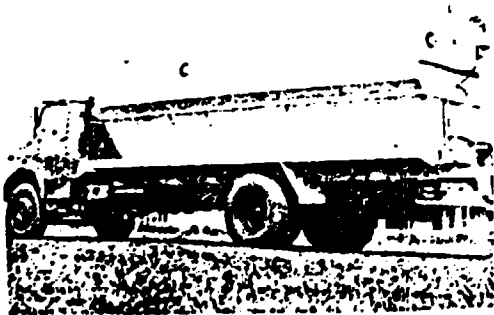
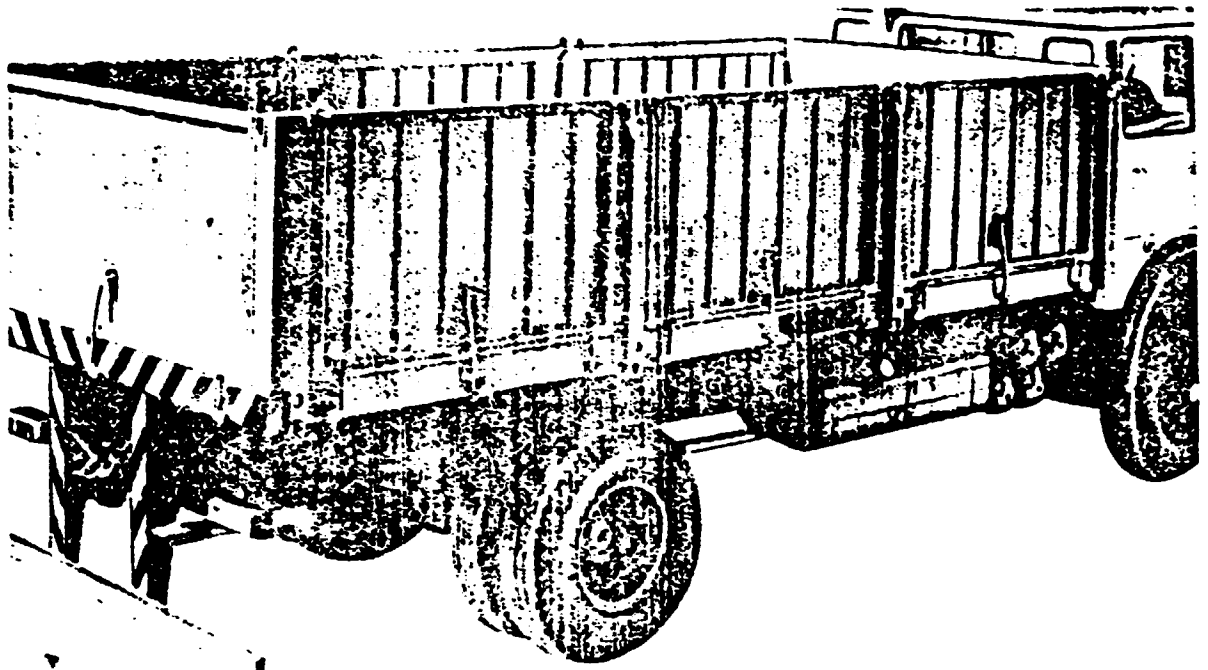


HARVESTER-LOADER

Annex 2

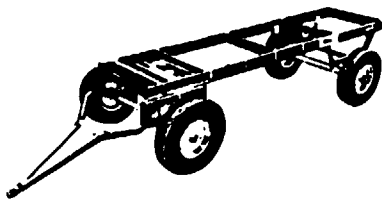
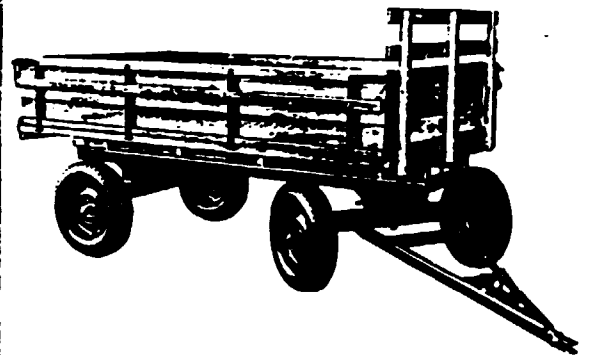
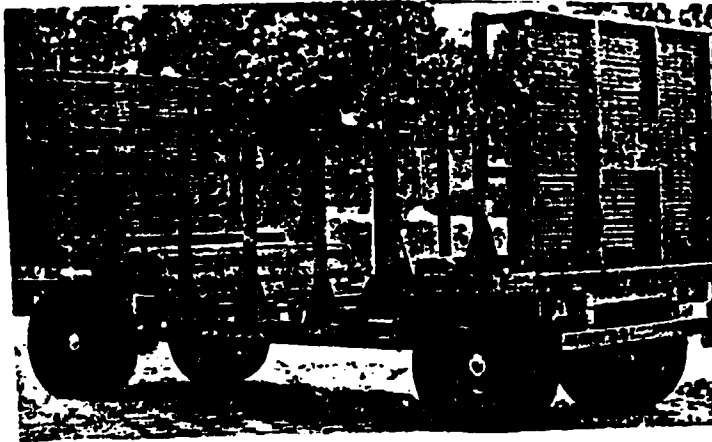
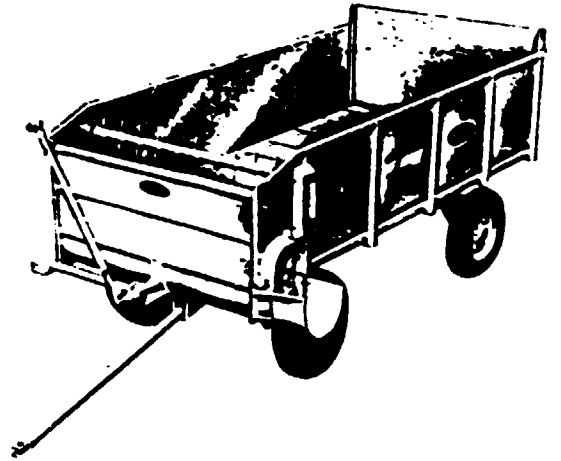
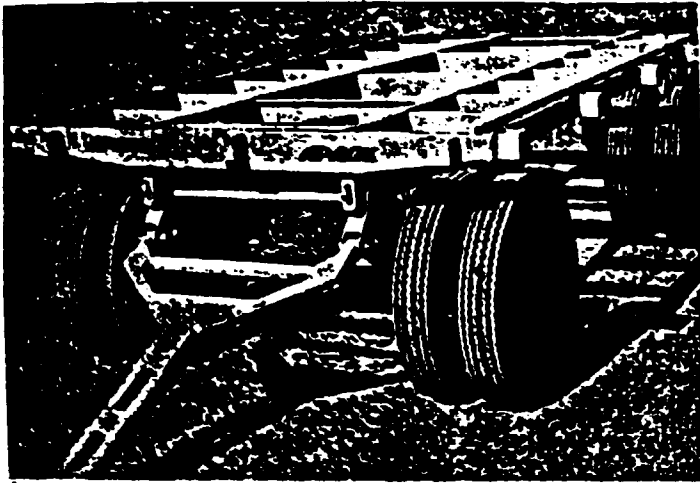
ROAD TRANSPORT EQUIPMENT - VEHICLE BODIES



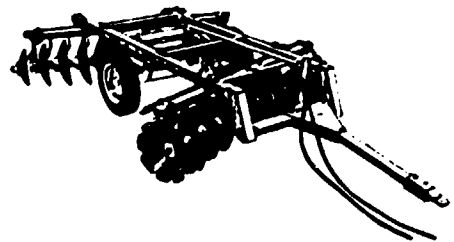


Annex 3

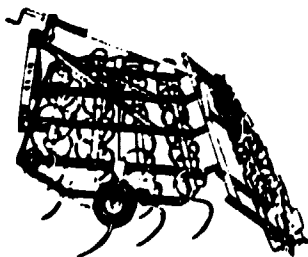
PRINCIPAL MANUFACTURED PRODUCTS FOR RURAL TRANSPORT (RELATED PRODUCTS)



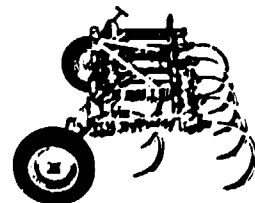
TRAILER CHASSIS



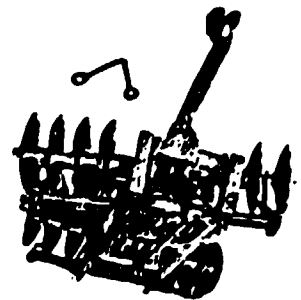
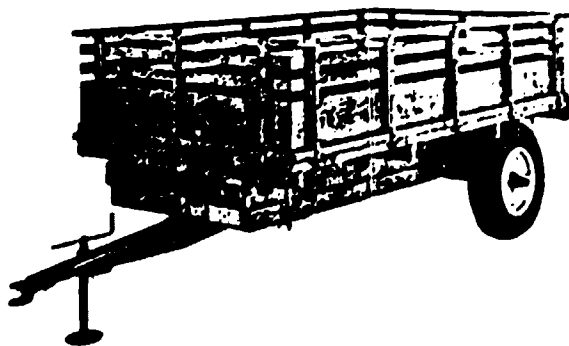
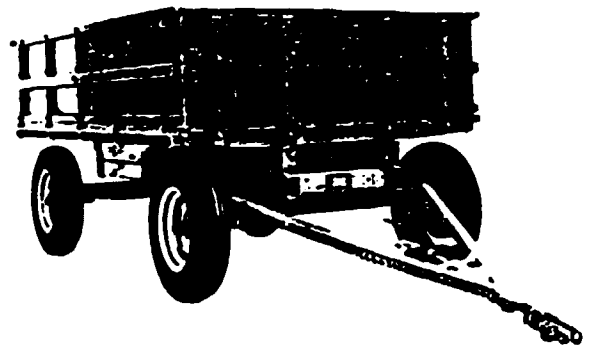
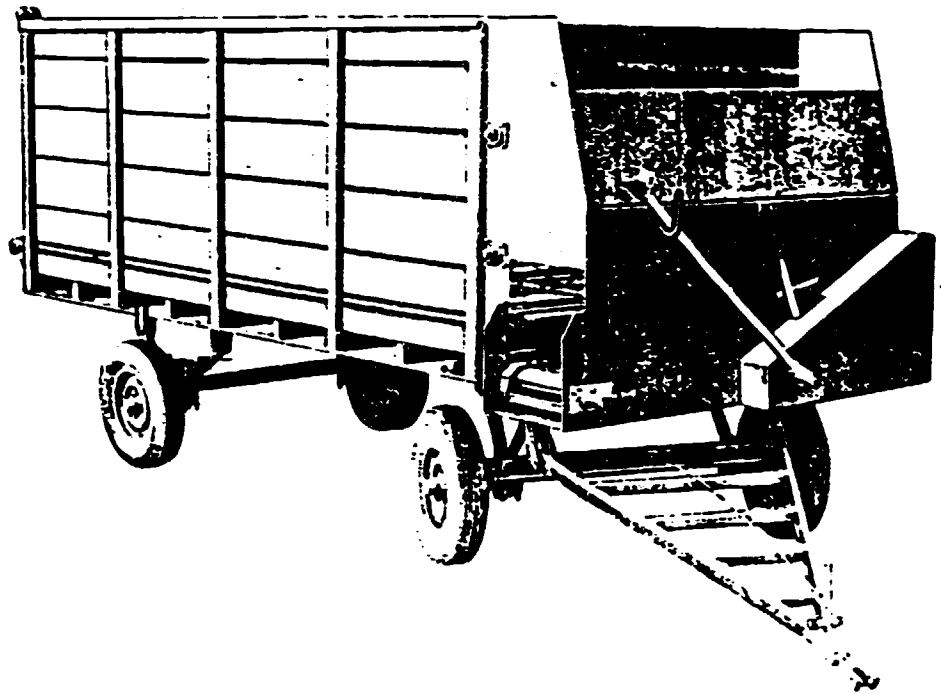
OFFSET HARROWS (18-24 DISCS)



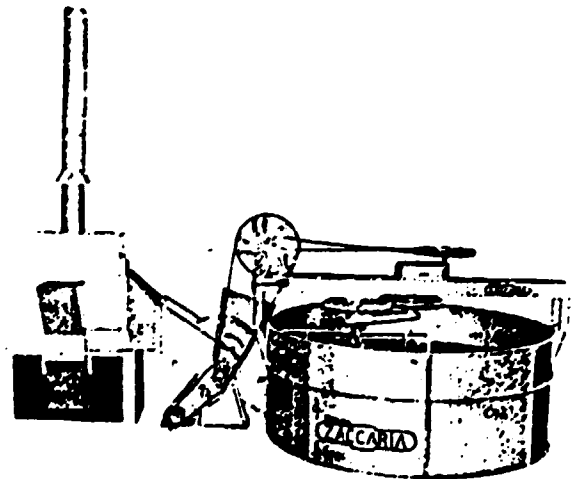
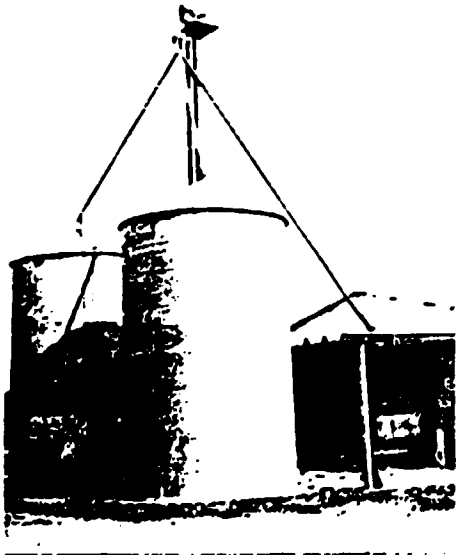
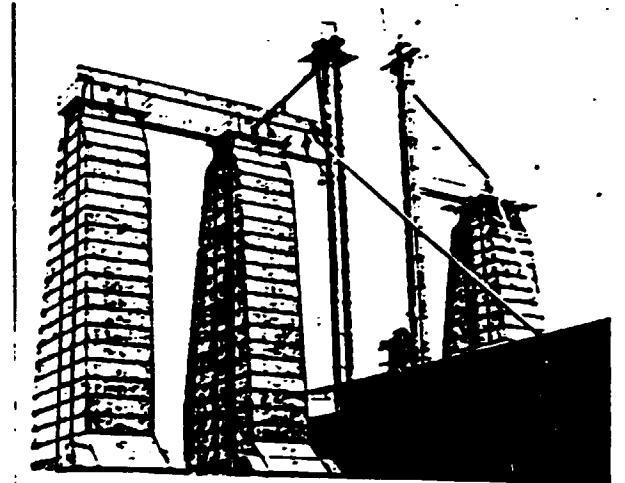
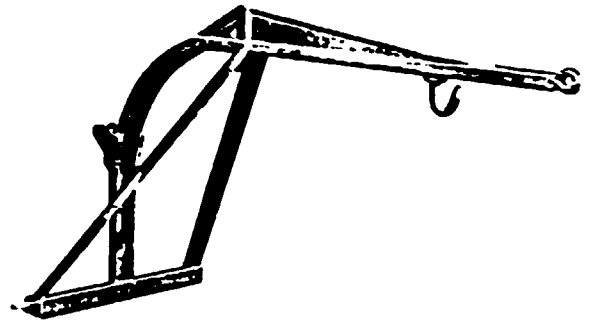
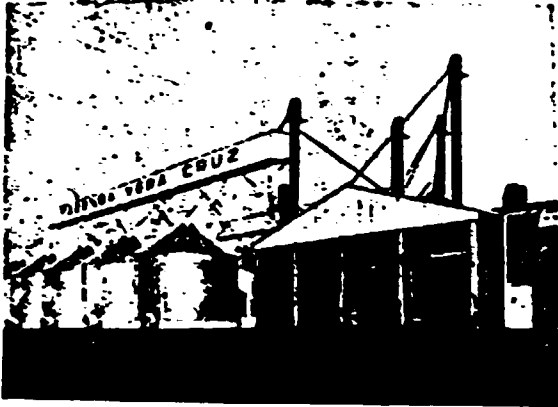
VIBRATING TINE CULTIVATORS



SUBSOIL PLOUGHS (TOOL BAR SYSTEM)



SILOS - GRAIN DRYERS/ELEVATORS



Annex 4

RAILWAY EQUIPMENT

