

Session 1.3: Notes

Role of Transport Services to Support Agriculture

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Learning Objective

The session covers the main issues relating to how rural transport interacts with and affects agriculture. Agricultural marketing is a key driver of the development of agriculture and transport issues cannot be properly discussed without understanding the agricultural marketing context. For this reason an emphasis is placed on marketing. Traditional agricultural marketing is discussed in the first half of the Session. The last section looks at the development of modern supply chain management for marketing high value perishable commodities.

1. Marketing Chains

(Source: TRL, 2001)

An efficient transport system is critically important to efficient agricultural marketing. If transport services are infrequent, of poor quality or expensive then farmers will be at a disadvantage when they attempt to sell their crops. An expensive service will naturally lead to low farm gate prices (the net price the farmer receives from selling his produce). Seasonally impassable roads or slow and infrequent transport services, coupled with poor storage, can lead to losses as certain crops (e.g. milk, fresh vegetables, tea) deteriorate quickly over time. If the journey to market is made over rough roads then other crops (e.g. bananas, mangoes) may also suffer losses from bruising; this will also result in lower prices to the farmer.

Agriculture is best served by consistent high urban, and international, demand. This is best brought about by an efficient, high volume, transport and marketing system where the transporting and marketing unit costs are low. If the margin between what the farmer receives from the sale of his produce and what the urban consumer pays for his produce is high then the effective demand transferred to the farmer will be correspondingly be reduced. Similarly if internal transport costs in a country are particularly high then the scope for agricultural exports will also suffer in comparison with other more efficient countries.

The pattern of agricultural marketing is strongly influenced by the nature of transport services. Many developing countries suffer from monopolistic, low volume and high cost transport and marketing systems. Economies of scale are present in both transport and marketing operations.

The importance of an efficient and competitive marketing system has been stressed as a complement to rural transport services (RTS) and infrastructure in promoting development. However, the presence of markets in themselves also constitute a means by which the effective demand for transport can be increased. A market acts as a point where goods and people are amalgamated together and thereby concentrating the demand for transport. Where populations are dispersed markets are also likely to be dispersed with long average distances to market and people less likely to make the trip. This is an important consideration for the demand for IMT's where, if distances become too large, an IMT may not be viable.

In addition, one of the most effective ways that farmers have of getting the best price for their produce is for them to sell it themselves directly to final consumers at rural or urban markets, and thus bypass the normal marketing system. Although farmers do not have the economies of scale of travelling wholesalers it is often recognised by urban dwellers that the keenest prices are often provided by the farmers. Farmers bringing their own produce to market represent a very important way of limiting the power of the

marketing cartels. However there is usually little support by the authorities for this type of 'unofficial' trading and farmers are frequently harassed as they attempt to sell. As far as possible facilities should be provided at urban markets, at minimum cost, so that farmers can sell their own produce without being disadvantaged or harassed in the process.

Whether farmers rely on travelling wholesalers, traders, parastatals or large private marketing companies they all reduce the farmers bargaining power, and critically, it reduces demand for transport services and the supply of vehicles available for rural people.

2. Access to Credit

(Source: TRL, 2002)

Credit availability is also an issue at the community and farm level. IMTs (bicycles, tractors, animal carts, etc.), which would contribute to improved local access, mobility and farm support, require investment on a scale which is beyond the reach of most. Small credit facilities are becoming increasingly available, particularly under the auspices of NGOs, though have not yet been directed at transport on a wide scale.

Credit for transport operators

Some of the risk to commercial banks on loans to the rural transport sector could be shared by government through loan guarantees or insurance. Associations of operators provides another mechanism for guaranteeing loan repayments Even so, commercial interest rates might still be a deterrent to borrowing from the commercial banks.

Associations can also pool funds in order to source investment; this has the advantage that repayment is very much the subject of peer pressure. However, the scale of funds is unlikely to be large. In exceptional circumstances, and where the association is a major undertaking, funds may be available through government channels (e.g. bilateral aid and supplier credits). The problem for the rural sector is that this investment is unlikely to be directed its way; the only benefit may be a trickle-down effect of old discarded vehicle stock to rural areas.

Financial instruments for facilitating vehicle purchase (hire purchase, rental schemes) are not well developed, and in any case suffer the same risk analysis as bank loans. These mechanisms should become more acceptable in future, but may require new legislation to underpin the transactions involved and to resolve any conflicts with current traffic law (on for example, the issue of who constitutes the owner of a vehicle subject to a hire purchase agreement).

Although operators often complain about lack of credit to purchase vehicles the evidence suggests that the problem of access to credit is not as great as is sometimes perceived. There is often an over-supply of vehicles in urban areas at the same time that there is a shortage in rural areas. This suggests that the emphasis should be on providing the necessary incentives to encourage these operators in rural areas.

Credit for local communities and farmers

Although the cost of acquisition of IMTs is relatively small, it is still a major barrier to ownership at the local level. Small scale credit schemes are finding increasing favour as a mechanism for supporting local entrepreneurs, and use of these funds for purchase of IMTs might be considered an appropriate investment.

The idea of credit is a relatively new concept to rural communities, and any scheme must include an educational component which explains the nature of loans and their repayment, as well as how an application is made and evaluated. Schemes will evidently be looking for value added, and hence the means for repayment. The concept of collateral and/or guarantors will need explaining; the loan may best be made to a group rather than an individual, on the basis that collective responsibility for repayment is a more assured way of meeting the obligation.

Small scale credit facilities are being promoted by commercial banks and NGOs. Interest may be charged at commercial rates or higher, because of the additional administration involved. Even so, these rates are likely to be less than those charged by private money-lenders, and are also likely to be more fairly and compassionately administered.

3. Transport Costs

(Source: TRL, 2001)

It is generally recognised that transport operating costs, are higher on rough roads than on good quality bitumen roads and generally this will be reflected in passenger fares and freight tariffs. For example in Zambia the route from Chipata to Mpetamai (24 km) is on good quality gravel road and costs Kwacha 62.5 per passenger kilometre; while the route from Chipata to Mwanga (74km) is on poor quality earth road and costs twice as much per km. However a wide range of transport costs (measured per passenger/km or tonne/km) have also been found in different countries for similar types of transport operation on similar roads. This indicates that there is substantial scope for improving efficiency of transport operations in many countries.

A comparative study of rural transport carried out in Ghana, Zimbabwe, Thailand, Pakistan and Sri Lanka in 1994-5 has shown that Ghana and Zimbabwe have transport charges that are two to two and half times more

expensive than for Asian countries for comparable journeys of up to 30km. In this case data was collected from a variety of different types of vehicles including tractors, power tillers pickups and trucks (Ellis and Hine, 1998).

In surveys in Tanzania designed to measure the impact of poor road condition it was found that over a 50km distance that an increase in roughness of 50% would increase truck charges by 16% and increase pickup charges by just under double. It was also found that there were large changes in wet and dry season charges on poor quality roads. For example, on one road passenger fares increased by 60% in the wet season and freight charges increased by 65%. Similar figures were also found in Madagascar where on poor quality roads wet season passenger fares on "Taxis-brousses" were 70% higher than dry season fares (Ninnin, 1997).

A similar picture emerges for long distance transport where the evidence suggests that freight transport costs and charges in much of Africa are also consistently higher than comparable costs in Asia. In the period 1986 to 1988 long distance freight transport tariffs in Francophone Africa were over five times higher than tariffs found in Pakistan. Similar levels of freight rates were found for long distance traffic in Zambia, Zimbabwe and neighbouring countries in 1989. Similar low rates to those found in Pakistan were found for long distance traffic in Vietnam and in other Asian countries including India (Rizet and Hine, 1993). More recently it was found that long distance freight rates in Tanzania were on average three times higher than for Indonesia.

However transport charges and costs (per tonne km) by conventional vehicles are not uniform. Not only are there large differences in costs between different countries for the same type of transport (particularly between Africa and Asia), there are large differences between rural short haul transport (usually carried out by pickups or small rigid trucks) and long distance interurban transport that is more often carried out by heavy tractor and semi-trailer. Research carried out in Cameroon, Mali and Côte d'Ivoire has shown that costs of short distance local transport (i.e. up to 10km) are on average six times those of long distance transport (i.e. 50km) (LET, ENSTP and INRETS, 1989). Similarly in Madagascar freight charges on non-national routes were some three times higher than on national routes (Ninnin, 1997).

The proportion of transport charges to final market price will vary with a range of factors such as commodity type, the efficiency of the transport and marketing sectors and travel distance. Studies carried out in Ghana demonstrate this variation. As a proportion of final market price wholesale transport to Kumasi were found to be between 3.5 and 5% for maize, yam and plantain with mean distances of the different crops of between 120km to 200km (Hine, Riverson and Kwakye, 1983). In another study an average of 7 to 8% were found for Koforidua. A more recent study carried out by the Ministry of Transport found that for Accra the proportion was 11% for maize (420km) and 25% for tomatoes (360km).

The impact of total transport costs on agriculture will be higher than these figures indicate because the critical factor is the relationship between transport costs and what the farmer receives for his produce at the farm gate. Both marketing margins and transport costs (including the high cost of head loading produce to the village or roadside) need to be subtracted from the final market price. The results will, of course, vary from country to country and year to year. However, Ahmed and Rustagi (1987) found that African farmers received only between 30-50% of final market prices compared to 70-85% received by Asian farmers with most of the difference going on transport costs.

The effect of reduced transport marketing costs on agricultural productivity can be estimated using agricultural supply price elasticities. These have been shown to lie in the range 0 to 1.5. If it is assumed that transport costs of moving goods to a major urban market are equivalent to say 30% of farm gate prices and that agricultural prices are set at the urban market then, a reduction of total transport costs by 20%, which is totally passed onto the farmer, will induce a rise in farm gate prices by six per cent. If it is also assumed that the total agricultural supply elasticity is +1 then one may estimate that total agricultural output would rise by about 6%.

Road investment has an important part to play in reducing transport costs, however improving short lengths of feeder roads may have little impact if no change in transport mode occurs. It has been calculated that upgrading 5km of feeder road from earth to gravel standard might only increase farmgate prices by about one tenth of one per cent. In comparison bringing new motor vehicle access 5km closer to a village (or farm) when the alternative was headloading by hired labour could increase farmgate prices by over a hundred times as much.

Besides transport costs, other factors that can account for a wide range of prices, these include small volumes, poor price information, commodity perishability, differences in storage and retailing costs and a monopolistic marketing system. For example at the village level travelling wholesalers will travel together to a village may collude and set prices to the farmer before they arrive. Individual farmers will often have little choice as to whom they will trade with. More often than not it will be with one travelling wholesaler with whom the farmer has a long standing relationship, this is often strengthened by a credit agreement. For many farmers, indebtedness will force them to sell at peak harvest time when prices are low.

The price of transport is not the only disincentive to increased agricultural production. There is evidence from all over SSA that crops remain unharvested, or are spoiled once they have been harvested, because of an inadequate supply of vehicles at harvest time. For example, Gviria (1991) presents evidence from Tanzania that in some regions after the 1987/88

harvest that up to 89% of harvest remained stranded with typical figures in the region of 10-40%.

4. Intermediate Means of Transport

(Source: Njenga and Davis, 2003)

Intermediate Means of Transport (IMTs) constitute modes of transport that provide the interface between walking and motorised public transport services. Whilst the majority of trips made internal to the village are undertaken on foot (typically 70% to 80%), such trips prove to be extremely burdensome, not least because of the distances covered, the load carried (typically 25-30kg) and the time taken to porter goods. Some households have access to a non-motorised means of conveyance that tend to be utilised when the movement of produce for marketing becomes unmanageable by human portorage. IMTs include everything from back frames and shoulder poles, to bicycles, wheelbarrows, hand carts and animal carts, which provide a cost effective means of transporting people and goods along village paths and tracks that cannot be negotiated by conventional motorised vehicles (see Table 1.3 for IMT characteristics).

Table 1.3: Characteristics of selected Intermediate Means of Transport

Mode of Transport	Typical Load	Average Speed (km/hr)	Daily Range (km)	Typical Purchase Cost (US\$)
Human	25-30	4-5	15-20	-
Wheelbarrow	90	3-4	5-6	60
Handcart	200	3-4	10-12	50-100
Bicycle*	70	10	50	60
Donkey cart (1 donkey)	300	4-5	20	150-200
Ox cart (2 oxen)	800	3-4	20	250-350
Motorcycle	50	40	150	2000
Tractor	800	10	40	3000

(Source: Dennis, 1998; Ellis, 1996)

Motorised IMTs provide the technology to substantially increase the power and speed at which people and goods can be transported, yet this increase in mobility comes at a cost. Motorcycles and tractors (the most common motorised IMTs) cost upwards of ten times the initial outlay of non-motorised IMTs, not to mention the operating costs of such machinery (including acquisition of spare parts, and fuel). High utilisation rates would be needed to justify the operating costs of IMTs which makes them inappropriate for 'internal' trip-making. More commonly, motorised IMTs (tractors especially) are used by village co-operatives in the mass transit of produce to market during the harvest period. IMTs are sometimes issued to civil service staff

such as bicycles to school teachers, and motorcycles to health and agricultural extension officers, enabling them to access a larger catchment area.

IMTs can have a substantial impact on the productivity of a household as they increase the distance over which produce can be marketed and produce time savings in daily transport tasks, allowing for increased agricultural productivity. However, IMTs are by no means a panacea for village level transport. The initial investment in an IMT is often prohibitive to most households, and in order for the maintenance of the IMT to be affordable there requires a 'critical mass' to guarantee the supply of low cost inputs. This critical mass is achieved in countries of Asia where backward and forward linkages are generated from the volume of demand. However, in Sub-Saharan Africa manufacturers and suppliers are sparse, and since there are no direct financial returns on undertaking subsistence tasks using IMTs, women are often prohibited from their use (aside from the cultural taboo of using select modes such as bicycles). In addition to affordability there are other considerations that dictate the use of IMTs including topography, infrastructure and other climatic and physical conditions. Nonetheless, with the adoption of appropriate policies that advocate education and awareness of appropriate IMT use, with increased production and supply, and the dissemination of affordable IMTs through credit schemes, IMTs will permeate low income communities, allowing them to optimise their production capabilities and income generation to bring them out of poverty.

Headloading can play a considerable role in marketing of agricultural produce. Sieber (1996) observed in Makete that more people used a footpath to travel to a local market than were transported by vehicle on a comparable road. Some villages preferred to transport a large proportion of their products by walking instead of selling it to traders with trucks because the traders would pay them less than they receive at the market. A footpath improvement was found to reduce travel times, increase transport loads and diminish accidents. This caused stronger market integration and reduced rural isolation.

However, transport by walking is restricted by weight carried or distance to market if more than half-day walk is involved. IMT can increase the carrying capacity and speed, reducing transport costs. IMT create additional economic opportunities; for example. farmers could grow more or heavier crops (in terms of US\$/ ton). IMT enable farmers to sell their produce when road conditions are bad, motor vehicles rare and, therefore, producer prices are high. In Kenya, farmers report that they pass roads in the rainy season with their ox carts, where trucks are stuck in the mud.

IMT enable farmers to reach distant markets. Three-to-four hours of walking (one way 10 - 15km) is often regarded as the threshold for access to markets. A pack animal can extend the distance to 20km in hilly areas, a bicycle to 30km in flat terrain and a single-axle tractor with trailer covers up

to 50km. Thus, IMT make new markets accessible where producer prices might be higher; new products might be demanded, or inputs might be cheaper.

5. Logistics and Food Transport

(Source: Sieber, 2011)

Poverty in developing countries is predominantly rural and its alleviation can be best achieved through agricultural growth. Thus, the improvement of agricultural marketing is the key to rural poverty alleviation. This requires not only well maintained roads and good transport services, but also logistical chains, telecommunications facilities and intermediate means of transport. With an integrated planning approach, appropriate structures may be created that improve market access for smallholder farmers and thus alleviate rural poverty.

Agricultural markets in developing countries have a dualistic structure – with a 'traditional' sector focusing on food staples and traditional export products; and modern markets for high value foods, such as fresh fruits and horticultural and dairy produce. While the first sector is dominated by 'traditional' transport activities, modern markets require modern supply and logistic chains.

Inefficient 'traditional' freight transport

Presently, traditional rural freight transport is primarily related to the evacuation of agricultural produce from the fields to domestic and international markets. The first mile is conducted on local paths and tracks, mainly by headloading, which is the most expensive means of transport (Sieber, 1999). Inefficiencies currently dominate rural transport operations in many developing countries, especially in Sub-Saharan Africa: Bad roads, low quality and unreliable services, monopolistic transport markets and high charges are the most important problems.

Since bad market access hampers development, rural roads generate strong impacts on agricultural production and marketing, and thus contribute to poverty alleviation. However, roads are not enough due to their rather permissive character, so transport services and modes have to be taken into account as well. Intermediate Means of Transport (IMT) can reduce transport costs significantly, if multimodal transport chains are used. While IMT can efficiently carry small quantities on local infrastructures, trucks operate cost efficiently over longer distances, on good roads and when fully loaded. The multimodal approach uses the comparative advantages of each mode in the transport chain from the field to the market (Sieber, 1998). Thus, the promotion of IMT for multimodal transport is an essential component for the improvement of rural freight transport.

New opportunities through emerging agricultural markets

Flowers from Kenya, cherry tomatoes from Senegal, green beans from Niger, organic cucumbers from China are offered more and more in the supermarkets of industrialised countries. A tremendous growth in world food trade has been observed over the past decade. Exports of horticulture, livestock, fish, cut flowers and organic products now make up 47% of all developing country exports; far more than the 21% for traditional tropical products such as coffee, tea and cotton.

Additionally, in many developing countries, a rapid rise in the number of supermarkets since the 1980s has determined the structure and logistics of agricultural markets. In Latin America, supermarkets are buying 2.5 times more fruits and vegetables from local producers than all the exports of produce from the region to the rest of the World. Future agricultural markets in middle-income countries will be dominated by supermarkets; while in poorer countries they are still in their infancy.

The new markets create diversified opportunities for developing countries, not only to supply high-value produce, but also to carry out value-adding processes such as washing, pre-packing, mixing, labelling and bar coding. Consequently, many new economic activities may be undertaken within developing countries; thus increasing the rural value added dimension. For example, in Bangladesh, when exporting French beans, more value is added through transport, handling and packaging than by the original farming activities. The new paradigm that emerged from such developments on the world market was that, if producers were more closely linked to their markets, they would increase their revenues and improve their livelihoods.

Supply chains and modern transport logistics

The emerging agricultural markets for high value products entail severe impacts on marketing, procurement processes, quality control, warehousing, packaging, logistic chains and transport. For such products, modern supply chains are necessary – covering upstream processes, such as the provision of inputs, as well as downstream transport logistics from the producer to the final consumer. Thus, they call for high-quality transport services that, in turn, require major investments in facilities, transport equipment and management capacity.

In order to satisfy the demand from customers and adhere to quality standards, produce has to undergo a number of processes, such as pre-cooling, pack line operations, ripening, degreening and labelling. A well-equipped and hygienically maintained infrastructural base is a pivotal support element of the chain. The technological level must be appropriate to the needs of the target market and the length and complexity of the chain. For simple chains, such as where the producer is within hours of the market, a simple infrastructural base consisting of packing and well-ventilated transportation facilities is adequate. For longer, more complex chains, packing houses, cooling systems and logistical infrastructure – such as

refrigerated transportation, storage/warehousing and containerisation, supported by appropriate logistical operations – are required.

Pre-cooling prior to shipment is needed to prevent quality loss and wilting. Cooling is not a domain reserved exclusively for the high-tech sector. Appropriate cooling technologies, such as a solar assisted cooling chamber, might provide low-cost solutions in poor areas. The evaporative cooler shown can prolong the life of fresh fruit by two to three weeks.

A new concept for regional and transport planning

How can modern supply chains be implemented in a traditional rural transport market? The answer is through an integrated regional planning approach that encompasses disciplines such as agriculture, logistics, manufacturing, transport and business development. On the regional level, conventional and modern transport chains may be planned using the approach of 'basic access' provided by multimodal transport, embedded in the concept of central locations and combined with modern communication infrastructures.

In this concept, central locations form a hierarchical system of rural development nodes, which is derived from the Master Plan in South Africa. Over the first mile, agricultural produce is transported by IMT, using low-cost tracks and roads. The hubs are used to tranship cargoes onto motorised goods vehicles, from where they travel on well-maintained rural roads. The rural hubs are placed in central locations that function as buying points or local markets and provide communication and agricultural extension services for rural producers. In these rural hubs, facilities for modern supply chains – such as cooling, refrigeration, processing and packaging – may be provided. Superior centres provide additional transport hiring or brokering services. For regional planning, an interdisciplinary approach and the involvement of stakeholders, especially the private sector, is a must.

Multimodal basic access, combined with telecommunications, the development of central locations and modern supply chains, enable poor farmers to leapfrog from rural hubs to new markets and, thereby, escape the poverty trap.

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