Module 4 – Economic and Business Issues

Abstract:

Module 4 looks more closely at the economic issues surrounding IMTs and IMT use. Transport tasks dominated by women such as water and fuel collection or education and health access are often not considered to have sufficient economic benefits to justify IMT investment. However, social benefits as well as other quantifiable and non-quantifiable benefits need to be taken into account such as least-cost analysis and domestic time savings analysis. Since the adoption of IMTs is strongly influence by their cost and their income generation prospects, efforts must be made to keep the costs of IMTs low, by subsidization, reduction of taxes and duties, or the development of low cost manufacture, marketing and distribution systems. Since the low adoption of IMTs is often related to problems of availability and supply, a supply-side intervention such as technical training in IMT production may be appropriate to stimulate demand. However, low purchasing power on the part of women, in particular, may make interventions like credit provision, income-generating schemes, or subsidies more appropriate. IMT promotion programs must understand the perspectives of potential users, both men and women. Some methods for doing this include surveys, focus group and peer-to-peer discussions. This module also stresses that credit and subsidies are a necessary component for stimulating women's adoption of IMTs, in particular. Finally, IMTs need a "critical mass" of users to make ownership socially acceptable and to justify service providers. Women's skill in working in groups and associations should be exploited to increase IMT adoption by women.

- Economic Efficiency

Economic profitability should not be the only factor considered in IMT adoption. This is particularly true with respect to adoption by women. Most IMT projects presently focus on generating income, saving time or increasing the efficiency of a profitable venture. As such the motorized types tend to be used by men, and the non-motorized by women. Also at present most IMTs are found in towns and by markets where the income-generating potential is high. Profitable rural use of animal-drawn carts has come from greater use of manure and forage, increased production, more timely harvesting, larger circles of trade and income from hiring. Successful IMT introductions associated with transport hire and marketing include 'boda-boda' bicycles in Uganda, donkeys in Makete, Tanzania and ox carts in Zambia. Some technologies have not been adopted despite apparent economic viability. Examples include wheeled toolcarriers, extended bicycles and cycle trailers.
Important transport tasks involving women, such as water and fuel collection, health and education access, etc. are often considered to have insufficient economic benefits to justify IMT investment. However, a social benefit as well as both non-quantifiable and quantifiable benefits approach can and should be used for assessing IMT benefits as they relate to women. Least cost alternatives analysis can also be used, as well as domestic time savings analyses. The following "Boxes" presents a brief summary of projects where transport supply, demand and production were all inter-related.

Box 4
Ox carts in Zambia: increasing transport supply, production and demand

There had been little experience of IMTs in the remote north-western Province of Zambia, when the North-Western Integrated Rural Development Programme (NWIRDP) started operations in the late 1970s. The program, supported by the German

development agency (GTZ), was located 700 km from the developed infrastructure of the Copperbelt. Most (90%) of the rural population depended on smallholder production, with farms of 1-2 ha. During participatory appraisal surveys (including women), farmers identified agricultural marketing as a key constraint to development, and rural transport as the main constraint to marketing. The project therefore established rural depots where farmers could sell maize. It aimed to introduce ox carts, so farmers could transport maize to the depots.

There were few cattle, no existing carts or scrap axles and steel was difficult to obtain. Wood was in plentiful supply, and so the project evaluated 'appropriate technology' carts using wooden wheels and wooden bushes or block bearings. These were not a success. The program then brought in steel axles fitted with roller bearings and pneumatic tyres from the Copperbelt. The cart bodies were locally made of wood in the local market town. Although the axles/wheel combinations accounted for 90% of the cart cost, they proved appropriate. The ox carts proved popular and their adoption, assisted by extension and credit, was quite rapid. Carts were used to carry maize to depots as envisaged, and income from their hire allowed those who had taken loans to repay them.

The program had estimated the number of carts it should introduce based on existing maize trade. Once the target was reached, promotional assistance and credit were stopped. The original static planning model had not accounted for how much transport provision would stimulate economic development and growth. This growth, in turn, had stimulated further transport demand. With the transport constraint removed, more maize was grown, providing more work for the ox carts. The carts were also transporting a wide variety of other goods. Farmers growing and marketing fruits and vegetables had previously been limited by the transport constraint of head-loading. With ox carts, this limit was removed and production and sales increased. Some farmers started trading between villages. Carts collected water and fuel wood and sometimes acted as ambulances for the women. The initial theoretical limit was not sufficient to meet the new economic activity in the areas, nor the aspirations of the people. The ox cart program was a great success, and its targets were revised upwards.

Lessons Learned:

- IMT adoption rapidly achieved ?"critical mass", facilitated by extension credit, suitable cart design and the creation of marketing depots to ensure transport income.
- Even in poor, rural communities, good quality IMTs can be profitable, allowing credit repayments
- Planning models should be updated as adoption takes off, as IMTs can stimulate production and economic growth, further increasing demand for transport

References: Müller, 1986; Starkey, Dibbits and Mwenya, 1991; Löffler, 1994.

Box 5
Inappropriate wheelbarrows and profitable donkeys in Makete, Tanzania

The Makete Integrated Rural Transport Project operated for many years in a remote, hilly area of south-west Tanzania. Its first phase (1985-1987) involved transport studies that clearly identified and recorded the scale of village-level rural transport problems. A sample survey of 431 households showed that 90% of all journeys and 95% of total weight transported took place within and around the village. Women transported 85% of the overall load carried, men 11% and children 4%. Very few motor vehicles or IMTs were used in the area. Roads were very circuitous in the hilly terrain. Head-loading was the main transport technology. Small paths were very important and much shorter than the roads.

During Phases 2 and 3 (1988-1991 and 1991-1993) development interventions concentrated on improving and maintaining roads and paths and introducing some IMTs. Given the terrain and infrastructure, emphasis was placed on IMTs suitable for use on narrow paths, notably wheelbarrows and pack donkeys. No wheelbarrows were recorded during an initial household survey in Makete, and the only donkeys in the area were in the very north of the District.

The project aimed to establish the local capacity to produce wooden wheelbarrows. However, the people of Makete thought these wheelbarrows were heavy, awkward and expensive, difficult to use on steep paths, where their effective payloads were not much greater than normal head-loads. Some men used wheelbarrows for construction work but they were considered unsuitable for use by women, particularly on the steep paths of the area. Women also noted that both hands were needed at all times to push a wheelbarrow, a disadvantage when carrying or walking with children. Women expressed no interest in using wheelbarrows. The wheelbarrows were never widely adopted.

In another IMT intervention, the project aimed to develop the use of donkeys and to introduce new panniers. At the start of project, few people in Makete District gave serious consideration to donkey technology however as the project progressed, acceptance (mainly men) appeared high, although the numbers of actual adopters grew only slowly. Donkeys increased from about 100-150 in 1988 to 250-500 in 1998 (estimates varied considerably!). Pack donkeys were found particularly useful for the transport of potatoes from field to village and from village to market. Women and men (but mainly men), who previously transported headloads of 20-30 kg, could now transport 80 kg with a single donkey. The theoretical benefit-cost ratio of donkey investment (7.5:1) was one of the highest of the

project with donkey-owning households found to have higher levels of agricultural inputs and outputs, higher incomes and more wealth indicators than other households. Despite their apparent popularity, the rate of donkey adoption was low, constrained by the limited supply. The project was not able to develop sustainable supply systems, by breeding or outside purchases. It was also unable to develop sustainable animal health services. By the end of the project, although donkey use was slowly increasing, its level was still below the 'critical mass' needed to stimulate local support services and make adoption easy.

Lessons Learned:

- This was a big research endeavour, which spanned over a decade, where the transport problems of both men and women are well-known and articulated – but little has changed.
- One project "solution" – that of wooden wheelbarrows – failed because they were expensive , heavy and awkward
- Acceptance of pack donkeys by both men and women appeared high but were associated with profitability
- The rate of adoption of the more successful IMTs (pack donkeys) appeared to be constrained by limited "supply and maintenance" services (local donkey breeding/trading and animal health services).

References: Howe and Zille, 1988; Howe, 1989; Jennings 1992. Sieber, 1996; Relf and Mkwizu, 1998.

Box 6
Extended bicycles in Sri Lanka: not worth the extra money?

When the members of the IT Sri Lanka team began to promote bicycle trailers, they became aware of how much the ordinary bicycle was used for load carrying. A cycle trailer, with a safe load of up to 200 kg, could carry more than was practical with a normal bicycle, but its cost was similar to that of a second bicycle. It seemed that there might be benefits from increasing the load-bearing capacity of the normal bicycle. This would allow greater loads to be carried, but without the expense and complexity of a cycle trailer. The extended bicycle was developed as a reversible modification of a 'normal' bicycle. The extension produced a larger frame that allowed a larger 'carrier' to be fitted behind the saddle. This could carry a safe load of up to 100 kg. The cost was about 25% more than a normal bicycle, whereas the cycle trailer was almost 100% more.

It was initially anticipated that sales could be high, since 'normal' load-carrying bicycles were very common and the additional cost was relatively modest. It was planned to sell 1250 extended

bicycles and 800 bicycle trailers between 1994 and 1997. In fact uptake of the extended bicycles was minimal. Users did not consider the possible benefits justified the costs. Only 32 extended bicycles were sold. IT Sri Lanka continued to promote the extended bicycle, but without much expectation of further success.

Lessons Learned:

- The engineers believed the extended cycle was genuinely better and affordable
- Potential users indicated they would pay a modest amount for a significant improvement
- In reality the users did not perceive the "improvement" was worth the extra cost.

References: IT News, 1994

- Cost and affordability

The adoption of IMTs is strongly influenced by their cost and their potential to provide economic benefits. Their overall affordability and sustainability may depend on income generation prospects. Provided funds or credit are available to allow the process to start, the potential to gain income, rather than actual cost may be the more crucial issue. Thus relatively expensive IMTs may be adopted in peri-urban areas, while there may be little uptake of socially-beneficial low-cost IMTs by disadvantaged people (including women) in rural areas. A large number of people (mainly men) have purchased bicycles, even when their price has been high relative to average incomes. On the other hand, few have felt it justifiable to spend the extra needed to buy a cycle trailer or even an extended bicycle, or purchase a modified bicycle which could be used by both men and women.
One implication for IMT programs is that efforts must be made to keep the costs of IMTs low. Some programs have subsidized IMTs. There have been a significant number of cases, for example, of very high mark-ups on imported IMTs and components. This is a case where the types and rates of taxes and duties should be reviewed and action taken to reduce them. Other options may include support to develop low cost manufacture, marketing and distribution systems with initiatives including bulk purchases of materials/components for resale to small workshops. In addition, IMT programs should endeavor to identify or stimulate income-generating activities for IMT users, both men and women.
The donor community is particularly interested in IMT projects because of their "social" value. They tend to include in project preparation and implementation local and regional NGOs which may be more suitable to execute the project at the grass-roots. Many of these tend also be small-scale and very localized. How this could be revamped and up-scaled to larger proportions, moving from a village approach to a regional approach, is still being addressed, and an appropriate blueprint/framework is still in the making.

- Supply, Distribution and Maintenance Systems

The low adoption of IMTs in Sub-Saharan Africa is related to problems of availability and supply. There are many examples where the creation of improved supplies (of carts, axles, bicycles or donkeys) has stimulated demand and lead to more rapid adoption.
In order to increase availability, it is necessary to identify the limiting factors. These may be components and raw materials (local or imported), manufacturing/assembling facilities and skills, IMT designs, capital availability and/or marketing systems.
In some cases, shortage of supply can be overcome by training artisans or workshops to make the IMTs. However, in many cases, technical training is not enough. Technical training may need to be combined with credit and/or training in marketing, the management of small businesses and the establishment of stocks of raw materials.
In many cases, the problem of supply may be linked to the low purchasing power of the users (women are particularly susceptible). Suppliers will not invest in manufacturing or stocks if they do not believe there is an economic market (as opposed to a felt need). Such situations may be over come through credit provision, income-generating schemes (including labor-intensive road construction) or subsidies. The following "Box" presents some insights into the training of artisans.

Box 7
Training artisans to make IMTs: training may not be enough

Katopola Agricultural Engineering Centre (KAEC) near Chipata in Zambia provided services relating to vocational training and rural structures. During the 1980s, the Sida (Swedish International Development Agency) provided nine years' funding including the services of Swedish personnel. The Vocational Training Section aimed to train male and female school leavers and upgrade rural carpenters, metal workers and blacksmiths. It offered courses on the making of IMTs and farm implements, blacksmithing and rural technology for women. During the final three months of the six-month woodwork course, participants were taught how to make wooden ox carts, push-carts, wheelbarrows and farm implements. In the initial six years, none of the course participants trained went on to manufacture the heavy wooden carts and wheelbarrows they had been trained to make. Most trained carpenters worked on furniture production and house carpentry. KAEC staff were unaware of any rural people actually using the technologies with wooden wheels that had been promoted for several years. However some ox carts with pneumatic tyres were in use. These had been purchased in nearby Malawi.

Lessons Learned:

- The project had no obvious impact on IMT use in the area
- The project had predetermined the IMTs of choice and did not offer true design choices
- The project addressed one perceived element (shortage of trained artisans) but did not assist in other aspects of production or marketing although there was some general promotion of technologies through local services
- The wooden-wheeled technologies did not prove popular
- There was no self-critical or participatory evaluation of progress that may have allowed the project to react to the situation and change direction as necessary

References: Starkey, Dibbits and Mwenya, 1991

- **Promotion**

IMT users are not a homogenous group. They differ according to gender, income, occupation, age and ethnic background, all of which influence their perspectives. Programs involved with IMT promotion need to interact with potential users to understand their perspectives, this includes both men and women as well as youth and elders. Programs introducing cycle trailers for women in Ghana and wheelbarrows for women in Tanzania failed because the projects had insufficient understanding of users' requirements and the IMTs offered were judged unsuitable.
Market research tools such as surveys, focus groups and peer-to-peer discussions can be employed to assist IMT programs to predict the needs and wants of people, and the likelihood of products being bought or used. Pilot programs as well as demo techniques are also useful to promote IMT choice and use, particularly where women are concerned. The following "Box" presents a case study in point.

Box 8
Policy-makers' assertions, farmers' viewpoints and dialogue in Madagascar

A recent RTTP workshop in Antananarivo, Madagascar, was attended by many senior civil servants in the transport sector. The serious problem of rural road maintenance was addressed. It was agreed that the traditional wooden cartwheels with their narrow metal-rims caused damage to rural roads. Several senior policy makers asserted that such carts must be banned to protect the roads and suggested that only modern carts with pneumatic tyres be allowed.

The workshop participants then visited villages and put such ideas to local farmers, transporters and village authorities. The farmers recognised that cartwheels did make ruts and caused damage, but pointed out that ox carts were actually the main users of the rural roads. There was no point in protecting empty roads. As for pneumatic tyres, they were not as suitable as the traditional wheels for use on cart tracks. The traditional wheels were cheaper, easily available in the villages, puncture-free and lasted much longer (ten to twenty years). They had very good brakes, high clearance (necessary on poor roads) and people could easily assist a cart by pushing or pulling on the spokes. The trundling cartwheels also gave the 'right sound', and people could hear them coming.

The cartwheel issue was clearly complex with immediate prohibition not a realistic solution. The great importance of such dialogue with transport users was recognised, where workshop participants indicating that the most valuable and educational aspect had been the field visit discussions with farmers. Many participants added that such visits and dialogue between civil servants and transport users would be important in the future.

Lessons Learned

- Many transport planners still think in terms of roads rather than rural transport needs
- Alternative transport technologies (traditional or modern) generally have both pros and cons. The final choice(s) may involve compromises between competing criteria
- Prohibitions in the interest of roads or traffic may cause problems for resource-poor users
- Dialogue with rural communities and transport users is extremely valuable

Source: Evaluation and field visit reports from RTTP workshop, Antananarivo, Madagascar, May 1999

Many experiences relating to IMT promotion appear paradoxical. People's different perspectives and the value and appropriateness of the technology to them can explain some, but not all of the paradoxes. For example wooden ox carts were promoted in Zambia and Tanzania but were rejected in other areas in favor of more expensive carts using automotive technologies; and while participatory processes were used to introduce cycle trailer manufacture and use in Sri Lanka, adoption has been disappointing. Most IMTs have been promoted by the private sector which means that cost recovery and financial rates of return issues are important and often key to implementation. In as far as women are concerned, since their needs cover a wider spectrum than that of men, including not just economic uses but also social, community and family uses, pure private sector funding is not usually available. This is where public sector intervention is often required, which could involve a public/private partnership. The following "Boxes" illustrate three different results of the participatory process and attempted IMT interventions.

Box 9
Cycle trailers in Sri Lanka: participative processes but disappointing adoption

Sri Lanka has about three million bicycles in use. IT Sri Lanka has been involved in the evaluation and promotion of cycle trailers of the type introduced by IT Transport into India during the 1980s. After almost ten years, only about 400 cycle trailers have been made and no one now seems optimistic about their widespread adoption. This is despite (or possibly because of) a participatory and inclusive methodology involving partner organisations in the disadvantaged rural areas.

1990: First five cycle trailer prototypes introduced to Sri Lanka. IT Sri Lanka studied the technology in relation to the transport needs of the rural poor. Monitoring revealed that trailers addressed the need to carry loads from villages to towns. They encouraged self-employed work among owners/users. A few small-scale workshops were assisted to make cycle trailers with the provision/fabrication of jigs, wheel-benders and training.

1994: Three-year promotion project commences. Initial constraints identified to the widespread use of the cycle trailer were both economic (low incomes, low agricultural production, lack of credit) and socio-cultural (expectations of public transport services and

desire for prestigious products

1995: Project works with and through small partner NGOs responsible for credit provision and promotion. Mid-term review notes lack of encouragement of women users and adds additional project objective of "considering women's need in technology development and dissemination".

1996: Project aware of continued credit problem and need for partner organisations to effectively manage their revolving funds. Further constraining factors identified were: user expectations of 'handouts', low visibility and availability of cycle trailers and lack of quality raw materials in workshops.

1997: Project extended for one year to implement a marketing strategy and to develop the capacity of two partner organisations to take over project functions. Selected bicycle retailers were linked to the small-scale workshops to assist with sales. Quality control guarantee certificates were introduced and an advertising campaign was mounted.

1998: IT Sri Lanka cycle trailer project ended. About 400 cycle trailers had been made since 1990. Most remain inactive or intermittent use in 14 out of 25 districts. Work relating to cycle trailers continued in the context of five small NGOs and 16 small-scale manufacturers. Numbers of cycle trailers in use seem unlikely to change rapidly in the immediate future.

User benefits: Individual owners of cycle trailers have benefited in a variety of ways including income generation (reported by 95% of owners) and increased access to market (55% of owners). Many female cycle trailer owners reported easier access to water and greater use of water in the home as well as major savings in the time required for transport. A few trailers were used for transporting sick people or school children. IT Sri Lanka and the partner organisation are convinced the disadvantaged rural poor families using the cycle trailers gain real social and economic benefits. However, there seems little evidence that these benefits are likely to result in a significant economic demand.

Institutional benefits: The IT Sri Lanka project costs were modest but totalled US$ 2400 per cycle trailer made. IT Sri Lanka gained from the project experience which resulted in valuable institutional links with small NGOs and workshops, a greater understanding of rural transport needs and the stimulation of a national network

Lessons Learned:

- Cycle trailers have brought social and economic benefits to some disadvantaged rural people.
- Organizational problems of small-scale manufacture and credit provision can be solved.
- Cycle trailer uptake is much slower than envisaged and

lacks clear momentum

- It is unclear whether mainstream adoption could be achieved through small-scale workshops (or through large scale manufacture).
- Reasons for relative "failure" (disappointing levels of adoption) of cycle trailer technology have yet to be clearly understood and articulated by the implementing organizations.

References: IT News, 1990; ITDG, 1995; ITSL, 1997, 1998.

Box 10
Animal-drawn carts in Mauritania

For centuries, animals (mainly camels and donkeys) have been used in Mauritania for riding and pack transport. With the settlement of many nomads, and the use of heavy trucks for long-distance trans-Saharan trade, the importance of camel transport has been gradually declining. Pack donkeys remain very important for the transport of water and goods in rural areas. Small numbers of animal-drawn carts, including ox carts, were introduced during the colonial period, but at independence in 1960 there were probably fewer than 1000 carts in use. In recent years, there have been large increases in the numbers of donkey carts and horse carts. In 1996, there were estimated to be over 75,000 donkey carts in use. Most are based on the Senegalese Sismar design, using a metal chassis, flat wooden platform, tapered roller bearings and pneumatic tyres. Some carts have been privately imported from neighbouring Senegal and Mali but many carts are manufactured in small, local workshops, often using components from Senegal. The very rapid increase in the use of donkey and horse carts has been largely the result of entrepreneurial activity, and not government intervention. Donkey carts in Mauritania cost about US$ 180-260, so that some US$ 15 million has been invested in donkey carts in the past 20 years. Most have been purchased for cash, since credit for carts has been minimal. This is a huge investment by urban transporters and rural families, and illustrates the capacity of people to invest in technologies seen to be profitable. The carts have greatly increased the capacity of donkeys to transport water, forage, agricultural produce, building materials, traded goods, people and urban waste. Donkeys (and to a lesser extent horses) now play extremely important roles in the urban and rural economies of Mauritania, and the present trends suggest a further increase in ownership and use.

Lessons Learned:

- Government funding and promotion are not prerequisites for rapid IMT adoption.
- If a technology is perceived to be appropriate/profitable, rapid IMT adoption is possible within 1 generation.

- Entrepreneurs can establish supply systems based largely on informal cross-border trade.

Reference: Starkey, 1996

Box 11
Introducing donkeys for packing and cart transport: successes and failures

Donkeys are increasingly used for transport in Africa. The total African donkey population (now about 14 million) has increased by 60% in the last fifty years. Ethiopia has five million donkeys, the Sahelian countries (Burkina Faso, Mali, Mauritania, Niger, Senegal, The Gambia and Chad) have increased their donkey population from about one million in 1950 to about 2.5 million today, and significant increases in donkey populations have also been reported from Botswana, Lesotho, Namibia and Zimbabwe.

Donkeys are adapted to arid conditions. Their drought resistance has been a major factor in their increasing popularity, particularly in southern Africa. The distribution of donkeys reflects their preference for arid and semi-arid conditions. They are mainly found in areas with less than 800 mm annual rainfall, as far as The Gambia. As environmental conditions changed (decreased rainfall, less bush and lower disease challenge) donkeys were able to thrive in areas that had previously been unsuitable. The 'donkey line' reached and crossed The Gambia and continued southwards into Cassamance and Guinea Bissau, with similar southward movements right across West Africa. There have been similar gradual movements of donkeys in Eastern and Southern Africa, but it is less easy to draw single boundary lines for the donkey populations, due to more complex patterns of rainfall and bush clearance.

The gradual introduction of donkeys into new areas has been due to farmers and traders purchasing donkeys in existing (drier) breeding areas and bringing them into the new areas. Some projects have seen the value of donkeys for transport and have assisted farmers to obtain donkeys. Such projects have often been successful, provided the target area was quite close and had a semi-arid climate (e.g., southern and western Zambia, north-east and south-west Tanzania). Major project failures have occurred when projects have attempted to bring donkeys large distances and into humid conditions (The Gambia to Sierra Leone, Botswana to central Malawi, Zimbabwe to north Zambia, northern Uganda to Rwanda).

Lessons Learned:

- Ecology, climate and diseases can influence the success of

animal-based transport.

- Moving animals long distances into new ecological zones is risky.
- The most successful adoption of donkeys for transport has been at the initiative of farmers and traders (without government intervention and sometimes across national boundaries).

References: Starkey, 1994a; Sieber, 1996; Mwenya and Chisembele, 1999; Starkey and Starkey, 1999

- Credit, Subsidies, Supply and Demand

Some credit lessons are also paradoxical. Credit has stimulated the adoption of animal-drawn carts in Guinea Bissau, Senegal, Tanzania and Zambia. A major factory in Senegal went bankrupt when a national farmer credit system ended. However, carts have been introduced without institutional credit in Ethiopia, Mauritania and Tanzania. Credit and subsidies proved insufficient incentives for the adoption of cycle trailers in Ghana or wheeled toolcarriers in Botswana, The Gambia and Mozambique. Credit can be important, but it is not always essential, at least in the case of IMT adoption by the male community. This is quite the reverse where women are concerned. Similarly subsidies can help launch IMTs, but they are not always necessary. Again, this is incorrect with respect to women. Subsidies and credit are a necessary component for women.
In many areas, the vicious circle of low IMT demand and low supply must be broken. Factors that limit availability may be components and materials (local or imported), production facilities and skills, IMT designs, capital availability and/or marketing systems. Each one may need addressing. In these cases supply and demand may be stimulated by credit targeted at users, traders, manufacturers and/or importers. Credit and subsidies may stimulate adoption but distort choices and markets. Nonetheless credit programs are necessary if women users are to be targeted. The following "Boxes" are illustrative of this point.

Box 12
Credit affecting choice of IMT purchase in Guinea Bissau

The PDR-2 development project in Guinea Bissau attempted to improve rural transport through the promotion of ox carts. Credit was made available to assist ox cart purchase. Although the project initially planned to promote ox carts, project staff noticed that donkey carts from neighbouring Senegal were becoming popular and farmers confirmed this. The project decided to sell donkey carts too. The following information is derived from on-farm survey data and project records.

Type of IMT Ox carts Donkey carts

Carts owned in the project area (estimate) 310 3718

Carts sold by the project for cash 444 2579

Carts sold on credit 389 104

From this data, it is apparent that the number of ox carts in use was less than the number sold. Almost half (47%) of the ox carts were sold on credit but most (96%) of donkey carts were sold for cash. It seems clear that donkey carts were popular and profitable. In contrast, the diffusion of the ox carts was much slower and seems to have been strongly influenced by the availability of credit. While credit may have boosted the sale of ox carts, in the early years it may have distorted choices, encouraging some farmers to buy an ox cart when their true preference may have been a donkey cart.

Lessons Learned:

- credit provision can promote adoption but may distort technology choices.
- if user preferences are monitored and evaluated, alternative technologies may be suggested.
- donkey carts have proved very popular in West Africa.

(Sources: Affani, 1989; Herbel and Camara, 1990; Starkey, 1991a)

Box 13
Large-scale cart production in Senegal affected by credit policies

In 1960, Siscoma established a factory at Pout in Senegal to manufacture carts and agricultural implements. Sales in the 1960s and 1970s were high, boosted by agricultural credit schemes. The sudden termination of credit in 1980 caused sales to plummet making Siscoma bankrupt. With some government support, the Sismar Company was formed in 1981 to take over the factory and diversify. Sismar manufactures commercially a range of carts and implements and has exported carts and equipment to many countries.

Sismar (Siscoma) has sold more than 150,000 carts since 1960. It has also sold axles and components in Senegal and the region. The carts are popular because they are strong but relatively light and easy to pull. The roller bearings and pneumatic tyres are efficient. Due partly to the strength of the CFA Franc (until recently), the carts have been relatively affordable, particularly when credit was available.

The Sismar cart design has been ‘cloned’ many times and workshops in Senegal and other West African countries manufacture similar carts. In the 1950s few carts were used in West Africa. Now there are hundreds of thousands of similar carts. The Sismar carts (and clones) now have a clear ‘critical mass’ of users (assisted by credit). This makes it easy for traders to stock spare

parts (e.g., bearings) and it allows artisans to specialise in repair services. At large numbers of weekly markets in Senegal and neighbouring countries, it is easy to buy cart spares and to obtain repairs.

The supply of good factory-made standard axles with roller bearings has allowed local artisans to make similar carts. The use of factory-made axles ensures wearing parts are of high quality. The local fabrication of bodies keeps distribution costs down and provides rural employment.

The situation in francophone West Africa differs from Nigeria, Ghana and most of Eastern and Southern Africa. In these countries, factory-made axles have not been readily available. Most carts have been made from old car parts (which make carts heavier). In many countries the adoption of such carts has been constrained by the shortage of scrap axles in rural areas and by lack of credit.

Lessons Learned:

- credit provision can assist rapid cart adoption, but its withdrawal can cause problems.
- The rapid growth of carts in West Africa has been associated with a good supply of carts/axles and the widespread availability of spares and repair facilities in local markets.
- The availability of factory-made axles and components allows artisans to combine the comparative advantages of centralised production (of precision parts) and decentralised fabrication/assembly.

References: Havard and Faye, 1988; Sismar, 1999 (personal communication).

There is ample evidence that points to the importance of credit in stimulating IMT adoption. However credit is not always essential, and some credit programs linked to particular technologies have failed. Credit provision may allow users (men and women) to purchase technologies. Just as important can be credit to workshops to fund the cost of manufacturing, and traders/retailers to allow them to stock IMTs and spare parts.
Credit-providing programs may need to make special efforts to ensure women benefit. This may include making information and application systems easily accessible to women, and ensuring credit and repayment conditions are appropriate.

- Critical Mass

It is difficult to buy, use and maintain IMTs when they are rare. People are often unsure as to the their appropriateness if it is a "new" introduction, and the supporting infrastructure for their manufacture, supply and repair may be unavailable. IMTs need a ‘critical mass’ of users to make ownership socially acceptable and to justify the establishment of service providers (sales and

maintenance). This is particularly true where use by women is concerned. A vicious circle can hinder early adoption, with insufficient support services for easy adoption and insufficient users to sustain support services. Promotion is also critical and may involve demonstrations, field days, training, media coverage, advertising, credit and/or subsidies.
With some innovative technologies, it may be sensible to start promotion in conditions favorable for adoption. Rural markets and trading centers may offer a supporting infrastructure and income-generating prospects for men and women users. Once technologies are established, it may be easier to introduce them into outlying villages. In terms of women, women tend to work well in groups, associations, etc, and have the added benefit of innate "socializing" or "grouping" skills. In so far as adoption of IMTs by women is concerned, this skill should be exploited and used as a stepping-stone to wider and more individual use. The following "Boxes" present a case for "critical mass".

Box 14
IMT repairs in Madagascar: importance of critical mass

In the village of Anjanadoria, 70 km from Antananarivo in Madagascar, there are about 800 ox carts in use and most families own a cart. There are very few bicycles. There are two carpenters that make and repair ox carts in the village but no one in the village who repairs bicycles. Bicycles needing repairs are taken by ox cart 15 km to the local market town, where there are artisans who repair cycles. According to local people, one reason why so few people own bicycles is the problem of repairs. No one had started to offer cycle repair services in the village, as there were few bicycles and little demand. People believed that in a few years there would be more bicycles and a bicycle repairer in the village. The number of ox carts would also slowly increase.

Lessons Learned:

- Ownership and maintenance of ox carts was facilitated by the presence of artisans
- The lack of bicycle repair facilities slowed bicycle adoption.
- There were sufficient bicycle owners in the town and surrounding area to provide work for repair services.
- There was not yet a "critical mass" of bicycle users to justify repair services at the village level.

Source: Field visit reports from RTTP workshop, Antananarivo, Madagascar, May 1999

Box 15
Animal-drawn carts in Sierra Leone and Guinea: failure to achieve critical mass

Prior to the 1980s, few, if any, animal-drawn carts were in use in Sierra Leone. The Work Oxen Program imported Sismar carts from Senegal for assessment and demonstration. Some were placed in relatively remote villages in different areas while extension agents monitored their use. There were few bicycles or motorcycles, and

no regular bush taxi services. The metal-framed ox carts had roller bearings and pneumatic tyres. Most developed punctures. Although pumps and repair materials were provided, the repair of the tyres proved frustrating. Project resources were stretched trying to monitor and support innovations in several remote locations. The project and the farmers concluded these carts were not really suitable and the project began to work with puncture-proof 'appropriate technology' cart designs. But these were considered 'heavy' and unpopular. Although some carts continued in use, the cart program was not a success.

During the 1990s, similar attempts to introduce animal-drawn carts took place in Guinea. The strategy was similar. Individual carts were placed in remote villages and their use monitored. Most developed punctures and were abandoned. All farmers agreed they needed transport, but they provided a variety of reasons for not using the cart. Some farmers said they wanted to use the cart, but were worried that their neighbours would think they were being cruel to their oxen if they made them pull a cart. Although some carts continued in use, the cart program was not considered a success.

With the wisdom of hindsight, it appears that both projects failed to consider the importance of critical mass. They did nothing to assist the development of a self-reinforcing group of users and repair services. With many carts around, people should have soon overcome their worries or embarrassment at using the new technology. Furthermore, both projects were concentrating on helping poor, remote villages overcome transport problems. They did not examine which villages had the most favourable conditions for carts. Had they done so, they could have first concentrated getting the novel technology accepted under relatively favourable conditions. With a critical mass established in a propitious village, there would be a local nucleus of adoption available for all to see.

Lessons Learned:

- IMT extension projects should consider achieving a "critical mass" of users and support services.
- It may be better to place several IMTs in one village rather than one in each of several villages.
- When introducing innovative technologies, the preconditions for success should be considered. It may be sensible to begin work (and to learn lessons) in relatively favourable extension sites.

References: Starkey, 1991b; Starkey, 1994b; Starkey, 1997

The concept of critical mass has major implications for IMT promotion program. If a technology is to be viable and quickly adopted, there is a need to establish as soon as possible a 'critical mass' of users. This means sufficient users to make potential adopters comfortable with the idea of using the technology and sufficient users to justify support services (manufacture, sales, repairs).

Strategies designed to achieve a ‘critical mass’ may involve a variety of promotional techniques. There may be demonstrations, field days, training, media coverage, advertising and other forms of publicity. The provision of credit to manufacturers, retailers and/or purchasers may prove particularly effective. Promotion may also include some form of direct or indirect subsidy. Credit for pre-financing production runs and retail stocks may be an effective subsidy. If production credit is provided on a ‘sale or return’ basis, the promoting organization is effectively funding the risk of production or holding stocks. A common form of indirect subsidy involves intensive in-kind support and training from the promoting organization to the manufacturers, retailers and/or purchasers.

The private sector may try to develop a critical mass of users in a variety of ways including pilot marketing. Early promotional attempts may involve advertising, fairs and events, discounted prices, free samples, goods on trial and linking of products with important personalities and events. Consumer reaction is monitored and evaluated in the pilot area, before wider campaigns are initiated. This is particularly useful for women as it is an excellent information tool, allowing them to evaluate best options for their own use without having it foisted upon them.

One big problem with the ‘achieving critical mass’ concept has been the great optimism and lack of self-criticism of IMT programs. The great majority of IMT programs have concluded that the technology being introduced was highly appreciated by the potential users. They therefore would conclude that the next stage was active promotion to achieve critical mass. Many people involved in these technologies have blamed the ‘failure’ not on the technology, but on the lack of effective marketing and promotion. What would have happened if all these technologies had put resources into the rapid achievement of critical mass?

- IMT Safety Issues

IMTs may pose safety problems to owners, road users and animals. Unbalanced or unsafe loads are dangerous when cycles and motorcycles are used for transport. Overloaded carts may cause physical injuries to people and animals. Inadequate brakes and inadequate lights can cause accidents. IMT users are often poor people maximizing income for minimum expenditure. There is often a need for a combination of legislation, enforcement and education. Some authorities have prohibited IMTs, for reasons of traffic management and/or prestige. Some rural road projects have created difficulties for IMTs users. The issue of IMT safety is particularly critical for women users. Projects need to be sensitive to this issue and designed accordingly.