

Hire services by farmers for farmers

FAO Diversification booklet 19



Diversification booklet number 19

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Rural Infrastructure and Agro-Industries Division
Food and Agriculture Organization of the United Nations
Rome 2011

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ISBN 978-92-5-107072-7

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■ Preface	v
■ Acknowledgements	vii
■ Introduction	1
■ Hire services as a smallholder enterprise: common hire services	2
■ Opportunities for improved livelihoods	4
■ Market potential	6
■ Purpose of the booklet	8
■ Benefits of hiring as a livelihood activity	11
■ Hire services at the household level	11
■ Repair and maintenance as an enterprise	14
■ Technical linkages and improved knowledge	18
■ Benefits to farming	21
■ Smallholder empowerment: services	23
■ Gender issues	23
■ Business location: embedded in the farming community	25
■ Financial rewards	26
■ Feasibility of the activity	29
■ Market research	31
■ Appraisal of input supply chain: spare parts	33
■ Appraisal of other support services	33
■ Credit	34
■ Costs and profits	35
■ Evaluation of the business opportunity	40
■ The livelihood activity	43
■ Common hire services	43
■ Production services	43
■ Harvest and post-harvest services	50
■ Marketing services	56

■ Sustainable strategies for the livelihood activity	57
■ Market appraisal	57
■ Marketing strategies	60
■ Organization	61
■ Multiple service products	61
■ Sustainable business enterprise	62
■ Support services	65
■ Access to support services	65
■ Supporting the input supply chain and linkages	66
■ Technology	68
■ Training	69
■ Financial services	70
■ Veterinary services	71
■ Institutional role	72
■ Challenges	73
■ Which hire service?	73
■ Equipment acquisition	73
■ Access to credit	73
■ Repair and maintenance	74
■ Infrastructure	74
■ Sustainability of the enterprise	75
■ Selected further reading	77
■ Sources of further information and support	83

Table of contents

Preface

The purpose of the FAO Diversification booklets is to raise awareness and provide decision support information about opportunities at farm and local community level to increase the incomes of small-scale farmers.

Each booklet focuses on a farm or non-farm enterprise that can be integrated into small farms to increase incomes and enhance livelihoods. The enterprises profiled in the FAO Diversification booklets are suitable for smallholder farmers in terms of resource requirements, additional costs, exposure to risk and complexity. The products or services generated by the enterprises are suitable for meeting demand on a growing, or already strong, local market and are not dependent on an export market.

The main target audience for these booklets are people and organizations that provide advisory, business and technical support services to resource-poor small-scale farmers and local communities in low- and middle-income countries. It is hoped that enough information is given to help these support service providers to consider new income-generating opportunities and how these might enable small-scale farmers to take action. What are the potential benefits? What are farmer requirements and constraints? What are critical ‘success factors’?

The FAO Diversification booklets are also targeted at policy-makers and programme managers in government and non-governmental organizations. What actions might policy-makers take to create enabling environments for small-scale farmers to diversify into new income-generating activities?

The FAO Diversification booklets are not intended to be technical ‘how to do it’ guidelines. Readers will need to seek more information or technical support, so as to provide farmer advisory and support activities relating to the introduction of new income-generating activities. To assist in this respect, each booklet identifies additional sources of information, technical support and website addresses.

A CD has been prepared with a full series of FAO Diversification booklets and FAO technical guides, together with complementary guides on market research, financing, business planning, etc. Copies of the CD are available on request from FAO. FAO Diversification booklets can also be downloaded from the FAO Internet site.

If you find this booklet of value, we would like to hear from you. Tell your colleagues and friends about it. FAO would welcome suggestions about possible changes for enhancing our next edition or regarding relevant topics for other booklets. By sharing your views and ideas with us we can provide better services to you.

Acknowledgements

Gratitude is owed to Josef Kienzle, Agro-Industries Officer, Rural Infrastructure and Agro-Industries Division, (AGS), FAO, who provided for a detailed technical review on the final draft version of this booklet. Special thanks go to Martin Hilmi, Small Enterprise Management and Marketing Consultant (AGS), for providing the chapters on *Feasibility of the activity* and *Sustainable strategies for the livelihood activity* as well as providing reviews to previous drafts of the booklet. Special thanks are also owed to Muhammad Bhatti, Rural Infrastructure Officer (AGS), for his careful and detailed review of a previous draft of this booklet and for his inputs. Thanks go also to John Ashburner, Agricultural Mechanization Specialist Consultant, for his review.

Acknowledgements for the series

Gratitude is owed to Doyle Baker, Senior Technical Officer, Rural Infrastructure and Agro-Industries Division (AGS), FAO, for his vision, encouragement and constant support in the development of the FAO Diversification booklet series. Martin Hilmi managed the development, production and post-production of the series and provided technical support and inputs. Michael Breece undertook the design and layout of the booklets and desktop publishing.

Introduction

Rural people depend heavily upon agriculture either as farmers, casual labourers, workers in agro-based industries, traders in agricultural produce or as hire service providers. One of the principal causes of poverty among smallholder farmers is the lack of farm power (labour saving tools and equipment, animal and mechanized power) and importantly access to it. Farm power embraces all forms of power inputs in agriculture and the commercialization of its

products, ranging from human inputs, animal traction, engine-driven technologies, together with associated tools and implements (FAO, 2005a).

Rural poverty is exacerbated by smallholder farmers not being able to expand and/or intensify their area of cultivation of food and cash crops. Lack of availability and access to farm power by smallholder farmers is a key factor that leads to a decline in production and consequently farm output. Timeliness of farming



FIGURE 1 Farmers in Bolivia preparing land to cultivate potatoes on ancient Inca terraces. They use the same tool (chaquitaclla) as used by their ancestors
(Photo: FAO/22400/ R. Faidutti)

operations can also have a critical effect on crop yields. Delays in planting after the optimal date can amount to yield penalties of up to one percent per day of delay.

■ ***Hire services as a smallholder enterprise: common hire services***

Hire services, be they rental, custom or leasing services, can commonly be found in many countries and concern production, harvest, post-harvest and marketing operations. The most popular hire services encountered are those devoted to:

- Land preparation
- Planting
- Spraying

- Threshing
- Shelling
- Transportation

In rural areas of many developing countries, consumers of hire services are typically smallholder farmers within village communities cultivating less than one hectare of land. Providers of hire services in this context are primarily farmers themselves who have invested in equipment, both for their own use and because they have identified a potential for hiring services to their local markets. In more sophisticated settings with more rigorous demands and better rewards, specialised service providers commonly emerge.



FIGURE 2 Rice threshing by machine in the United Republic of Tanzania
(Photo: FAO/17672/ A. Conti)

Realistically the option that many small-scale farmers have is hiring power services from neighbours or service providers. Hiring the power

service spreads the cost and brings the animal or engine powered operation into the realms of financial possibility for many small-scale farmers.

CASE STUDY 1 Animal traction as a hire service in Eastern and Southern Africa

Animal hire services are commonly found in many communities in Eastern and Southern Africa. Between 30 to 60 percent of farming communities in the region benefit from such hire services, mainly as they can access technology (oxen power). For example in the Sumbawanga district in the United Republic of Tanzania 98 percent of rural households use oxen in ploughing, but oxen are owned by only 30 percent of households. This means that animal hire services have a large market to cater for and at the same time provide benefits to the local community.

It has been proven that using animals for hire services in the realm of traction is more profitable and the payback period of investment is quicker when animals are hired out. Moreover small-scale farmer hire service enterprises have recorded increases in farm incomes of more than 50 percent.

Source: Adapted from Shetto, R. M., Mkomwa, S. & Simalenage, T.E. 1999. Entrepreneurship in animal traction: empowering rural initiatives, ATNESA



FIGURE 3 *Spraying a mango tree against pest and disease attack using a motorized knapsack sprayer*

(Photo: FAO/9528/ F. Mattioli)

BOX 1 Paying for hire services

While 85 percent of the farmed land in Njombe District, United Republic of Tanzania, is ploughed by oxen, only 40 percent of the households own cattle. About half of the non-oxen owning farmers acquire the services by cash payment while the remainder pay in kind by herding the oxen and cattle of the service provider, deferred payment in kind as crops, as an operator for the oxen in the fields of the ox-owner or in other people's fields.

Source: Adapted from Shetto, R. & Owenya, M (Eds). 2007. Conservation agriculture as practised in Tanzania: Three case studies, CIRAD, FAO, ACT, RELMA, World Agroforestry Centre

Smallholder hire service enterprises in many communities have, for a long time, been characterised by barter trade where the service is offered in exchange for a particular service or commodity or sometimes based on returning a particular favour. It is only recently where some business-minded households, especially those with oxen, started attaching monetary value to the service rendered as illustrated in Box 1.

■ ***Opportunities for improved livelihoods***

Hire service enterprises offer many opportunities for smallholder farmers in rural areas to diversify and increase income sources. Small-scale farmers can make their cultivation practices more efficient by using hire services. This can lead to reducing costs and thus increasing income. They can raise the intensity of cropping

patterns and/or expand their area of cultivated land, plant more crops and generate more income and provide for more food security for the farm family. Hire services can reduce the drudgery of associated farm work, especially for power-intensive tasks. This is particularly important in lowland tropical areas where high temperatures and humidity render fieldwork arduous (FAO, 2008). Hire services can reduce the labour time spent on farming operations that can be performed by animals and machines, hence enabling more time for small-scale farmers to carry out additional operations. The use of hire services also improve efficiencies in both harvest and post-harvest operations and reduce crop, food and income loss as well as speed up marketing operations enabling faster cash inflows to the farm business.



FIGURE 4 Shelling maize by using a machine considerably reduces drudgery and time.
(Photo by B. Sims)

CASE STUDY 2 Wheat threshing in Nepal

In the 1990s winter wheat was threshed communally in the Nepalese terai plains region. The machine used was a heavy spike-toothed thresher which was owned by a local large-scale landowner and operated with 7 hp diesel engine (also used on an irrigation pumpset). It was a common sight to see scores of village farmers with their stacks of wheat surrounding the communal threshing area and waiting their turn to thresh their crop. Wider use of the threshers encouraged local manufacture and now it is common to see mobile threshing units travelling to the villages and obviating the need for costly transport to a central threshing area. The numbers of threshers in use have grown from 19 000 in 1991 to over 90 000 in 2010. It is estimated that over 50 percent of these are manufactured in Nepal and, of course they have opened up great potential for local entrepreneurs. In the future it may be that the increasingly popular tractor pto driven 25 hp threshers will be the preferred option as they, too are mobile and have a greater threshing capacity. This will open doors for a new breed of service providers.

Source: Justice, S. & Biggs, S. 2010 Rural and agricultural mechanization in Bangladesh and Nepal: Status, processes and outcomes, In FAO.2012. Farm mechanization for development, FAO (Unpublished)

CASE STUDY 3 Two-wheel tractor transport in Bangladesh

With the advent of a major increase in the import of Chinese two wheel tractors into Bangladesh in the 1990s, the opportunities for offering transport hire services became apparent to rural smallholder farmer entrepreneurs. Local artisans have entered the market and manufacture trailers for the imported tractors. Today more than 40 percent of the tractors are equipped with locally-made transport trailers with capacities of between 1 and 2 tonnes.

The trailers are, of course used on their owners' own farms during the cropping seasons but are an important complementary income earning source when used for transporting a wide range of agricultural and non-agricultural goods in rural and peri-urban areas. The transport of non-agricultural goods is, naturally, an activity not tied to the agricultural calendar and can be undertaken at otherwise slack times.

Source: Justice, S. & Biggs, S. 2010 Rural and agricultural mechanization in Bangladesh and Nepal: Status, processes and outcomes, In FAO.2012. Farm mechanization for development, FAO (Unpublished)

■ **Market potential**

There is a growing market potential for smallholder farmers to offer hire services to other farmers and to the wider community in many countries in the world. In the case of sub-Saharan Africa, 65 percent of farm power still comes from manual labour and is tied to the back-breaking use of the hand-hoe. This is followed by 25 percent provided by draught animal power and only 10 percent by engine power (FAO, 2005a). The trends in Asia and Latin America are quite the reverse where tractor numbers have grown rapidly to replace both manual labour and draught animal power (FAO, 2008). All this indicates that there is market potential for small-

scale farm hire service providers, particularly in Africa.

Commonly farm families tied to manual labour are in such a situation because they find it hard to accumulate the capital required to invest in power sources and farm machinery themselves. This means that they are all potential customers for small-scale farmer entrepreneurs who recognize and exploit such a market opportunity.

The market potential for hire services will naturally depend on, or will vary with, purchasing power which in-turn will depend on crop yield trends, price fluctuations, off-farm income and remittances to farmers from relatives.

CASE STUDY 4 The rental market for farm power in Bangladesh

In the 1970s Bangladesh was amongst the poorest and least mechanized agricultural economies in the world. In 2010 this situation has been completely reversed and the country has one of the most highly mechanized sectors in South Asia – 80 percent of all land preparation is mechanized. The work is mainly performed by 300 000 small 2 wheel tractors. Sixty percent of the agricultural land is irrigated by one million small diesel-powered pumpsets and the wheat and rice is threshed by small, engine-powered, machines.

Land holding areas are small (average less than 2 ha) and there is much inequality. Small scale equipment is generally owned by rural entrepreneurs. They will do their own work (sometimes even hiring in specialist services) and hire out their own machines when that work is completed. Specialist markets have developed for tractors, threshers, pumpsets, crop processing and other services as a result of the now ubiquitous spread of small diesel engines.

Source: Justice, S. & Biggs, S. 2010 Rural and agricultural mechanization in Bangladesh and Nepal: Status, processes and outcomes, In FAO.2012. Farm mechanization for development, FAO (Unpublished)

CASE STUDY 5 Hire services in central and southern Iraq

In southern and central Iraq hire services are commonly provided by the private sector solely by farmers on a neighbour to neighbour basis. Current estimates are that 51 percent of farmers use their own equipment and 49 percent use a contractor for undertaking harvesting and seedbed preparation.

Some issues of the hire services sector are its informality and spare parts acquisition for machinery. Since hire services are based mainly on farmer to farmer transactions they are not recognized or represented by an association. The supply of spare parts, which was once a problem for an aging fleet of Iraqi tractors has partly been resolved by the intervention of the private sector. In the past, the government imported spare parts and distributed them through its warehouse network. However this arrangement has been replaced by an agency system whereby the private sector is involved in the distribution process. Current estimates are that 33 percent of farmers purchase their spare parts requirements through the agency system and 67 percent from the local market.

Source: FAO.2003. Towards sustainable agricultural development in Iraq, by F.K. Bishay, Rome

The market potential for agricultural hire service provision also creates opportunities for support service enterprises. For example, repair and maintenance of implements, the veterinary services

BOX 2 The importance of support services for successful service provision

According to a recent study commissioned by FAO in Kenya hire services in the two districts of Laikipia and Nakuru are offered by public sector, private sector and NGOs. Agricultural Machinery Services (AMS) is the government arm (under the Ministry of Agriculture[MOA]) offering mechanization services with about 20 branches country-wide, including one in each of the two districts. Of the hire businesses interviewed, AMS had been in the industry longest but there had been very little penetration by the service to target smallholder farmers. With wide geographic coverage, limited capacity and understaffing, the ability of AMS to offer timely services to their clientele was found to be close to impossible.

The study established that in addition to the MoA initiative, there were private entrepreneurs who were involved in the hire service provision in specific areas such as harvesting, land preparation, weeding and planting. The study concluded that while there was a huge untapped market potential for hire service provision in rural areas, lack of or insufficient support services, high poverty levels and little awareness are critical constraints.

Source: Adapted from FAO, 2006b. Business management skills of agricultural farm related entrepreneurs. A case study of Laikipia and Nakuru districts, by M. Mbaka, P. Ngeli, & T. Apina, Rome (unpublished)

for draught animals and livestock markets. The proximity of repair and maintenance services and the available skills for equipment operation are important initial considerations. In many circumstances, small-scale farmer entrepreneurs have to travel (often by foot) long distances to access support services as a result of poor infrastructure in rural areas.

The presence of support services and necessary infrastructure are an important catalyst for the establishment and operation of hire service enterprises in the smallholder context.

■ **Purpose of the booklet**

This booklet has the primary purpose of creating awareness about the potential for profitable hire service provision by smallholder farmers to other farmers. It focuses on the most popular hire services found throughout many countries, but also considers hire services which have the potential to become popular.

The experiences described in the booklet are based on situations encountered in Africa, Asia and Latin America and reflect the solid potential of hire services as a viable and

profitable enterprise for small-scale farmers.

Policy-makers need to be aware of this potential and they are the principal target of this booklet. Others will also derive

benefits from the information supplied; key stakeholders will be national extension services, rural development NGOs and even farm machinery manufacturers and suppliers.

Benefits of hiring as a livelihood activity

■ *Hire services at the household level*

At the household level, hire services provide for a number of benefits which include: reduced drudgery, increased income and improved food security. Hire services are commonly provided by human energy, but also, and preferably, by animal or mechanical power. It is the latter two that have most potential to reduce drudgery, even though some muscle powered tools and

implements can have a considerable impact, such as for example the job planter. Overall, animals and machinery at household level can reduce drudgery and hence can possibly save time for those working on the farm. This time saved can be devoted to other farming operations, utilised importantly in marketing or processing of farm produce or simply used as more time spent with the farm family or in other activities.



*FIGURE 5 Animal power is used to reduce drudgery in pressing olives for oil
(Photo: FAO/21786/ R. Messori)*



FIGURE 6 Mechanized equipment being used to harvest and transport maize to safe storage

(Photo: FAO/21065/ R. Faidutti)

Hire services can also be beneficial for increasing food security. Time saved can enable small-scale farmers to grow more crops, raise more livestock for market as well as for home consumption purposes. Crop areas can be expanded and/or intensified as a result of better access to farm power, and hence provide for larger yields. Importantly harvest, post-harvest and processing operations as well as storage operations on farm can be improved and thus increase food availability and avert spoilage.

Hire service equipment can also have multiple functions and so provide more benefits to the farm family. For example a sprayer can be used to spray crops, but also spray storage areas prior to storage operations. This multiple usage of various types of equipment can be very useful and with local knowledge and skills can be adapted to diverse needs. It is common practice, for example, to use two wheel tractors, not only for soil cultivation and transport, but its engine can also be employed for pumping water for crop

irrigation, electricity generation, hammer milling and so forth.

With increased yields and increased time savings, farming becomes more efficient and costs can be reduced. This can signify more income for the farm family. Importantly, efficiency increases even more as tools, equipment and machinery are not left idle for lengthy periods, but are hired out to other farmers in the local area. This means that such equipment is used more efficiently (as costs per unit of output are reduced) and more income is generated, in particular if it derives from an enterprise that is a service and not based on the farm business enterprise alone.

The ability and knowledge required for successful operation of agricultural equipment (especially planters and sprayers) can also be a benefit at household level. This not only places the farming family at the forefront of the community in terms of technology (and more importantly in the appropriate use of it) but gives the farming family a competitive edge in terms of marketing such a service.

A small-scale farmer who has mastered the intricacies of field operational adjustments and calibration of machinery will be

recognized by other small-scale farmers and so such machinery service providers will be preferred over those offering a less skilled service. Consequently they will benefit financially from gaining a larger market share. Moreover with know-how and knowledge in equipment usage the small-scale farmer will be able to offer a superior service which avoids waste and maximizes efficiency of operation. With a larger market share comes the possibility of expanding the business (for example with the purchase of bigger, better and more modern equipment) and offering a higher quality service which can generate more income for the farm families of both the service provider and the recipients.

Know-how and knowledge also offer another benefit that is correlated to hire services and this is a maintenance and repair service. Small-scale farmers who are knowledgeable about certain technologies in a local community can also offer maintenance and repair services to fellow farmers who may have similar or analogous equipment. This will make the household a focal point for others in the community and a 'retail outlet' for such services.



*FIGURE 7 Farm equipment service providers in Kenya learn how to calibrate a direct planter during an FAO training course
(Photo by B. Sims)*

At household level a hire service enterprise provides for more social contacts and the possibility of forming a social network. Such networks may be important in generating future business references and opportunities as well as creating social capital for the farm family, when the need may arise. Such an enterprise may also have a binding effect on the local community. For example machinery, especially motorized machinery, can sometimes be used for infrastructure work, like irrigation canals, road maintenance and construction, etc., that are generally for overall communal benefit.

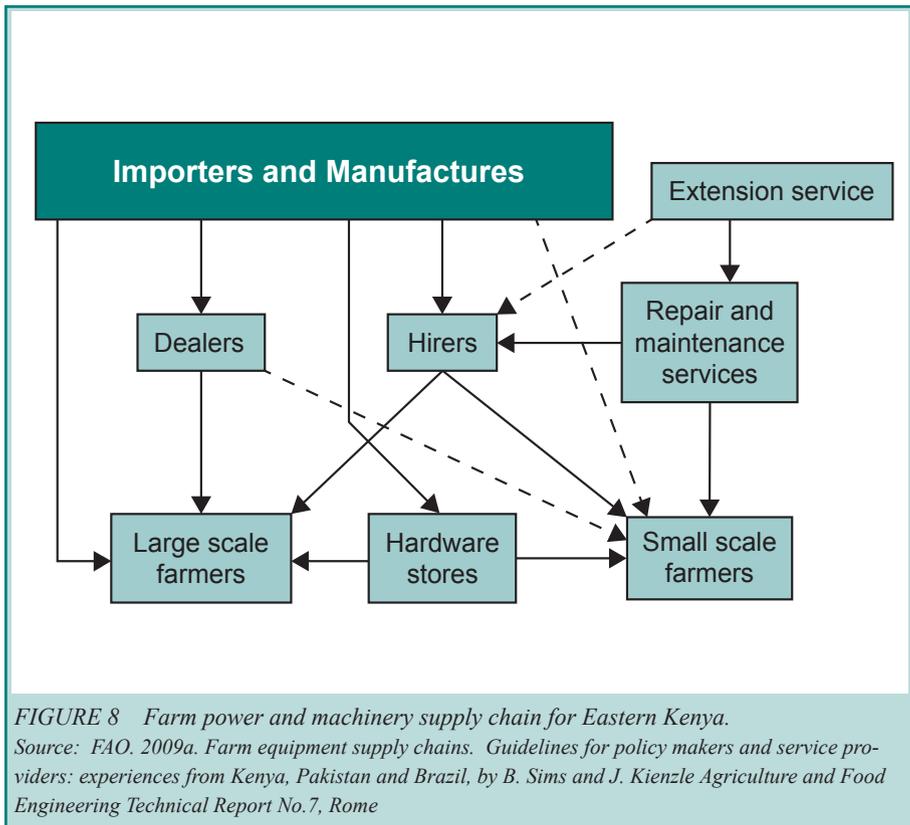
■ ***Repair and maintenance as an enterprise***

Small-scale farm hire service enterprises are commonly part of an input supply chain. This input supply chain is important for the operation of the hire enterprise and its efficiency. In such input supply chains there are multiple stakeholders who include: equipment manufacturers, retailers, importers and, crucially, repair and maintenance service providers (see Figure 8).

While large-scale commercial farmers will usually have fairly sophisticated workshop facilities for repair and maintenance, the same

is not generally true for smaller-scale operators. Thus this creates an opportunity for small-scale farmers with hire service enterprises to also provide repair and maintenance services. This though will depend on the small-scale farmers' ability and knowledge on such matters, but also and importantly if other local repair services are already available. For many simple jobs requiring bending, cutting and welding, the local level artisan (*jua kali* in East Africa) can

provide an effective service. They are close to the farming community and can readily adapt to locally available materials and local demands. In fact they can become important links in the local adaptation of technology to suit local conditions, working in close collaboration with the farming community and responding to their particular, site-specific, needs. This is also very much the same for small-scale farmers who operate a repair and maintenance service.



To establish a repair and maintenance facility requires not only the relevant technical expertise, but also an investment in tools and working space. This needs to be considered by would-be service providers be they small-scale farmers or, more probably, external specialists. However commonly these are unlikely to be attractive investments until there is a critical mass of demand in an area – a point to be noted by development programmes aimed at introducing new technology to rural areas. An example from Starkey (2002) makes the point. Projects to introduce ox-carts into West African countries placed one cart in each of several villages. Punctures proved to be a problem and an obstacle to continued use of the carts. If, on the other hand, several carts had been placed in one village, then there would have been a greater likelihood that the increased need would have been sufficient incentive for an entrepreneur to establish a repair and maintenance service.

However small-scale farmers have an advantage in offering a repair and maintenance service, even if there is no critical mass. And so it is an option which could be seriously considered by progressive farmers looking for additional business opportunities.

Small-scale farmers will be offering such a service as a sideline to their main hire service business and hence will be able to amortise costs better. They can operate either from their farms or be mobile and take the service to the location where it is required (a mobile mechanic for example). They will also have an advantage in terms of knowledge as they will be using most of the equipment they repair and maintain and thus know far more in-depth what is required to repair it, to maintain it and the possible spare parts required over the equipment's life cycle. This can make small-scale farmers more competitive and efficient as well as providing for an extra source of income. Payments can also be made in kind, as often this kind of commercial activity occurs in small-communities. This though is still beneficial to a small-scale farmer as it can provide for the farm family as well as extend social capital and networks.

A repair and maintenance service that is combined with a hire service from the same small-scale farmer will also provide for benefits in terms of marketing such services. Small-scale farmers can offer both services, leaving more options open to fill a market niche which will often depend on the season and time of year. It also enables small-scale farmers to offer a



*FIGURE 9 A simple agricultural machinery repair service offered in a rural area
(Photo by B. Sims)*

full package service, where they can provide both a hire service as well as repair and maintenance service for other equipment that users may have. This approach starts to consolidate the idea of a “one stop shop” and has great potential to enhance competitive advantage.

With such an enterprise in operation, coupled with the main hire service enterprise, even at the smallest scale it will provide for demand and create incentives within the equipment input supply chain as shown in Figure 8 previously. Moreover the availability of such services over time will create greater incentives for

local manufacturers and/or importers of equipment to set up more long term distribution channels as well as more long term relationships with local retailers of input supplies and/or small-scale farmers’ associations.

There are also benefits to the wider local community that such small-scale repair and maintenance services can provide. These could include, for example, repairing local buses for public transport services, hence ensuring that local communities have a functional public transport service. People may come from other communities attracted by repair and maintenance services in the area and

so contribute to the local economy. However, such a service is only likely to be provided by a full-time repair service provider, rather than a part-time, farmer-repairer.

■ ***Technical linkages and improved knowledgae***

The use of equipment by farmers and the training received in its use will enhance their knowledge of the function, operation, maintenance and repair of the equipment being used. This can also be said for livestock that is used in the hire service. These competencies will be beneficial for farmers both for

their hire service and for their repair and maintenance enterprise. It will improve their confidence in their entrepreneurial activities as well as provide motivation to persist with such enterprises. Moreover and as mentioned previously, such knowledge and know-how will make the small-scale hire enterprise more competitive and in demand as users will see the small-scale farmer entrepreneur as being competent in such a field of work. Advice on repairs and regular maintenance intervals may also enhance a farmer's status in the eyes of service users.



*FIGURE 10 A trainee learns how to make a ripper wing
(Photo by B. Sims)*

Experienced farmers, mechanics and paravets will usually not have too much difficulty in acquiring the relevant knowledge, they will seek it out of their own accord. But when innovative technologies (such as conservation agriculture, ripping, subsoiling, rural transport with two wheeled tractors, or new medicines for livestock) are being promoted and are new to a country, region or district, then the public sector and, in some cases NGOs,

will be under pressure to fulfil an important information dissemination role. This will typically be in two main areas: technical expertise in field operation, calibration, adjustment, repair and maintenance of new equipment; provision of new information on preventive measures and new medicines for animal health; and business skills to increase the probability that the entrepreneurial activity being undertaken is a sound and profitable investment.



*FIGURE 11 Equipment and agricultural inputs on display that have been provided by FAO to a training and production centre for women
(Photo: FAO/ 22144)*

CASE STUDY 6 Tanzania: Two entrepreneurs create a business with conservation agriculture equipment

The villages of Ekenywa and Ikiushin in Arumeru district, United Republic of Tanzania, are characterized just before the rains in February by strong winds and alarming amounts of soil being lifted to the skies. Two of the villagers (Simon Kutingala and Godwin Sanare) following an FAO training courses in business skills and conservation agriculture, were inspired to start a hire service provision enterprise in 2008. Initially using draught animal power (DAP) rippers and Fitarelli no-till planters provided by the project, the services offered were ripping and no-till planting. The service has continued to date (2011) and the record of progress of the enterprise can be seen in the Table 1.

TABLE 1 Hire service provision in two villages of Arumeru district, United Republic of Tanzania from 2008 to 2011

Year	Number of farmers served	Acres attended		Price charged per acre ('000Tsh)*	
		Ripping	NT planting	Ripping	NT planting
2008	11	15	4	10	7
2009	19	15	5	15	7
2010	44	46	18	15	7
2011 (to February)	30+ (est)	8.5	5	17	12

Tsh 1500 = USD1.00

Total gross margin from the hiring enterprise in 2008 was Tsh 178 000 (US\$119); in 2009, Tsh 307 000 (US\$205); and in 2010 Tsh 750 000 (US\$500). Not a bad record for a budding industry.

Provision of both types of training (technical and business) can most effectively be provided by a high quality extension service. Unfortunately such services are not universally available and often extension staff must themselves be recipients of relevant training from commercial or international organizations and NGOs. It is highly

appropriate that manufacturers should collaborate in the technical training of users and repairers of their equipment. Unfortunately in many countries this is rarely seen as a profitable activity for many manufacturers, especially at the smaller-scale end of the market. It is, after all, an expensive undertaking; nevertheless it is appropriate for

manufacturers to be closely involved in training trainers in the extension services. In the case of business skills, smaller scale manufacturers often find that they themselves are in need of relevant training. In this case the public sector (possibly with the assistance of international development agencies) will need to fill the void with training on the identification of costs and calculation of profits for existing and would-be service providers.

Understanding the true costs of a service provision enterprise will enable the provider to offer a competitive service at a cost which is sustainable over the long term. Depreciation (or amortization), for example, will have been taken into account and so machines can be replaced at the end of their useful lives. Clearly smallholder farmer recipients of such services will also benefit as they will be receiving a higher quality, more reliable and repeatable service at a fair price which reflects the true costs of the service.

A smallholder farmer venturing into the service provision market place will benefit directly from this kind of technical and business skills knowledge acquisition. Machines will perform better, inputs such as seeds, fertilizers and agro-chemicals

will be correctly and efficiently applied, livestock will be healthier and hence less prone to sickness. The result will be a better job done at a reduced cost (see Case Study 6).

■ *Benefits to farming*

Hire services fit well into small-scale farming systems. They can be based on manual labour, or preferably animal and/or mechanical power and will be adopted by small-scale farmers depending on their farming needs. Capital investment such as for example in farm tools, a sprayer, and draught animals will be tailored to the necessities of the farming system. In this regard the capital that is viable for one type of farming system in a local area may be extendable to others in the same local area. Farming systems will benefit in that many operations will be carried out more precisely, in less time and provide for possibilities of increased yields. Harvest and post-harvest operations will be carried out more efficiently and in less time and will provide for reduced losses in the harvested produce.

Farm power clearly has a great influence on the area of land that can be cropped. With animal drawn rippers or direct planters, the time needed to establish a hectare of crop can be reduced from several days to a few hours. However, thought

will have to be given to the whole production system with weed control options (mechanical and/or herbicide application) being considered at the

outset. Increased harvest, storage and transport options may also need to be considered if production increases are considerable (see Figures 12 and 13).



FIGURE 12 & 13 Farmers and machinery hirers need to plan the whole cropping cycle. Increased production area will probably require increased weed control possibilities and perhaps greater transport facilities

(Photos: Figure 12 by B. Sims; Figure 13 by J. Kienzle)

Access to hire services can also have a big impact on the timeliness of farming operations. Delayed crop planting can have a huge impact on future yields and losses of up to between 1 and 1.5 percent per day of delay are not uncommon (Erenstein *et al.*, 2008). In addition to the yield penalty applicable to delayed planting dates, if farm power is a limiting factor it may not be viable to establish a second crop if conventional soil tillage implements are used. The use of available power in a more efficient way, such as direct drilling wheat after rice in the Indo-Gangetic plains of Asia, for example, can make planting a second crop not only more timely but feasible and viable.

Clearly a farmer-owner can have greater control of the timeliness of farming operations but reliance on hire services may, possibly, lead to late planting if the demand for the services outstrips the supply. However with a well functioning, technically competent, hire service being provided, the options to smallholder farmers are, generally speaking, expanded. With the knowledge that services will be available within an acceptable time window, farmers can plan their cropping seasons and maximise

the use of their assets, especially land and labour. Access to farm machinery hire services means that more potential can be realized (for example greater areas of crops grown or more crops per year) and so farm family livelihoods are likely to improve.

■ *Smallholder empowerment: services*

A smallholder farm family that ventures into the service provision market will, potentially, be greatly empowered (see Case Study 7 on Stanley Muriuki). Farmers offering hire services can expect to gain standing in their communities so long as they offer an effective and fair service. They will gain knowledge as their business flourishes and expands and their views will often be sought on a variety of topics of interest to the local community. Contact with a wide range of community members will put a competent service provider in a position to assume leadership roles and so contribute to community development, as well as that of their own family.

■ *Gender issues*

Typically women carry most of the burden of household work, farm work and taking goods to

market to sell. For example in the homestead women carry out daily transport duties which can involve carrying fuel wood and water to the homestead and goods to and from market. A small-scale hire service can alleviate drudgery for women. Such an enterprise will provide an economic justification for an investment, in a donkey for example, which can be used for transport services. Although the use of hire services for water and fuel wood duties is less likely to be provided to other farms, transport hire services to access markets, especially distant markets, would alleviate a heavy burden for many women. This would not only provide an income from the hire service, but importantly can reinforce social links among women. Moreover such a transport hire service, as an example, could also be more palatable to those in the household who would not normally allow women to leave the homestead. There would be an economic justification for it and hence it may be seen as more acceptable.

A hire service could thus reduce the time spent on daily chores and in transporting produce to market. This time could be spent by women

either in expanding the business operations of the hire service, or opening up opportunities to participate more actively and having a greater role and say in the farm business, for example by having more time to devote to planting and tending more crops. Contributing more actively to the farm business would also involve women more in the farming enterprise and make them more active in the economic life of the farm household. It would give them business contacts as well as the possibility of seeking loans and having the ability to take them on in a responsible way. It would allow for more independence, especially in cases of widowhood or abandonment. It would also give them a better social standing within the community.

Gender may also have an impact on the kind of technology available. In some cultures, women do not traditionally use draught oxen and this can severely curtail their access to timely farm power. Of course it may be possible for them to diversify into other types of animal traction, donkeys for example, but a more practical strategy for alleviating the farm power deficit would be to access contract hire services.



FIGURE 14 Women farmers using an electric fan instead of a sieve for winnowing wheat. (Photo: FAO/16983/G. Bizzarri)

It seems that in several regions in the world, female-headed households are becoming an increasingly familiar feature. Women are taking on greater responsibilities as male family members succumb, disproportionately, to a range of pandemics or become economic migrants seeking areas of better earning potential, often in different regions or countries. There is clear potential in these cases for women to take greater control over the economic issues surrounding the family business. This could be manifested by women exploiting

the business opportunities presented by offering local hire services, especially for transport.

■ ***Business location: embedded in the farming community***

Hire services are more likely to be successfully offered by farmers to other farmers if they are living in the same community. One example is given in Case Study 7 where a local lead farmer who is also active in the local church as a preacher has been able to develop a successful local machinery contracting service. This is so even though he concentrates

on conservation agriculture services which are not yet as popular as ploughing services. However, because he is a trusted and a respected member of the local community he has been able to expand the business through adaptation and painstaking explanations of the financial, environmental and energy saving advantages of conservation agriculture.

A hire service enterprise should be developed in close coordination with other stakeholders to define needs and select the most appropriate solutions. It makes little sense, for instance, for a contractor to be offering ploughing services when the extension service is recommending reduced cultivation to cut energy requirements for agricultural production and to protect the environment. Farmers cannot adopt new practices if the service is not available, so that hire service providers need to liaise with manufacturers and importers to have access to more profitable and more environmentally friendly technologies and then to embed them in the local farming community.

■ *Financial rewards*

A hire service that generates profits will necessarily contribute

to the farm business. It has the potential to increase income, reduce cash flow deficiency during the year and help with paying for extra expenses that may occur, for example medical, educational and emergency costs. Hire services also have the potential of enabling investments in capital assets that in other circumstances may not be possible or viable. They also provide incentives for regular maintenance of equipment or health care for animals, upgrading the technologies used both for the hire service enterprise and as a consequence for the home farm, and generally a more careful and efficient use of equipment and animals. This in turn may improve farm productivity and yields, as well as those of other farmers in the local community area. Overall a profitable hire service has the potential to provide a positive impact on the finances of the farm family. Increased income will quite quickly be converted into improved living conditions, healthier eating, better health care and schooling for the children. Generally the result will be an improved livelihood for the family of the successful small-scale farmer who markets hire services.

CASE STUDY 7 Stanley Muriuki: Community leader and conservation agriculture (CA) service contractor

Stanley lives in Karau village in Laikipia district, Kenya and is a conservation agriculture (CA) service provider who received his first training on CA equipment through an FAO CA project. He is now a private sector machinery service provider for no-till mulch planting, ripping, sub-soiling, chemical weed management and rural transport with animal traction. He is a leader in his community, being a preacher in the local church his views are sought on a variety of subjects, including CA and environmental protection.

He owns four draught oxen and the equipment that he operates includes the following:

- Animal-drawn sprayer
- Animal-drawn no-till planter
- Ripper and subsoiler
- Jab planters
- Animal-drawn cart
- Animal drawn wheat seeder

Stanley recognizes that there are barriers to scaling out CA in his district. He mentions that there is a cultural belief that one 'should be ploughing' and this militates against the concept of direct planting. There is also the problem of availability of CA equipment in the local market. Fortunately this situation is constantly improving as more manufacturers in East Africa are exploiting the growing demand and are manufacturing CA equipment for smallholder farmers.

Despite these challenges, this CA equipment contractor has continuously increased his client base for CA planting and weed management services. In collaboration with his neighbour he started building alternative and modified planting equipment. He is also in demand for CA equipment training and as a farmer instructor develops immediate rapport with farmer trainees.

As a result of increasing demand for his services in the community, he has trained several young people in the operation of his implements and, after successful training, they are offered temporary employment. In this way he is contributing to job creation in his village.

Stanley is a good example of how a farmer contractor can profitably supply a very valuable service to other farmers in his immediate community. This allows him to develop the market further and to extend the range of services on offer.

Feasibility of the activity

Hire enterprises of whatever type and offering whatever services (rental, lease and custom services) have shown in the past that they are a challenging business undertaking. Small-scale farmers can face sometimes daunting constraints in investing in tools, animals, equipment and machinery. Such constraints derive from a multitude of factors: a lack of money to finance investments; difficult access to loans and the correlated risks involved in interest rates and repayment schedules; lack of access to information regarding the most appropriate type of equipment for particular farming systems; the need for a well functioning input supply chain and for other necessary support services to be in place.

Further, some farming systems are not intensive so that markets for hire service enterprises may be limited initially in some areas and demand may grow only once access to such services increases agricultural activities in the area. Moreover, the demand for hire services is time-bound and synchronic (demand arises at the same time) as a result of the seasonality of agriculture. During the high season, agricultural

equipment needs to be operated out of regular 'office hours' and managing workloads and staff can be difficult. Finding enough clients for hire services all year round can also be challenging (Pingali *et al.*, 1987).

These challenges can be considered in business terms for a hire service enterprise if small-scale farmers prior to investing money, time, effort and energy conduct a feasibility study. A feasibility study, with appropriate support from an advisor, can help small-scale farmers in estimating the level of business challenges found in a local area and eventually taking the decision to start or no to start a hire service enterprise. It will provide would-be service entrepreneurs with estimates of:

- What types of hire services may be required in a local area (for example, simple renting, a custom hire that involves a specific amount of work to be done with particular equipment, leasing);
- If there is a market demand for such services which is profitable enough to justify investments in such things as tools, animals and machinery;

- What level of investment is required for the business and the feasibility for manual, or animal or machine powered services or a combination of them;
- What money will be required for investment to start up the business;
- Credit availability in the area;
- Costs and profit margins and;
- If there is a functioning input supply chain in the area that can provide spare parts, veterinary services, and so forth.

In parallel with such a feasibility study, estimates of the viability of offering a repair and maintenance service can also be made. Overall a feasibility study is not difficult to carry out and is not expensive, but it

needs to address the most important aspects of the proposed enterprise.

However such a study can only provide estimates for the feasibility of an enterprise and cannot eliminate business risks that are commonly found in any private economic activity. A feasibility study provides support information to increase knowledge and thus supports small-scale farmers' decision-making processes. Advisors can support small-scale farmers in this process by providing, for example, information about markets, equipment and equipment suppliers. Ultimately though, it must be the small-scale farmer who decides whether or not to start the enterprise based on his or her evaluation of the livelihood activity and the risks involved.

BOX 3 Some questions for consideration for a feasibility study on a hire service enterprise

- Who are potential customers and how many are there in the local area?
- What are the main farming constraints that are faced and would it be possible to solve them by hiring the appropriate service?
- Can the service be effectively and efficiently supplied by small-scale farmer entrepreneurs?
- What are the available time windows for such work in the local area?
- Can complementary services be offered to create a hire service job market more uniformly throughout the year?
- Are there any competitors offering a similar service?
- What do they charge?
- What would the enterprise cost? Can it compete?
- What are the strengths and weaknesses of the enterprise compared with the competition?

■ **Market research**

As a first step in the feasibility study, a small-scale farmer needs to conduct market research. This will allow estimates to be made of what hire services are most in demand in the area (production, post-harvest, marketing), what repair and maintenance services may be required, what is the market size, what possible prices will be paid by potential customers, what can be the utilisation rate of equipment, tools, animals and machinery, and the overall market potential of a hire service. Moreover, estimates can be made to verify if there is market potential in moving equipment across several agro-ecological zones, for example to follow the harvest cycle. Market surveys can also be conducted outside the realm of the agricultural sector. This would be to verify the potential for the hire service enterprises in such aspects as infrastructure (building and maintenance of roads for example), real estate construction and

maintenance, transport services for people and so forth.

For most potential hire businesses it is essential to collect data and information through discussions, interviews and surveys and always on the basis of sound local knowledge. These surveys do not need to be very sophisticated and can provide the knowledge that is required to provide a comprehensive picture of all factors related to marketing matters. Such marketing knowledge is fundamental in terms of making estimates about what services to offer, the types of services to offer (rental, a lease or a custom service), planned utilization rates, where potential customers are and how much they would be willing to pay. As an example Table 2 shows potential markets in Uganda for a tractor-based hire service. It shows the wide range of possible applications and the large market potential that a tractor hire service could have, and not only in the agricultural sector.

TABLE 2 Potential tractor usage in rural areas

SECTOR	POTENTIAL TRACTOR BASED ACTIVITIES
AGRICULTURE	<ul style="list-style-type: none"> • Land preparation • Crop growing operations • Harvesting • Farm infrastructure: roads, earth dams, boreholes and fencing • On farm processing

TABLE 2 Potential tractor usage in rural areas (Cont.)

SECTOR	POTENTIAL TRACTOR BASED ACTIVITIES
FORESTRY	<ul style="list-style-type: none"> • Transplanting and thinning • Logging and extraction • Collection of fuel wood • Forest access and extraction roads
MINING & QUARRYING	<ul style="list-style-type: none"> • Sand and gravel extraction and screening • Crushing stone for building and road making materials, cement. • Clay extraction for ceramic and refractory industry • Salt extraction, solar evaporation and crushing and screening
MANUFACTURING	<ul style="list-style-type: none"> • Wood and wood products, mobile saw milling and planning • Brick and block products
CONSTRUCTION	<ul style="list-style-type: none"> • Landfill and levelling • Earthmoving and excavation • Land drainage • House/commercial/farm building • Highways, roads, bridges, tunnels, railways, ports and airfields • Water projects, irrigation, sewage, pipe/power lines, borehole drilling • Plant hire through renting out machinery with operator
TRANSPORT	<ul style="list-style-type: none"> • Transport by road of bulk materials, liquids, goods, people
PUBLIC WORKS	<ul style="list-style-type: none"> • Roads and highway maintenance • Operating port and airport facilities • Household refuse and sewage disposal • Street cleaning
COMMUNITY SERVICES	<ul style="list-style-type: none"> • Sports facilities: municipal/school football/cricket pitches/playing fields

Source: Adapted from DFID. 1999. Guidelines for the development of small-scale tractor-based enterprises in the rural and transport sectors, by R. Petts & W. Hancox (Unpublished)

■ *Appraisal of input supply chain: spare parts*

After estimates have been made in terms of market potential, the next step is for small-scale farmers to ascertain input supply chains in their local area and, importantly, access to them. Input supply chains provide support services that are essential to the appropriate functioning of a hire service enterprise. They provide spare parts via retailers and/or manufacturers' local outlets and advice about functional and mechanical aspects of what equipment is being used. In the case of livestock, advice and training can be provided about disease prevention measures, the advantages of vaccines, animal health and disease prevention, and so forth. Importantly, training can (or should) be provided by supply chain manufacturers and/or retailers. Maintenance and repair services are also an important component as they can provide not only important services, but also information, advice and training in terms of tools and equipment used by the hire service enterprise.

Advisors can support the provision of information to small-scale farmers with regard to appraising local input supply chains. For example, advisors can provide information about where equipment retailers are

located, which kind and what type of local manufacturers exist and what equipment they can supply, what equipment is available in the local area, order times for spare parts, cost of equipment and so forth.

Small-scale farmers will need to ascertain the overall picture of local input supply chains and make estimates of how these can possibly support their hire service enterprises.

■ *Appraisal of other support services*

A third step in the feasibility study is the appraisal of other support services that are of use for the successful operation of a hire service enterprise. These range from technical training services (for example training courses on animal health and equipment operation and maintenance) provided by public and/or private services, to financial services and access to infrastructure services such as power supply and fuel distribution networks, to public services devoted to licensing of businesses.

Financial services play an important role in hire service enterprises as initial investment costs may be high for many small-scale farmers. It is essential to have financial services that provide appropriate financial products giving access to the money required for a

start-up hire service enterprise or for those who want to expand an existing one. Tools, equipment and livestock all represent considerable costs and having the financial ability to be able to invest in them as well as having the enabling financial infrastructure to do so, can be important elements in the establishment of a successful hire service operation.

Infrastructure, such as those for energy and roads, is another important element in support services that needs to be ascertained. Energy infrastructure may be the electrical power that is needed by a hire service business to operate its machinery, re-charge batteries, etc., it also includes fuel infrastructure. Road infrastructure is also important to provide accessibility to possible clients of the enterprise as well as, for example, to facilitate the supportive input supply chain.

Advisors need to support small-scale farmers in appraising the range of other support services that are needed for a hire service enterprise as well as information about particular aspects of it. For example how and where energy can be sourced, where training courses can be taken and so forth. Importantly small-scale farmers will need to ascertain the overall picture of local support services and make estimates of how

these can possibly support their hire service enterprise.

■ *Credit*

The existence of credit institutions, their products, the terms of their products (interest and payback periods) as well as ease of access to such services for small-scale farmers also needs to be evaluated. This is because small-scale farmers may have considerable constraints in being able to buy capital assets for either a start-up hire service enterprise or expanding an existing one.

Moreover credit constraints will be higher in the initial stages of the start-up enterprise and hence may require not only investment financing, but also working capital finance. Estimates of cash flow (money in versus money out of the enterprise) need to be made to verify where cash shortfalls may occur and where financing may be needed. In this instance advisors can be supportive by providing information on credit availability, the type of credit available, interest rates and so forth.

The distinction between long and short term financing is important with reference to the estimates that must be made in a feasibility study. For example a tractor will require a

longer term loan than a hand tool. Commonly a long term loan has a lower annual interest rate, but can burden the business over a longer period and some financial institutions may be unwilling to extend a long term loan to a small-scale farmer. The financial institution will also require collateral as a form of insurance on the loan and this also needs to be taken into account.

■ *Costs and profits*

The range of hire services that can be offered in such an enterprise are many and each of them has a potential for making profit. However each one of these services also has costs which, together with the profits, need to be estimated for each service on offer. This will be the case whether the business will be a rental, a lease or a custom service or all of them. This is far from an easy task and will require support from advisory services in areas that need to be covered in making such estimations.

The initial step is to investigate start-up costs, including possible loans that may be required. These in particular will involve knowledge and quantification of interest rates and payback periods.

Start-up costs can include items such as money required for a licence, fees for a training course, the cost of

a loan needed to buy basic equipment (for example a sprayer, a chainsaw, an ox, or a two-wheel tractor). Once these costs have been estimated it is sensible to estimate depreciation of such items. In the case of animals it has to be noted that depreciation does not work in the same way as for mechanical equipment. Animals as they become older become ‘more experienced’ in their role and become stronger. They can also be used to produce new draught animals and once their useful life is over they can be sold for their skins, meat and bones. This results in annual depreciation or amortization costs that are very low; close or equal to zero.

Operating costs need to be estimated next. These will commonly consider, for example, fuel expenses, feed, labour to operate the equipment and/or draught animal, distance travelled to location of work and so forth. Other costs relate to maintenance and repair costs, for example cleaning, changing oil and parts, veterinary bills, etc. Importantly such costs will need to be made for hourly, daily or weekly usage, depending on the type of service offered. Examples of various cost calculations for equipment, tools and draught animals are shown in Tables 3, 4 and 5.

TABLE 3 Estimating the annual costs of tractor operation

Cost	\$
Depreciation: Tractor (20,000 - 5,000) / 5 yrs	3000
Plough (1600 - 270) / 7yrs	190
Tractor shed depreciation (1000 / 10 yrs)	100
5500 litres of fuel and 20 litres oil	2835
Spare parts and repair work	950
Part time driver	500
Insurance and road tax	220
TOTAL	7795

Source: FAO. 2009d. *Explaining the finances of machinery ownership*, by J. Heney, *Talking about money No 3*, Rome

TABLE 4 Estimating the annual costs for a pair of draught oxen with their associated equipment

Cost	\$
Depreciation: Oxen (they maintain their value)	0
Plough (150 - 20) / 10 yrs	13
Cultivator (200 - 30) / 10 yrs	17
Cart (400 - 50) / 5 yrs	70
Yoke, chains 45 / 3yrs	15
Spares: tines, nuts and bolts, tiers	35
Maintenance work: welding, etc.	40
Purchased feed: 1.0t maize bran, 0.5t cotton seed cake and minerals	180
Medicine and veterinary costs	30
Extra labour	120
TOTAL	520

Source: FAO. 2009d. *Explaining the finances of machinery ownership*, by J. Heney, *Talking about money No 3*, Rome

TABLE 5 Estimating the annual costs of tractor operation

Cost	\$
Depreciation (5500 - 50) / 15 yrs	30
Repairs, spares and lubricants	25
TOTAL	55

Source: FAO. 2009d. *Explaining the finances of machinery ownership*, by J. Heney, *Talking about money No 3*, Rome

Once costs have been estimated they need to be set against estimates made about possible prices that customers are willing to pay for the services. However it is important to note that depending on the service required (rental, custom service,

leasing) different estimates will have to be made for each. This will give a better and clearer idea of what profit margins to expect. Table 6 illustrates as an example some of the typical services offered in Punjab, India and applicable rates.

TABLE 6 Custom hiring rates prevailing in Punjab, India in 2002-03

Sr. No	Operation	Rate (Rupees)*
1	Cultivator x 2 and bund making	850 /ha
2	Harrow x 2	1200 /ha
3	Planker x 1	288 /ha
4	Seed drilling	672 /ha
5	Puddling (Cult x 2 + levelling x 2),	2280 /ha
6	Potato planting	1,200 /ha
7	Potato digging 1	480 /ha
8	Straw combine (@ 450/trailer) 2,	160 /ha
9	Reaper	1,920 /ha
10	Threshing	2,400 /ha
11	Fertilizers broadcasting	360 /ha
12	Combine Harvesting of Paddy or wheat	960 /ha
13	Leveling	600 /ha

TABLE 6 Custom hiring rates prevailing in Punjab, India in 2002-03 (Cont.)

Sr. No	Operation	Rate (Rupees)*
14	Stubble shaver	300 /ha
15	Spraying	7 /tank
16	Transportation up to 5 km	300/round trip
17	Transportation for 5 km to 20 km	500/round trip
18	Cultivator x 2 and bund making	850 /ha

*US\$1.00 = Indian Rupee 47

BOX 4 Calculation of hourly costs of an animal-drawn no-till planter

Hire service providers will need to know how many hours they will need to spend to plant a hectare and this can be estimated from the performance of the draught animals, the distance between rows and an estimate of field efficiency, or from experience. The answer is likely to be around two to four hours per hectare. So now the hire service provider will have an estimate of costs per hectare and can add a margin for his or her own time and so calculate a reasonable charge rate.

TABLE 7 Hourly costs for oxen and planter

<i>Purchase price: \$200</i>	<i>Useful life: 8 years</i>
<i>Scrap value: \$20</i>	<i>Annual use: 50 hours</i>
<i>Interest rate: 12%</i>	

Annual Fixed Costs	
Depreciation $(200 - 20) \div 8$	\$22.5
Sub total : \$22.5	

Annual Variable costs	
1 share every two years	\$6.0
1 disc every 3 years	\$5.0
Chain replacement	\$15.0
Labour, welding, nuts and bolts	\$15.0
Sub total : \$22.5	



BOX 4 Calculation of hourly costs of an animal-drawn no-till planter (Cont.)

TABLE 7 Hourly costs for oxen and planter

Hourly Fixed Cost	\$0.45
Hourly Variable Costs	\$0.82
Total hourly planter costs	Sub-total: \$1.27
Hourly costs for a pair of draught oxen	Subtotal: \$2.00
Total hourly costs for planter and oxen	\$3.27

1. The interest rate is used to calculate annual interest charges if the service provider takes out a loan to pay for the investment

CASE STUDY 8 The economic advantages of hiring services in Riau province, Indonesia

A study was conducted in Riau province in Indonesia to ascertain the economic potential of small tractor hire services in rice cultivation. In the area small tractors per 100 hectares of cultivated area increased from 2.3 in the year 2000 to 6.6 in the year 2005. The most commonly found tractor model was of 8.5 hp. As a result of the many constraints in small tractor ownership, mainly as a result of initial high investment costs and in particular full capacity utilization, small-scale farmers looked for a collective use of tractors via hire services enterprises. This type of model was also commonly found in many other countries.

Ownership of small tractors was found to be both individual and in cooperative/joint modes. On average small tractors was used on 52 days per season with a 7 hour work day. Demand was only for land preparation of paddy fields, including ploughing and puddling. Average annual costs were US\$823 (range: US\$169 to US\$1 047). Variable costs accounted for 62 percent of total costs, while fixed costs were 38 percent. Labour resulted in the largest single cost (38 percent), depreciation was the second (27 percent) and fuel cost the third (13 percent). However repair costs, which are frequently the largest cost in other countries, were found to be only 9 percent of total costs. The reason for this was that in the area many of the tractors had been operating for less than 6 years. The tractor owners commonly received job contracts from neighbours and service charges ranged from US\$35 to US\$53/ha for both ploughing and puddling work. Interestingly the charges were lower than those advised by government (US\$59 per hectare) as a result of competition and



CASE STUDY 8 The economic advantages of hiring services in Riau province, Indonesia (Cont.)

the ability of hiring farmers to pay higher prices. Payments were made commonly in two instalments: 50 percent at start of the contract to pay for such aspects as fuel, oil and the other 50 percent was paid once the job had been completed.

Annual revenue was on average US\$932 (range: US\$353 to US\$1 647). Profit estimates made were around US\$109 per year, about 12 percent of the revenue. However the owners of tractors who actually carried out the work themselves and thus did not use hired labour had an average annual profit of US\$419, about 45 percent of the revenue. Owners required 6.5 years to cover the capital cost and obtain about 10 percent interest on the investment. Overall annual use needed to be about 17.23 hectares to justify economic ownership of the small tractor in the area.

Owners of small tractors in the area achieve a high level of annual utilization and there is a growing demand for further expansion. This not only justifies economic ownership of such a capital asset, but makes it clear that in the area small tractor custom hire services can be an important and viable livelihoods strategy.

Source: Adapted from Paman, U., Uchida, S. & Inaba, S. 2010. The economic potential of hand tractor hire business in Riau province, Indonesia. A case of small tractor use for small rice farmers. Agricultural Engineering International, MES 1591, Vol XII

■ ***Evaluation of the business opportunity***

The feasibility study shows small-scale farmers the importance of planning prior to starting an enterprise as well as conducting market appraisals to ascertain demand. Overall and importantly it enables small-scale farmers to collect information on a wide array of issues related to the enterprise and provides support in making and taking an informed decision on whether to

venture into the business opportunity or not. Ultimately the choice of starting or not starting the operation needs to be that of the small-scale farmer and his or her evaluations alone. Advisory services can only provide support and cannot take decisions for small-scale farmers. Case study 9 gives an example of a successful machinery hire service which pays close attention to prevailing conditions, preferences and prices.

CASE STUDY 9 Ngāngā farm machinery hire service, Njoro, Kenya

Simon Ngāngā has a thriving farm machinery hire service operating from Njoro in the fertile highlands of Kenya where wheat and maize are the predominant cereal crops. The operations in demand are for traditional tillage for these two crops. For wheat the land is disc ploughed and then disc harrowed twice. After a pass with a chisel plough, the soil is disc harrowed yet again to produce a seed bed. Costs (expressed in US dollars) for this high level of tillage are on a per acre (0.4ha) basis and are as follows: ploughing US\$26; first harrow US\$23; second harrow US\$19; chisel plough US\$25; third harrow US\$19; giving a total of \$US112 acre-1 (\$US277 ha-1). The 2008 fuel price rise means that prices will be increased by up to 20 percent for the 2009 season. Simon offers a comprehensive service with a wheat drill (\$US16 acre-1) and a 10 m boom sprayer for controlling wheat rust (fungicide plus US\$7 acre-1). The rise in wheat price, from US\$13 to US\$26 90kg bag¹, in the course of the last year, means that customers still find the service an attractive proposition.

Great attention is given to preventive maintenance and Simon is convinced that this keeps his repair costs to a minimum. Also he is the main tractor operator, only hiring in additional help when demand dictates it, which means that he can ensure safe operation of his equipment. His operational tractor fleet comprises four units (one of which is an aging Ford now consigned to spraying duties only). He takes care of most of his repair work, only using external services for specialist work such as repairs to fuel injection pumps.

Simon prefers to save from earnings when purchasing new (second-hand) equipment. He is averse to taking out loans, even if they were available to agricultural enterprises. But with the demise of the KFA and KGGC lines of credit in 1988 he now only has access to bank credit which he deems too expensive. He runs a parallel enterprise by leasing agricultural land for crop production, so that even if the hire service business encounters hard times (as a result of failing rains, political crises or lack of working capital amongst his customers) he has a fall back position.

The livelihood activity

■ *Common hire services*

The hire service typologies described in this section cover basic land preparation prior to crop establishment and move on to more sustainable and less environmentally damaging and no-tillage crop establishment options. These are likely to become increasingly popular in the medium term as populations increase and natural resources run the risk of being degraded.

Weed control is a major requirement for smallholder farms, especially when cropped areas are increased to boost farm income. Reduced tillage practices coupled with mechanical and biological weed control can help to address this constraint, but herbicide application is a further option. Herbicide application requires sprayers which must be carefully maintained and correctly calibrated and operated to achieve the desired results. This means that their operation is an ideal candidate for a mechanically-minded entrepreneur.

Post-harvest operations can also become a bottleneck in the crop production cycle and the establishment of crop threshing

and shelling enterprises offers good opportunities for the use of motor-driven machines which can be transported from site to site.

Crop processing will usually increase the value of farm products and improve their storage life. Processing offers high potential, opportunities for hire service providers from chipping to milling to oil extraction to packaging and marketing (see FAO Diversification booklet No. 4 *Value from village processing*).

■ *Production services*

Primary production services are many and varied and include land preparation, ploughing (see Figure 15), harrowing, ridging, puddling, planting and weed management by either herbicides or animal drawn weeders.

Ploughing

Ploughing remains one of the most sought after services that can be offered by a hire service provider. In many smallholder farmers' minds the plough is still seen as an essential tool for seedbed preparation. However, in the light of the devastating impact



*FIGURE 15 Ploughing with animal traction
(Photo by B. Sims)*

of the plough on soil, resulting in increased soil degradation through loss of organic matter and compaction and widespread soil erosion, the traditional view is rapidly changing.

While demand for ploughing may continue in the medium term, there are now strong moves towards minimum and no-tillage practices and the use of the plough is expected to decline sharply. The main purpose of the plough has been for weed control, but in achieving this goal it produces dramatic long-term declines in soil fertility and water-holding

capacity as the fertile top soil is lost and degraded and plough pans are formed at the depth of work. Weeds can now be better controlled by biological methods (permanent soil organic cover and cover crops); mechanical methods (knife rollers, superficial hoeing and hand-pulling); and, where necessary, with herbicides. It should be noted that herbicides in no-till conservation agriculture environments are used to a decreasing degree as biological methods adapt to the system and take over the weed control function.

No-till and conservation agriculture practices can, in the

same way as ploughing or hoeing, be achieved by manual, draught animal or tractor power and there is a wide range of suitable equipment available in the market for the purposes of no-till planting and weed control.

Farmers using animal traction as a power source require the draught animals, the plough, some harnessing equipment (for example yokes, chains, traces) to connect the plough to the work animals and semi-skilled operators ranging from one to three depending on the level of their competency and the prevailing culture of the region. Work animals constitute about 80 percent of the total ownership costs of the package, followed by the plough (15 percent) and lastly the harnessing (5 percent). Besides the actual labour required for the on-farm use of the animals, they will require additional labour for their care and herding when they are not working.

The capacity of work animals is extremely variable depending on a wide range of factors including animal numbers, size, age, nutrition and health, soil and ambient conditions, depth and width of work, etc. However to give order of magnitude figures for ploughing rates it can be reckoned that draught

animals can plough 0.2-0.4 hectares per working day (of about 5 hours) compared to 1 ha/day for power tillers and 5-10 ha/day for tractors. Of course in the case of tractors the daily output will depend on the tractor power, size of plough and the number of hours worked per day (which is not restricted as in the case of animals)¹.

The gains from using any of the mechanized options are high compared to conventional hand hoe tillage which can take 40 man-days per hectare (0.025 to 0.05 ha/day) and take up to half a million strokes of the hoe to cover one hectare. When work animals are restricted to ploughing alone, the window of utilization is only the planting window, which can typically be 20 days per year for mono-modal or 40 days for bi-modal rainfall areas. To maximise utilization of the investment in work animals and to have them working profitably for more days in the year, it is imperative to acquire implements for other farm operations that are demanded for many more months at different times of the year.

The benefits of soil preparation and crop establishment (for example

¹ The world record for ploughing was set in 2005 at 321.2 ha in 24 hours (Available at <http://www.youtube.com/watch?v=UenluAtrEt4>)

ploughing or better, no-till planting) using traction technology, i.e. animals and tractors, rather than the hand-hoe, provide advantages in terms of area cultivated, crop diversity, yields, levels of drudgery, opportunities to redeploy family labour and household food security. While hoe households typically cultivate 1 to 2 hectares per year, animal hirers cultivate 2 hectares, households owning animals cultivate 3 to 4 hectares, tractor hirers cultivate up to 8 hectares and household owning tractors cultivate more than 20 hectares. Households relying on family labour for all their farming needs survive at the margin of subsistence.

In the smallholder setup, farmers owning draught animal power can make booming business mainly in the transport and land preparation sectors with each sector having its own peak season. The more draught animal power a farmer has, the more the diversity and reliability in service provision he or she can offer, hence generating more income and a better livelihood.

Ripping

Ripping is a reduced tillage operation of opening parallel planting furrows on un-ploughed land prior to or at the onset of the rains using a single

timed implement (ripper) pulled by oxen or donkeys. Ox ploughing is used on about 25 percent of the cultivated land in sub-Saharan Africa where crop production is the main livelihood activity. However, poor access to ploughing services leads to late planting and eventually low crop productivity. The ox-drawn ripper is cost-effective, facilitates spreading of the labour peak, increases infiltration, reduces soil erosion, reduces labour input by 70 percent (compared to the hand hoe) and can increase crop (maize) yields by up to 30 percent (MATF, 2006).

Ripping as a business does therefore offer considerable advantages over ploughing. It is however a relatively new (but rapidly spreading) technology that still requires extensive promotional efforts and there are still uncertainties on the best corresponding weed management technologies to make the technology more friendly to the environment. Weed control options have been noted previously, although it should be emphasised that, as with all conservation systems, biological and mechanical control methods are preferred over herbicide solutions which are only recommended when absolutely necessary and before other methods can become established.



FIGURE 16 Ripping with ox power
(Photo by B. Sims)

Jab planting

The jab planter is an ideal planting implement for manually direct planting through a thick groundcover. A jab planter is a simple device that is operated by hand. It has two shafts made of metal or wood, with handles at the top and steel beaks at the bottom. A hopper on one of the shafts holds the seed which is then delivered by a metering mechanism and gravity to the seed beak. Other models would have a second hopper on the other shaft for holding fertilizer. Currently jab planter models used by many farmers are imported from Brazil, where they are known as *matracas*. They are now however beginning to be locally

manufactured in some parts of East and Southern Africa.

The jab planter is a highly functional tool that enables timely planting in undisturbed soil with organic residue cover – saving substantial time and labour and leading to increased crop productivity resulting from effective moisture and organic matter retention. It also has a low cost compared to animal drawn implements which facilitates acquisition without the need for credit. It is a highly suitable tool for hand hoe based farmers but scores low where the use of work animals is predominant.

Demands for jab planting services could also be compromised when



*FIGURE 17 Jab planter for planting seed and applying granular fertilizer
(Photo by B. Sims)*

farmers are not yet convinced about conservation agriculture and do not retain adequate soil cover. In such fields other hand tools like the dibble stick or the hand hoe have competitive advantages.

Animal drawn direct seeding

Animal drawn direct planters, developed in Brazil, enable farmers to plant on unploughed land that has a substantial vegetative cover. A typical no till seeder (like the Fitarelli model in Figure 18) is pulled by a pair of oxen to open a narrow planting slot, precisely a meter and place seeds and fertilizers and cover

them in one pass. It has a rear drive wheel which drives an enclosed chain and sprocket transmission which in turn operates the star-wheel fertilizer distributor via bevel gears and the seeder metering mechanism via a cone of three bevel gear options. Seed metering is by rotating horizontal perforated disc and seeds are expelled with a spring-loaded ejector. Soil vegetation cover is cut by a sharp vertical disc and the furrow is opened with a chisel-point tine. The seeder is pulled by an integral long draw-pole fitted to the ox yoke, and is steered by an operator via handles.



*FIGURE 18 Brazilian animal-drawn no-till planter (Fitarelli)
(Photo by B. Sims)*

At a cost of US\$600 - 1 000, the draught animal power seeder is a relatively high capital cost machine and a careful analysis of the demand potential and even a break-even acreage is required before taking the decision to procure it. It has a high field capacity (7.5 person hours per hectare) and it is one of the mechanization technologies that would benefit greatly when ownership is coupled with hire service provision.

Hand pulled sprayers

Hand-pulled herbicide sprayers are usually constructed from knapsack

sprayers mounted on wheels (see Figure 19). When the drive wheels turn, an eccentric actuates the sprayer pump which delivers herbicide to a boom with four or six spray nozzles. The height of the boom can be adjusted to spray at different heights above the target. They have more nozzles than a hand-pumped knapsack sprayer, so can cover larger areas more evenly. They are suitable for spraying a whole field but they cannot be used to spot-spray individual patches of weeds. Because the spray is behind the operator (unlike with knapsack sprayers) there is much less risk of breathing in the



*FIGURE 19 Hand-pulled sprayer for herbicide application
(Photo by B. Sims)*

spray or getting it on the skin or clothing.

Herbicides are a cheap and quick way of managing weeds. However, they are not normally easily available at the village level as a result of poor availability of demanded package sizes and their efficacy is not always assured as a result of adulteration and product expiry. Provision of weed management services with herbicides can be lucrative but care has to be made to assure quality (through selection of viable herbicides and pre-testing the rates) and targeting the services to a few

clients based on a selected crop or geographical area.

■ *Harvest and post-harvest services*

Harvest and post-harvest services include combine harvesting, threshing, shelling, and processing of cereals, pulses, fruits, vegetables and oilseeds. Custom hire of combines for harvesting is more common in Asia than Africa (see Case Study 10). However with the increasing commercialization of smallholder agriculture associated with the adoption of sustainable

CASE STUDY 10 Hire service enterprise in Pakistan

In Rawalpindi, hire services are commonly provided by established larger-scale farmers and the most commonly offered services are for land preparation, crop planting and wheat threshing. In Sheikupura both wheat and rice are harvested by custom-hired combine harvesters. The clients for hired machinery are usually farmers in the vicinity of the service provider, with typically the number of clients for tractor services being approximately 25 and for combining services 50–60. The hire service operators are not specially trained, but tend to learn on the job. Financial records of hire services appear to be inadequate to enable profit margins to be calculated. While on the other hand it seems that cash flow management is satisfactory. There is potential for expansion in the equipment hire market and training in financial management skills would be a valued input which would allow greater accuracy in calculating operating costs and so enabling a more precise pricing regime to be used in decision-making.

Source: FAO, 2009a. Farm equipment supply chains. Guidelines for policy makers and service providers: experiences from Kenya, Pakistan and Brazil, by B. Sims and J. Kienzle Agriculture and Food Engineering Technical Report No.7, Rome

intensification practices such as conservation agriculture, it is a market niche that is likely to be more widely exploited in the medium to long term.

Threshing and shelling services

Threshing or shelling consists of separating the grains, or the shells in the case of groundnuts, from the portion of the plant that holds them. This separation, done by hand or machine, is achieved by threshing, by friction or by shaking the products; the difficulty of the process depends on the varieties grown, and on the moisture content and the degree of maturity of the grain. Threshing or shelling operations follow the harvest and whatever drying of

the crop is undertaken. Threshing operations may be carried out in the field or on the farm, by hand or with the help of animals or machines. Whatever the system used, it is very important that threshing or shelling be done with care. Otherwise, these operations can cause breakage of the grains or protective husks thus reducing the product's quality and fostering subsequent losses from the action of insects and moulds.

Most hand shelling or threshing operations are too laborious and will not be discussed here as they are normally a family rather than a hire service business possibility. Traditional threshing by animal treading has been almost fully replaced now in many parts of the



*FIGURE 20 Although animal threshing (in this case of wheat in Bolivia) is on the wane worldwide, in remote areas it can still offer potential to an animal-owning entrepreneur to establish a threshing service to other farmers.
(Photo by B. Sims)*

world by power threshers operated by 5-15 hp engines or electric motors. Winnowing machines driven by hand or pedal are often used to clean the grain immediately after threshing.

Threshing with hand or pedal-driven machines

These machines are especially popular for crops such as rice which is threshed by hand-holding the sheaves and pressing the panicles

against the rotating toothed drum. The machine must be continuously and regularly fed, but without introducing excessive quantities of product. If the paddy obtained contains too many unthreshed panicles and plant residues, a second threshing must be followed by an effective cleaning of the product. Use of these threshing machines may require two or three workers one of whom should be skilled.



*FIGURE 21 A pedal-operated thresher for small-grained cereals such as rice
(Photo: Silsoe Research Institute)*

Maize-shelling with hand or motor-operated machines

Manual shellers, whose design make them suitable for construction by small-scale manufacturers, permit

easier and faster shelling of maize cobs (see Figure 4). These come in several models, some of them equipped to take a motor; or they can be driven by a handle or a pedal.

Use of manual shellers generally requires at least two workers.

Threshing or shelling with motorized equipment

Motorized threshing-machines are increasingly becoming popular in sub Saharan Africa and are very widely used in Asia and Latin America, competing only with combine.-harvesters (see Figure 22). These machines can easily be adapted to treat different kinds of grain (e.g. rice, maize, sorghum, beans, sunflowers, wheat and soybeans). Equipped with a rotating

threshing-drum (with beater bars or teeth) and a stationary concave, these machines often have devices to shake out the straw and to clean and bag the grain.

This type of equipment is however usually owned by medium to large scale farmers whose area of farm operation is large compared to smallholder farmers. The private entrepreneurs offering threshing and shelling services are also farmers who will more often than not hire their machines out after they have completed their own post- harvest operations.



*FIGURE 22 Mobile wheat thresher
(Photo by Brian Sims)*

The demand for threshing services is normally high at harvest time as farmers are desperate to contain and reduce losses amidst harsh conditions. Typically a rice production family member is compelled to camp at mosquito infested rice fields for about three weeks to harvest one hectare of rice and guard the produce against thieves. The huge business opportunity is challenged by the poor on-farm transport network of roads, footpaths and bridges and the relative high cost requirements for the threshers. It is for this reason that medium sized (portable) threshing and shelling machines like those powered by single axle tractors are more adaptable as the tractors can manoeuvre narrow roads to access remote farms and require reasonably low operating costs.

Crop processing services

Processing of cereals, pulses, fruits, vegetables and oilseeds at the rural level into higher value products and by-products is gaining popularity as a value addition enterprise (see FAO Diversification booklet No.4 *Value from village processing*). All major grains: paddy, wheat, maize, barley and millets – can be processed into flour, refined flour, semolina, grits, using different types of processing machines of different capacities.

Tubers (cassava and sweet potatoes) can likewise be processed but into chips with a longer shelf-life that command higher market prices. Pulse milling into dal involves splitting and removing the outer seed skin by machines to improve consumer acceptance. It can be undertaken by small-scale village machines owned and operated by farmer hirers or industrial size mills. Dal milling is the third largest processing industry in India after rice and wheat milling, to supply the protein demands of the vegetarian population and the by-products are generally used as cattle feed.

Hand operated ram-presses are used to extract oil from seeds by smallholder farmers for family needs and those of neighbours at a fee. However, similar to oil extraction using animal power in rotary mode (see Figure 5); both technologies are in decline as they are being out-competed by mechanical oil expellers which produce edible and non-edible oils.

Apart from oilseeds, the by-products obtained during the processing operation (de-oiled cake, oil meals) are also of high economic value. Small capacity oil expellers are available on the market for use in rural areas by entrepreneurs for promoting agribusiness.

Fruit and vegetable processing is being promoted for reducing post-harvest losses and increasing shelf-life. Processing of commercial crops (sugarcane, jute, cotton, tea, coffee and tobacco) provides more employment opportunities to rural work force in addition to minimizing post-harvest losses.

■ *Marketing services*

Different transport technologies which employ human energy, animal power or the use of motor vehicles exist. They range from basic walking and carrying to large-scale motorized transport, including motorcars, large trucks and buses. The many transport options available have different ranges, capacities and operating costs. These overlap and provide a continuum of complementary options, each with advantages and disadvantages. They vary in purchase price, payload, complexity and their requirement for work animals, mechanics, foreign exchange and road quality (FAO, 2009b).

With poor road infrastructure in most countries, rural transport is frequently undertaken by animal power and the same applies to most of the farm operations. Rural transport would probably score higher than ploughing as it is conducted

throughout the year, it is mainly demanded at harvest when cash flows are better and farmers can pay in kind and rural repair services are supported indirectly by an extensive automotive industry.

Sustainable strategies for the livelihood activity

Hire services as enterprises to improve livelihoods have good potential and offer many opportunities. At the simplest level for such an enterprise equipment that is used on a farmer's farm can also be hired out to other farmers, for example a sprayer. In a more complex and capital intensive hire enterprise, a tractor for example, can be hired to many different farms in a local district or province. Whatever the size and complexity of the business, to be successful and durable over time i.e. be profitable, requires strategies that identify opportunities in markets, understand market demand and consistently provide a service that markets desire, keeping an eye on competition activities and prices.

Hire service enterprises are no exception to such rules and require small-scale farmers to constantly appraise markets, understand opportunities that may exist, understand market demand and provide services that are competitive, satisfy customers and importantly earn a profit.

■ *Market appraisal*

As seen previously in the feasibility study, a market appraisal is important in helping small-scale farmers to understand markets. This is also an important element of a sustainable livelihood strategy, especially when market appraisals are conducted on a regular basis. This will enable small-scale farmers to become knowledgeable about markets and marketing, and hence reduce the risk of business failure. Such marketing knowledge will not only be related to such aspects as: Who needs the service? And what prices can be charged? But importantly will provide a comprehensive picture of all the factors that affect the marketing of hire services. It will also enable a proactive approach for small-scale farmers to anticipate market needs and provide them when and where required. Being in tune with market trends, as well as with innovative technologies that maybe introduced, is also important for hire service providers. This approach departs considerably from the more commonly found opportunistic and reactive selling strategies.

CASE STUDY 11 Demand for hire services in the Nakuru and Laikipia districts, Kenya

Demand for hire services is highest during the rainy season and lowest during the dry season. During the rainy season farmers have to plant on time, hence demand for hire services is high. Thus the majority of hire service demand occurs normally in planting and harvesting times of the year. Commonly demand is so high in these times that hire service enterprises from outside the two districts have to come in to complement efforts.

TABLE 8 Hire services in Nakuru and Laikipia districts, Kenya

	Services offered	Peak season	Low season	Remarks
NAKURU				
1. Agricultural Machinery Service, Government of Kenya (AMS)	<ul style="list-style-type: none"> Dam construction Harvesting Road grading Land levelling (tillage, harrowing, ploughing and land preparation) 	Planting and harvesting time	Dry time	No low season for bulldozers
2. Farming Systems of Kenya (NGO)	<ul style="list-style-type: none"> Planting Ploughing Harrowing Transport 	March & April (Land being prepared) November to December (Harvesting time)	January to February then May to October but not for tractor	No low season for tractor
LAIKIPIA				
1. AMS	<ul style="list-style-type: none"> Farm construction Farm planning Area determination Land levelling (tillage, harrowing, ploughing and land preparation) 	Tractors – January to February (planting time)	Dry time	No low season for bulldozers
2. Private service provider (Maina)	<ul style="list-style-type: none"> Harrowing Ploughing Planting transport 	March to April then June to August	Rest of the year	Trailer seasonally used

Source: Adapted from FAO.2006a. Farm power and mechanization for small farms in sub-Saharan Africa. By B. Sims and J. Kienzie Agriculture and Food Engineering Technical Report No.3, Rome

Commonly information gained from appraisals will initially provide a range of potential customers to pursue. Choosing which potential customers to pursue will depend on numerous factors. For example what requirements are there for each customer in terms of what needs to be done, how, when, and what land area needs to be worked on, etc. This may be a challenge as customers may have quite different needs, but require the same equipment to be used and at the same time of the year. In this respect it may be sensible to plan out possible customer needs and

their particular requirements. This can be seen in Figure 23.

A hire service enterprise that has high fixed costs, for example a tractor hire service, needs to earn income throughout the entire year wherever possible so as to amortize costs better and be more competitively priced on a cost per unit of work basis. Other services that are not so capital intensive and do not have such high fixed costs may require less income generation throughout the year. Overall market appraisals will commonly identify opportunities for selling services

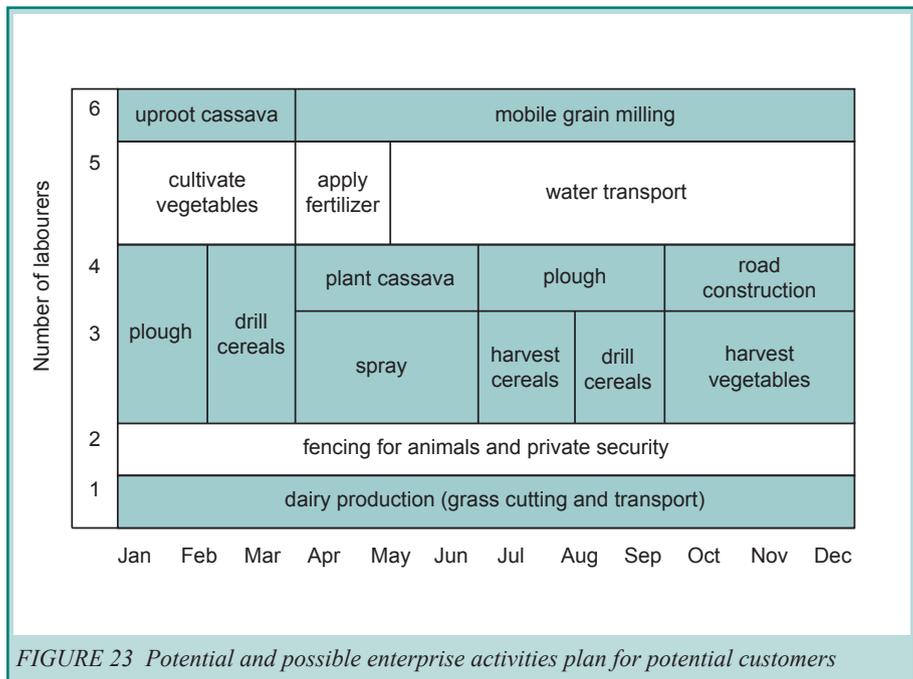


FIGURE 23 Potential and possible enterprise activities plan for potential customers

which are available either all year round or only for some months or weeks per year.

■ *Marketing strategies*

Only once market appraisals have been carried out can marketing strategies be formulated. Opportunities for targeting various markets are numerous as services can be offered at production, post-harvest and transport-to-market levels of the local agricultural and food supply chain.

Hire service enterprise marketing efforts need to differ according to the type of client being served. This is a result of the (frequently) high variability of demand for hire services; the actual specifications of the required service; the particularities of agro-ecological zones and farming systems in the case of production services; local infrastructure found, and so forth.

Establishing a good relationship with customers is fundamental to any marketing strategy. This can generate positive word of mouth promotion of the service and thus create a network of customers in an area.

Some of the steps that can lead to successful marketing include:

- The service: Customers are aware of what the hire enterprise can offer in terms of services and the flexibility and quality of such services.
- The price: The price of the service is clearly defined and based on the needs of the customers and the price is competitive.
- Demonstration: Customers have seen the service being conducted on other farms and/or demonstrations have been provided.
- Promotion: Potential customers (importantly others involved in the input supply chain, for example input dealers, and others in the local area, for example farmer cooperatives) are aware of the service enterprise and the services being offered.

Selling is an important aspect of any business enterprise and is the final part of the overall marketing process. However a good deal of work needs to be done before a sale can be made if an enterprise is to remain in business and prosper. Market appraisals and marketing strategies make selling hire services relatively simple and straightforward.

■ *Organization*

Marketing strategies can also involve small-scale farmers organizing themselves into marketing groups. Groups of small-scale farmers commonly create benefits for their members and this is especially true in the case of hire services. Opportunities to learn from each other are increased in terms of using equipment, repairing and maintenance as well as knowing where to procure spare parts and veterinary medicines, for example. Opportunities in learning also increase as public and private donor institutions frequently prefer to work with groups of farmers as costs are reduced. This may allow small-scale farmers to be trained in many aspects related to a hire service enterprise such as the correct usage of new equipment, access to new technology and improved business management skills for the enterprise. Groups of small-scale farmers may also create advantages in equipment purchase, for example a group has more bargaining power to reduce prices and in some instances may also be able to buy capital assets, for example a tractor, that individuals would have difficulty in acquiring.

Importantly, in terms of marketing, groups have the potential to: offer more varied services; offer services in the realm of production, post-harvest and marketing; offer a wider variety of power sources; and can be more effective and efficient in the overall marketing organization for the hire service enterprise. Group-owned equipment has the potential to be used more frequently, there is more equipment available and hence the same service can be offered at the same time and prices can be lower as costs are reduced as a result of high utilization rates. However, it must be borne in mind, that the care and maintenance of group-owned machinery requires careful planning and rigorous execution to keep the equipment in an operable condition. Poor maintenance and repair are dangers that have been associated with shared equipment.

■ *Multiple service products*

Hire service enterprises even at the most basic level can offer a plethora of different services. This means that the potential product portfolio that can be marketed is large. For example a simple sprayer can have numerous applications and is not only confined to

spraying crops with pesticides, herbicides and fertilizers, but can also be used in storage operations, processing operations and so forth. A draught animal can be used for production, post-harvest and marketing operations: ploughing, threshing and transport. However, whatever applications of a single piece of equipment are made, such applications need to be customer-based, planned and, importantly, their costs ascertained. There is little purpose in offering many services, if such services cannot be run at a profit.

■ *Sustainable business enterprise*

As noted previously often small-scale farmers will heavily underestimate their costs and find themselves running at a loss and being unable to put money aside to replace the animal or equipment once its 'useful-life' is over. This commonly is a result of not knowing how to cost hourly operations, but can also be a result of other factors that need to be ascertained. The first factor is that the more income-earning operations a piece of equipment carries out in a standardized type of service (custom hire, for example) the lower the costs and

the higher the income. In other words the more the service is non-standardized the greater the costs. Secondly, operations that are conducted outside the optimal time period, for example a late harvest, are valued less, but the costs will be the same. Thirdly, a lack of precision in operations can require them to be conducted again and this will add to costs and reduce profits. Yet another aspect to consider is if the service equipment used i.e. tool, draught animal or tractor is specific for that operation (Can it perform the desired operation?), Does the operator and/or animal have experience in that operation?

The above means that capital outlays can be significant for small-scale farmers. In such circumstances small-scale farmers need to set aside some of the profits to cater for such business necessities. This will not only enable the business to keep costs under control (commonly old equipment tends to break down more often) but also remain competitive with the acquisition of new equipment and technology that can be offered to customers. Thus hire service enterprises need to earn profits, but also and crucially set aside some of the profits to provide for investments in productive capital assets that will keep the enterprise competitive.

CASE STUDY 12 Hire service enterprise in Punjab, Pakistan

In the Gujranwala District of Punjab Province in Pakistan (which is a predominant rice and wheat crop rotation region), a number of small-scale enterprises are actively engaged in providing harvesting and threshing services for rice and wheat with hired combine harvesters. The clients are small and medium size landholders (typically with 2 acres). One service provider, Mr. Abdul Waheed owns a small mechanical workshop in Rassool Nagar and also runs a small-scale enterprise known as Waheed Zarri Alaat (Waheed Agri Equipments). He has 5 Indian-made combine harvesters which he hires out to local farmers for harvesting rice and wheat. He provides his own combine drivers to ensure that the machines are correctly adjusted and operated and charges US\$18 to US\$24 per acre for rice; and US\$14 to US\$18 for wheat harvesting. The tariffs vary according to crop density, weed populations, expected yields, ground conditions and transport distance from Rassool Nagar. During the last Kharif season (October – November, 2010) he harvested about 500 acres of rice and according to him, there was a reasonable income generated by this business.

Source: Personal Communication, M. Akhtar Bhatti, 2011

Support services

■ Access to support services

The accessibility of support services can broadly be categorised as the financial ability to afford the service and the physical proximity of the client to the provider. These in turn depend on, and vary with, many other technical and socio-economic factors – all linked together in the form of a chain.

Support services required

Support services are essential for sustainability and operational continuity and integrity of hire services and may include some or all of the following:

- Equipment and implement supply outlets
- Spare parts
- Repair and maintenance services
- Finance and credit
- Veterinary services
- Fuel and lubricant support
- Technical advisory services
- Market information services

The support services are linked and interlinked with each other in the human-powered, animal-drawn and motorized systems. As a result, many players are required to play a critical role in the supply chain linkages. These are shown in Table 9.

TABLE 9 Services and related providers

Service	Provider
Equipment supply, demonstration, correct operation and technical support	Manufacturers, dealers
Spares	Dealers
Repair & maintenance services	Artisans, rural workshops
Financial	Micro credit institutions, agricultural development banks
Veterinary services	Fodder seeds suppliers, commercial fodder producers
Skilled operators	Ox-trainers
Extension and promotion	Usually a public sector role via the Ministry of Agriculture and its relevant departments

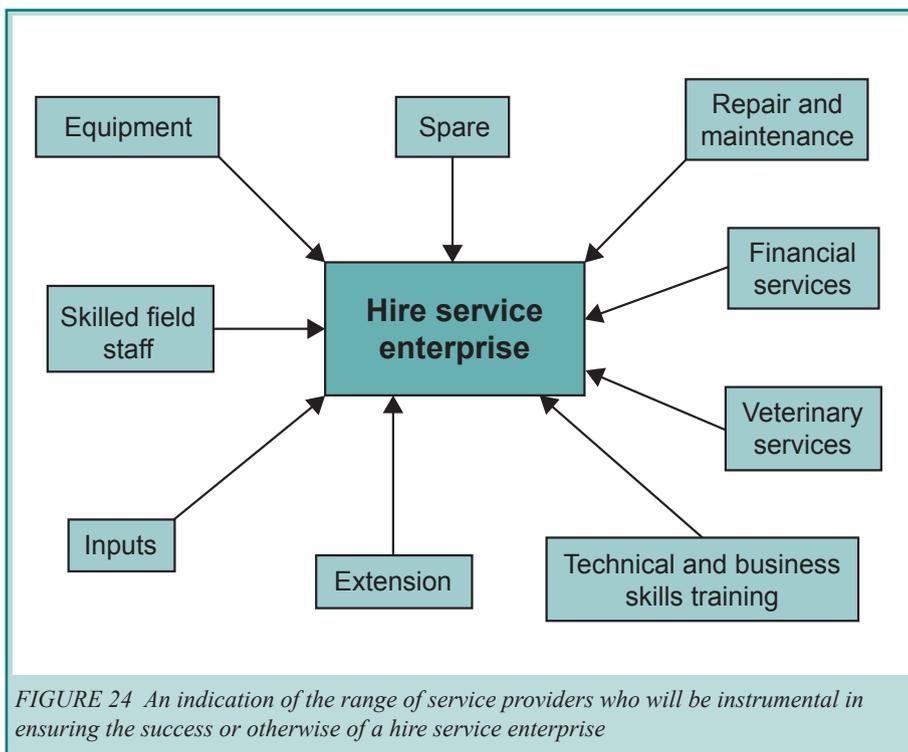


FIGURE 24 An indication of the range of service providers who will be instrumental in ensuring the success or otherwise of a hire service enterprise

Figure 24 gives an appreciation of the variety of support services that are active in the supply chain involving farm machinery hire service provision

■ **Supporting the input supply chain and linkages**

The supply chain is the network of facilities and activities that performs the functions of product development, procurement of material from vendors, the movement of materials between facilities, the manufacturing of products, the distribution of finished goods and services to

customers, and after-sales support for sustainability.

Input supply chain support is the backbone of any hire service operation without which the service provision would be unsustainable. The following factors are important in the sustenance of this component:

- **Policy framework:** The national policy and regulatory environment is critical to the functioning of markets and enterprises; it should create incentives for private sector

growth and involvement in the policy process. Moreover, poor local government operations and poor enforcement of legal and regulatory regimes increase transaction costs and risks, limiting investments in relationships and upgrading. Conversely, conducive local and regional policies can provide opportunities for rapid improvement of the enabling environment. Formulating and entrenching policies that would support rural development and in particular those aimed at supporting the wide scale adoption of a technology (for example conservation agriculture) through making implements available via hire service providers.

- **Capacity building:** Strengthening the capacity of service providers to enable them to maintain high standards of quality hence stimulate dissemination of targeted technologies and making them attractive to the majority of farmers. Capacity building should include both technical and business skills type of training.
- **Networking amongst key players at all levels:** Establishing and strengthening linkages

and networking along the supply chain within a particular neighbourhood would be critical. Such would be agricultural hirers' associations, common interest groups and many other forms of community mobilization. This is especially important when innovations (such as conservation agriculture) are being promoted. User and supply chain associations are mutually supportive and can encourage would-be practitioners in the early stages of adoption.

- **Subsidies:** Depending on the status of the targeted community, there could be a need for initial support both in terms of technical skills and lower costs. This will be even more critical in the dissemination of technologies such as conservation agriculture which is still new among the service providers and the farmers. An exit strategy for this support would need to be put in place to ensure sustainability and limit the development of a dependency culture.
- **Promotion of the technology and services:** Marketing of the agricultural hire services on offer is a key aspect for market expansion. Hire service providers need to create room to display

and demonstrate their services by contributing to community or district farmers' forums, field days and agricultural shows. In this they should be supported by other supply chain actors, especially manufacturers and regional dealers.

■ *Technology*

The nature of the technology being offered in terms of hire service provision will determine the level of up take. When a technology is well promoted, acceptable and seen to provide better results than current practice, then the service provision of such a technology would be expected to expand rapidly within a short period and the entrepreneur would make a good profit to sustain the business. Taking an example for the purpose of illustrating the relevant factors, to support a particular technology like conservation agriculture and its related services, we would need to consider the following:

- What are the technologies?

Hire services which are related to conservation agriculture cut across all types of hire service provision i.e. human, draught animal and tractor powered.

- Are the proposed innovations profitable and/or superior to the conventional practice?

The profitability of conservation agriculture technology is seen from the fact that it is more diversified compared to conventional agriculture. Its superiority is also seen from the results in terms of increased yield, reduced labour and cost of production. Finally its positive environmental contribution is a very critical factor that would recommend it for national policy support.

- Are they acceptable (socially and technically)? Are they perceived as modern or outdated?

Conservation agriculture technology is seen by many farmers as a modern way of farming and a move away from drudgery and decreasing yields. While its uptake in other continents is high and continues to rise, adoption in sub-Saharan Africa countries has been slow, mainly as a result of social inclination and a fixed mindset that deems that ploughing is essential for good crop production. The message of

advising farmers to plant without ploughing seems unbelievable to many and since they are risk averse, they are hardly willing to experiment. However, in regions where awareness is high, support is abundant and farmers have tested and seen the result, the technology is socially and technically acceptable. Farmers in sub-Saharan Africa are at the beginning of the adoption curve and numbers can be expected to rise sharply in the medium term.

■ *Training*

Irrespective of the type of hire service involved, the expertise level in the support service provision is a very critical consideration for any aspiring hire service provider. This is as a result of the fact that more confidence would be instilled in entrepreneurs if they are sure that the expert offering the support service to their business is of high calibre. Depending on the proximity to city or town centres, the level of expertise in a given area will vary from place to place. Some larger established hire schemes are more vertically integrated and have integral support services hence are able to undertake quality control. Smallholder service providers however will usually have to rely on external support service providers,

especially at the initial stages of the business, which depending on their level of training may or may not offer adequate and reliable services.

It is still the case that one of the most effective means of disseminating information on good agricultural practices or innovative production systems is via the written word. Posters and information leaflets that give technical detail and step by step methodologies are of great value to extension workers and lead farmers alike. Public sector institutional support for the design, printing and distribution of such information can be a key factor in a scaling out programme.

Knowledge, know-how and technical information

The level of awareness and skills among farmers and extension staff in most of the communities is a big determining factor in the adoption of a technology. The awareness needs to be created through the active intervention of knowledgeable extension services, manufacturers, dealers and other supply chain actors.

Availability of technical information at the village level is critical to create awareness among farmers, policy-makers and business entrepreneurs. Links need to be developed with specialised knowledge

sources, for example the African Conservation Tillage Network (ACT) as the continental information hub on conservation agriculture².

The quality and accessibility of the information are crucial factors. Careful consideration must be given to the way in which information on conservation agriculture is packaged and presented. It must be straightforward, rigorously truthful and present the new practice in a straightforward, easy to follow, manner. It is, of course, essential to use local languages and the media by which dissemination takes place must be in tune with local custom. Hence written leaflets and manuals will be important, but so, too, will radio and television programmes where applicable. At some levels internet websites will be the most practical way of presenting technical and commercial information

As has been intimated previously, the dissemination approaches will need to be multi-pronged. It is important to involve all supply chain actors in the dissemination effort. The private sector (manufacturers, dealers, technical and financial support institutions) will need to play a greater role than has sometimes been the tradition. The public sector will play a key role through its extension service

². See <http://www.act-africa.org>

and through the facilitation of credit lines to hire eservice entrepreneurs. NGOs can also be expected to play a major role in the dissemination of technologies such as conservation agriculture which make good sense for the farm family, service provider and environmental protection.

Commercial and business skills

Business and entrepreneurial training is required alongside technical training in hire services. This will enable the hire service business not only to have more probability of survival over the long term, but also improved marketing capabilities and resulting profits. Business training may include such aspects as management, planning, record and bookkeeping, marketing and so forth. The public sector will have a large role in such training as many agricultural ministries will have experience in public hire service enterprises and the lessons learnt over time of the importance managing such hire services as a business. The public sector though also needs to encourage private sector participation, including manufacturers, to offer such business training.

■ **Financial services**

The public sector should encourage the establishment of small micro credit

schemes in the rural environment to support smallholder enterprises to deal with the high capital acquisition costs and acquire implements or inputs on credit including those for agricultural hire service provision.

Hire service providers require access to rural financial services to enable them to manage high-cost capital acquisitions for agricultural machinery (some examples are given in Table 10) or simply to get some working capital. However, an efficient, sustainable and widely accessible rural financial system remains a major development challenge. Poor access to farm credit and financial services has been identified as a contributing factor to the decline in agricultural productivity.

While banks have generally been unwilling to provide credit to smallholder farmers as a result of the perceived high risk, a number of key rural financial models are evolving to address the demand for rural financial services. These include: Savings and Credit Cooperative Societies (SACCOS) and using farmer groups (for example national and regional farmers' associations, etc.) as collateral for individual member's borrowing.

■ *Veterinary services*

When animals are used as a source of power to pull transport vehicles or for farm work, they will also need to be maintained just as is the case with tractors and implements. Veterinary

TABLE 10 Some indicative prices for a range of agricultural equipment

Equipment	Indicative price (US\$)
50 hp tractor	30 000
3 furrow disc plough	1 200
Tractor mounted boom sprayer	1 300
Tractor mounted no-till planter	9 500
DAP no-till planter	1 000
DAP boom sprayer	1 300
Pair of draught oxen	1 000
Manual jab planter	45
Manually pulled sprayer	500

officers or farmers trained to provide veterinary services (commonly known as para-vets) will need to be in place to provide this essential service. Farmers providing equipment hire services based on animal power will need to get training on basic animal management skills including feeding, watering, work/rest routines, treatment of minor ailments, harnessing and handling to ensure their source of power is available all year round. Traditionally the public sector has been the main provider of such services but the private sector is increasingly being encouraged to offer them on a commercial basis.

■ *Institutional role*

Interventions need to not only consider economic aspects, but just as importantly other aspects of policy such as easing technology transfer by promoting innovations through such avenues as field demonstrations. Support should be provided to research institutions so that they can involve farmers in testing new technology. In the same way the relevant public sector institutions can play a useful and important role in creating a training infrastructure (for the technical and business skills which have earlier been discussed in detail). It will often be the case that private sector technical personnel are

better placed to deliver such training, but its organization and financing will usually be a public sector responsibility.

The role of public institutions in supporting hire service enterprises is multiple and should be encouraged to promote improved rural livelihoods in a region or country. In certain situations agricultural service providers can also be employed by other industries such as road building and maintenance and even the construction industry when it is executing suitable projects in the rural sector. Most of this work will be in material transport and so tractors and trailers are likely to have a high potential in this regard.

The creation of an enabling environment is an important role for the public sector. And this crucially involves the provision of adequate infrastructure, especially roads for transport but also basic utilities such as electricity and water, which are, of course, basic requirements for the development of the whole rural sector and so should always enjoy a very high priority.

Challenges

A hire service enterprise, like many other diversification enterprises focused on small-scale farmers, has its associated challenges. These are particular to such types of enterprise and need to be considered, alongside the support services that are required to promote them, in the formulation of development strategies and plans targeted at rural and peri-urban areas.

■ *Which hire service?*

One of the first challenges and probably the most decisive one is ‘What service to offer?’ This challenge is usually viewed from a market perspective. What is the market demand for such a service in the local area? What equipment do small-scale farmers already own in terms of tools and implements, draught animals and machinery? And what can be bought locally and is within reach of small-scale farmers’ budgets?

■ *Equipment acquisition*

Small-scale farmers who do not own tools, equipment, draught animals and machinery; and those

who may want to add to their hire service assets will need to be able to access them locally, have money to be able to buy them and, where needed, be supported by necessary services (spare parts and veterinary services, for example). There is also a need for training both in the use of equipment and this has to be provided, especially with more complex machinery; and also in how to train livestock to become draught animals, for example.

■ *Access to credit*

The promotion and encouragement of credit services along with privately owned input supply chains is not a panacea in the sense that such services do not remove the problem of capital accumulation for machinery purchase. But such services do not only support hire service enterprises in the local area, they also create markets and jobs for others who are directly and indirectly involved in the input supply chain and credit services.

Credit institutions also need to be encouraged to have more outreach into rural and remote areas and also to provide financial

products that cater both for the particular input needs of the small-scale farm sector and the necessities of buying assets such as tools and draught animals, which usually require differing credit instruments.

■ *Repair and maintenance*

As seen in the previous chapter there is a strong linkage between repair and maintenance services and hire services, be this devoted to equipment, tools and machinery or veterinary services for draught animals. On one side there is good potential to train small-scale farmers in repair and maintenance of equipment as well as basic health care for draught animals. This should focus on preventive measures rather than curative methods in areas where professional veterinary services do not exist or are difficult to access or are deemed to be too expensive. On the other side it may be viable to enhance, encourage and promote existing repair and maintenance services as well as veterinary and/or para-veterinary services in an area where these are non-existent or scarce.

National manufacturers need to be encouraged to extend their distribution networks as well as their

product research and development activities. Public research institutes need to be encouraged to form public-private partnerships with private manufacturing companies, especially in terms of development, testing and demonstration. Private animal breeding services may also be required to extend their distribution networks and also form public-private partnerships for improved draught species that are stronger, healthier and more robust. Traders and dealers need to be encouraged to extend their trade, especially in the after-sales service sector and be able to provide not only spare parts and technical know-how, but also training courses. This training could be provided in unison with any public training organizations that may exist.

■ *Infrastructure*

Poor rural infrastructure, especially with regard to road quality, can be a major challenge to hire service providers. It is clear that transport costs between farms, fields and markets will need to be factored into the pricing of the service, and if the transport costs are too high then the feasibility for providing such a service declines as profits will be reduced by higher costs (see Figure 25).



*FIGURE 25 Poor rural infrastructure can increase operational costs dramatically
(Photo by B. .Sims)*

It has been seen in the development of countries emerging from the soviet era in Europe and Asia that the quality of road infrastructure has a marked influence on the demand for investment in agricultural machinery (World Bank, 2009). Better infrastructure has resulted in better access to fields and markets and has increased the role of, for example, farm machinery in the transport of products and inputs.

Roads are not the only important infrastructural concern for a hire service enterprise. For an enterprise to thrive there is a need for an attractive environment for rural entrepreneurs

to operate: development of a market, along with the crucial power and telecommunications infrastructure. The public sector has a major role to play in providing all of these components, except, perhaps, for telecommunications which have prospered well enough under private sector control.

■ *Sustainability of the enterprise*

Hire service providers require a clear idea of the costs involved for business success. This is fundamental as the cost burden of assets for hire services for small-scale farmers can be considerable. It is commonly the

case that this is frequently an area where deficiencies abound. Correctly calculating the costs of service provision is one part of the equation; another is correct assessment of the market. Experience relates that costs are often under-estimated and potential income over-estimated. The result can be an unviable business plan and financial disaster.

This constitutes an important challenge and is an area where the public sector can encourage the development of entrepreneurial activity by providing basic business skills training to small-scale farmers as well as others involved in the input supply chain. The public sector importantly also needs to encourage the private sector to become involved in business skills training.

It is important to keep in mind that the small-scale farmer is part of a supply chain. The service provided must be timely and of good quality. And the service can only be sustained if the contractor can count on parts and service back up when needed. The quality of the service being provided is an aspect requiring constant vigilance. It is clear that a farmer client will not come back for more of the same if crops do not emerge, weeds and pests are not controlled or if the transport service fails to get the goods to market on time.

Maintaining the quality of a service means making sure that farmers' needs are fully met and this requires a good communication network between service provider and farmer client. It also means that the communication network should include other stakeholders, and especially the agricultural extension service.

Another challenge to the sustainability of hire service contractors endeavouring to offer technical solutions for environmentally and financially viable agriculture will be if the agricultural extension service is lagging behind in this technical area. There are many cases of extension messages being at odds with the thinking of progressive farmer groups, NGOs and other rural development organizations, with the extension officers continuing to recommend the use of disc ploughs and harrows while others are trying to reverse the processes of soil degradation with conservation farming practices.

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Sources of further information and support

Food and Agriculture Organization of the United Nations

Agricultural Mechanization

<http://www.fao.org/ag/ags/agricultural-mechanization/en/>

Food and agricultural industries

<http://www.fao.org/ag/ags/food-and-agricultural-industries/en/>

Post-harvest management

<http://www.fao.org/ag/ags/post-harvest-management/en/>

Rural infrastructure

<http://www.fao.org/ag/ags/rural-infrastructure/en/>

Notes

Hire services have the potential of providing improved livelihoods to small-scale farmers the world over. These services can reduce drudgery, expand or intensify crop production, contributing to food security, reduce production, post-harvest and marketing costs and increase smallholder incomes.

The booklet is intended to raise awareness and promote hire services as a viable smallholder enterprise among policy-makers, development specialists and others involved in development programmes.



ISBN 978-92-5-107072-7 ISSN 1810-0775



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I2475E/1/11.11