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TRAINING MANUAL

Business Management of Custom Hiring of Agricultural Machinery in the Dry Zone

Funded by

LIFT
Livelihoods and Food Security Trust Fund

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TRAINING MANUAL

Business Management of Custom Hiring of Agricultural Machinery in the Dry Zone

Developed as part of the project

An Integrated Rural Economic and Social Development Programme for Livelihoods Improvement in the Dry Zone of Myanmar

Funded by

Livelihoods and Food Security Trust Fund

Design: Fransisca A. Wijaya, CAPSA-ESCAP
Cover Photo: Centre for Sustainable Agricultural Mechanization (CSAM)

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Abbreviations

AMTs	Agricultural Mechanization Technologies
CHS	Custom Hiring Services
CSAM	Centre for Sustainable Agricultural Mechanization
DS	Dry Season
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
IP	Intellectual Property
IPR	Intellectual Property Rights
IT	Information technology
LIFT	Livelihoods and Food Security Trust Fund
NGOs	Non-governmental Organizations
POs	Private Organizations
RDE	Research and Development Extensions
WS	Wet Season

Foreword

Agriculture in Myanmar can be characterized as smallholder agriculture, where about 3.6 million hectares of agricultural land is cultivated by small-scale farmers. The average size of the holdings in the country is 2.21 hectares, whereas the average farm size in the Dry Zone is below the country's average, at only 1.8 hectares. Climate and environmental stress are among the main drivers of the migration of farmers for employment, thereby reducing the availability of younger farmers for farm work during the peak agricultural season. Coupled with a lack of financial resources and the necessary technical skills, labour scarcity in the Dry Zone serves as an incentive for farmers to move towards custom hiring of agricultural machinery.

Custom hiring is a proven good practice; it enables farmers, particularly smallholders, to benefit from agricultural mechanization. It provides farmers with access to agricultural mechanization so as to reduce drudgery and production costs, improve production performance and increase farm operation efficiency. Besides, custom hiring of agricultural machinery facilitates alternative income opportunities for entrepreneurs. Custom hiring is becoming a common phenomenon in the Dry Zone. Irrespective of the farm size or the farming system, farmers generally utilize custom hiring services. Nevertheless, there appears to be a general lack of up-to-date databases/statistics, repositories or comprehensive reports on the overall situation of agricultural machinery, mechanization needs specific to localized challenges, custom hiring and users' feedback on the existing hiring systems. Farmers usually lack the knowledge and technical skills necessary to operate the machines they hire, which either results in an inefficient utilization of the machines or makes the farmers dependent on externally hired operators to do the job for them, who are also not fully trained for efficient utilization of those machines. In most cases, the potential efficiencies of the machines are not realized.

This training manual has been produced by the Centre for Sustainable Agricultural Mechanization under a project supported by the Livelihoods and Food Security Trust Fund (LIFT). We sincerely hope that it will serve as a valuable knowledge resource for practitioners and entrepreneurs who would like to start or improve their custom hiring business operations in Myanmar. The manual will support their efforts to promote sustainable and climate-resilient agriculture in the Dry Zone.

December 2016

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The lecture document on *Business Management for Custom Hiring Services of Agricultural Mechanization Technologies: Theories and Concepts*, developed by Dr. Rossana Marie C. Amongo, Director of the Institute of Agricultural Engineering & College of Engineering & Agro-industrial Technology of the University of the Philippines Los Baños under a consultancy assignment with CSAM, and the case-sharing documents from three international resource persons presented during the workshop provide the main references for compiling and developing this training manual. Ms. Lian Zhang, Operation Facilitator of CSAM compiled and edited the workshop materials and developed the manual.

We thank the European Union and governments of Australia, Denmark, France, Ireland, Italy, Luxembourg, the Netherlands, New Zealand, Sweden, Switzerland, the United Kingdom, the United States of America for their kind contributions to improving the livelihoods and food security of rural people in Myanmar. We would also like to thank the Mitsubishi Corporation, as a private sector donor.

Executive Summary

This training manual summarizes theories and concepts on business management of custom hiring of agricultural machinery, and offers practical instructions to entrepreneurs in the Dry Zone to start up or improve such business operations. Three cases from Asia-Pacific entrepreneurs are also presented as a reference.

The operation of custom hiring services requires business management skills and an understanding of the framework of custom hiring of agricultural mechanization. Three aspects need to be considered in this process: technical, social and economic. The process of commercializing custom hiring services involves five main subprocesses (imagining, incubating, demonstrating, promoting, sustaining) and four bridges (mobilize interests, resources, market and assets).

A good business in custom hiring of agricultural mechanization should be profitable, easy to implement (given an enabling environment) and require minimal capital investment. Enabling factors in commercializing custom hiring services include technology commercialization, level of business interest, the market, intellectual property issues and financial and investment management. The absence or lack of support from key players for custom hiring services could impose barriers to this process. A business plan covering ten components is essential for starting such a business.

Three cases from China, India and the Philippines related to this topic are recorded. The Gifore Agricultural Machinery Company of China is following a business model called 'Financial Lease for Agricultural Machinery', which is designed to meet the capital demand of end users by providing financial assistance for machinery purchasing. There are six processes in this operation, and risk management and assessment is essential.

Zamindara Farm Solution of India started to operate custom hiring services in 2003-2004. Two business models are presented for this company: the library mode, where the farmers operate the machines by themselves, and the radio taxi model, where the company rents the machines together with the driver and fuel. Difficulties and recommendations are listed, together with challenges and benefits.

Zantander Trading and Engineering of the Philippines provides custom hiring services, mainly for land preparation on wetland/upland paddy field utilizing mostly light equipment, such as power- and hydro-tillers. The working calendar, together with its cost calculation, is recorded.

1 Introduction

1.1 Objectives

This training manual aims to provide practical instructions, theories and concepts on how to start/improve the businesses in custom hiring services for agricultural machinery in the Dry Zone. Three business cases from China, India and the Philippines are shared to provide references and snapshots of regional practices in this area.

Through the training material, the trainee is expected to be able to:

- Discuss the importance of custom hiring services (CHS) of agricultural mechanization technologies (AMTs) in the agricultural production system
- Explain the processes involved in commercializing the CHS of AMTs
- Analyse the key considerations in establishing and managing the CHS of AMTs
- Draft a sample business plan for CHS of AMTs.

1.2 Definition of business management

Business management includes the alignment and coordination of multiple activities in running a business. Business owners use management skills to accomplish the goals and objectives of the business. Business management skills are needed to run a successful business.

Running a business requires skills in:

- Sales and marketing
- Accounts
- Human resources
- Information technology (IT)
- Communication and negotiation
- Knowledge of business legal issues.

To run a business you need to **PLAN** ahead.

1.3 Business management skills

a) Sales and marketing
This involves selling and promoting your product or services. It also includes the identification of your customers and their preferences so you can target your product and services.

b) Accounts
When you think of a business, you think of how to make a **PROFIT**. Good financial management is essential to ensuring a successful business. You must understand your financial statements.

c) Human resources
Human resources include the management of the people involved in running your business. You must look after them, ensuring their compensation, health and manpower development.

d) IT
You must keep yourself up-to-date with the latest technology relevant to your business.

e) Communication and negotiation skills
Business entails **PEOPLE**! Developing your communication and negotiation skills will be important in having a successful business. They will help you in negotiating contracts and persuading difficult customers.

f) Knowledge of business legal issues
Business always deals with legal issues (e.g. industry regulations, tax requirements, industrial relations, business structures, etc.). You should be aware of these issues before you start your business.

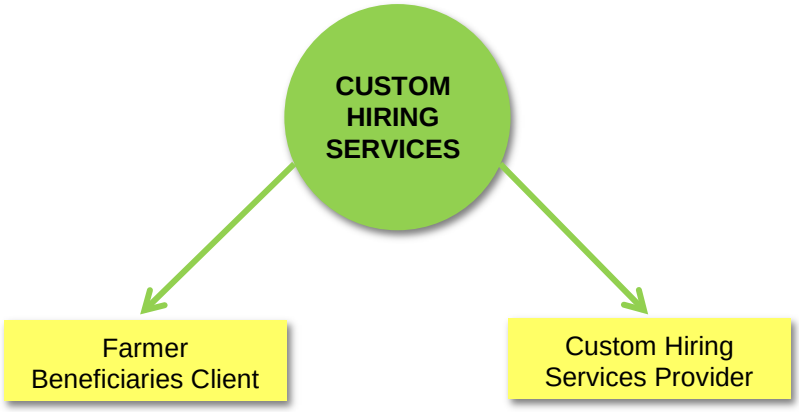
1.4 Custom hiring services (CHS) of agricultural mechanization technologies (AMTs)

The custom hiring services for agricultural mechanization technologies (CHS for AMTs) should be operated as business enterprises that provide the following services:

- After-sales service and warranty for their respective clients
- Custom ploughing, harrowing, harvesting, drying, milling and other farm mechanization services
- Repair and troubleshooting services of agricultural and fishery machinery and equipment
- Training in maintenance and proper use of agricultural machinery and equipment.

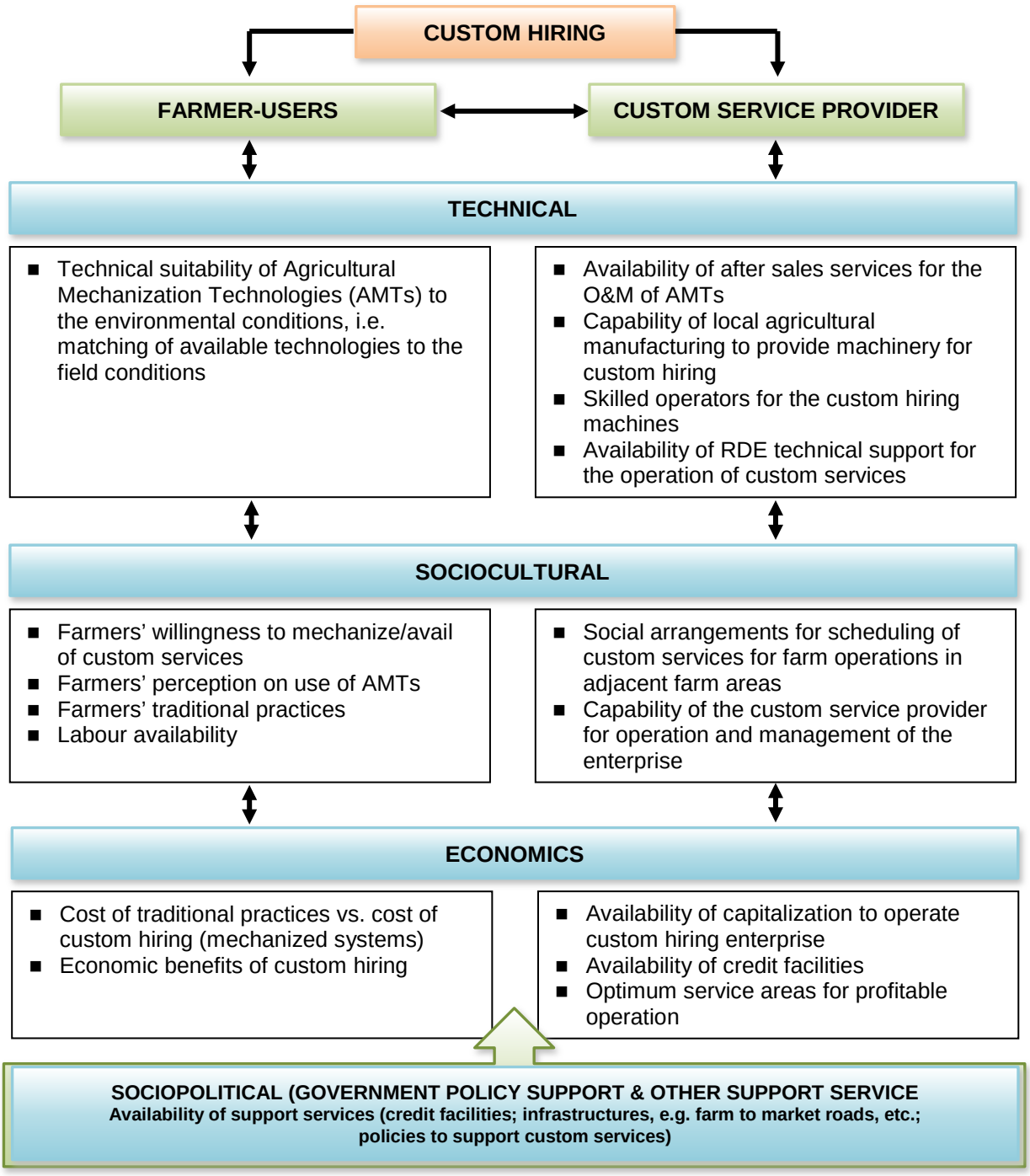
The basic business structure and the conceptual framework for CHS of AMTs are shown below.

Figure 1.1 Custom hiring services business structure



There are three aspects to be considered in the custom hiring business: technical, social and economic. The details on each of them from the perspectives of the service provider and the user are shown in Figure 1.2. It is essential for business operators to familiarize themselves with the details in the figure, as they are the key to business success in managing a custom hiring service of AMTs.

Figure 1.2 Conceptual framework for custom hiring services of agricultural mechanization technologies



Source: Amongo & Larona, 2014

2 The Process of Commercializing CHS of AMTs

2.1 Definition

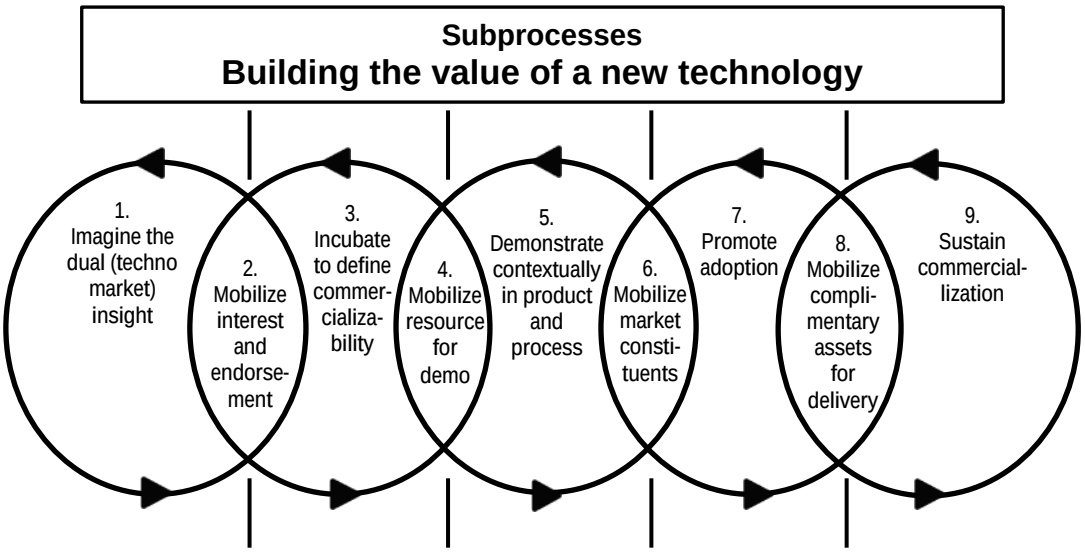
The commercialization process of CHS of AMTs involves converting technology to wealth. There are two main processes: knowledge and understanding. The former is the ability to predict and the latter is the ability to make it happen.

Technology commercialization is conceived as a sequence of distinct subprocesses. As Jolly, Vijay K. stated in *From Mind to Market* in 1997, “It permits the use of a sequential investment decision framework based on options theory, which is best suited for accommodating the long-time horizons and the nature of the risks involved.”

2.2 Characteristics of the process of commercializing CHS of AMTs

The commercialization process involves a subprocess of activities wherein each stage accepts an input and adds value to the input to create an output. The areas involved include manufacturing, sales, funding, management, team, technology and marketing. The process of technology commercialization is shown as below.

Figure 2.1 Subprocesses, building the value of a new technology



Source: Jolly (1997)

The characteristics of the process include:

- Each stage or subprocess is an independent go or no-go decision. Each stage increases investment and the investments should match the value created.
- Uncertainty is high throughout the commercialization process and the sources may change from time to time.
- The value of the technology is measured by what stakeholders perceive.
- The research at each stage must interest the stakeholders where the researchers must manage the expectations of the stakeholders.
- Current information is used to judge the technology at each stage.

There are five main subprocesses (1, 3, 5, 7, 9) and four bridges (2, 4, 6, 8) in this process. Details on each of them are as follows.

2.3 The subprocess in commercializing CHS of AMTs

a) "Imagining" subprocess

- Listing possible ideas
- Rejecting unrealistic ideas
- Judging ideas subjectively
- Deciding on technical merit or market factors
- Choosing the least cost investments

b) "Incubating" subprocess

- Defining technology commercializability
- Bringing additional stakeholders into the process
- Estimating market opportunities over time
- Forecasting development of other technologies
- Engaging agents
- Beginning of greater investments in the technology

c) "Demonstrating" subprocess
- Developing the product/services to a commercially feasible stage
- Considering complementary technologies
- Considering expanding the scope of the technology/services beyond initial forecasts
- Developing with the commercial end- markets in mind

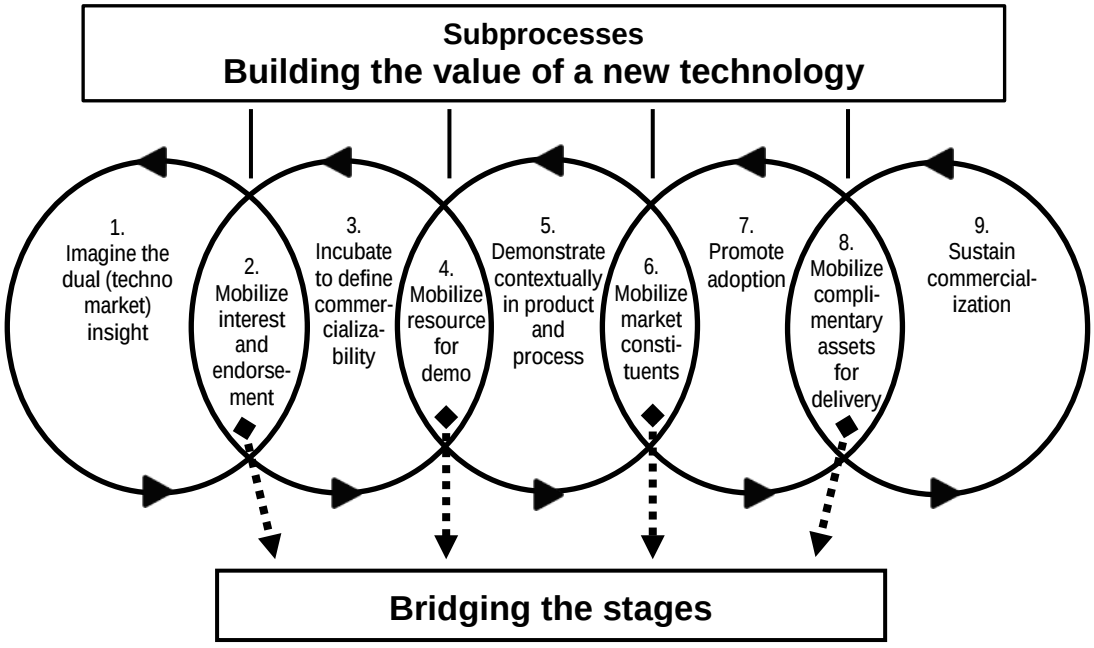
d) "Promoting" subprocess
- Realizing that market acceptance is never assured
- Being aware that ideas that fail at this stage (and beyond) can result in large sunk costs
- Noting that promotion can go beyond the particular technology
- Noting possible infrastructural barrier

e) "Sustaining" subprocess
- Sustaining market presence as key to realizing the value from a technology
- Sustaining means:
  - Planning of commercialization activities
  - Constantly improving price and performance
  - Paying attention to competitors

f) Bridging the stages

"The bridges evoke an important reality about the innovation process – that it is fundamentally an exercise in stakeholder management."
(Jolly, 1997)

Figure 2.2 Bridging the stages



Bridging the stages:

- Reaching out
- Interesting others
- Influencing stakeholders and customers
  - Early bridges: Transferring technology
  - Later bridges: Selling and distributing
  - Marketing is always included in these activities
- Mobilizing the interest of stakeholders
- Mobilizing resources to continue the commercialization process
- Mobilizing market constituents
- Mobilizing complementary assets for delivery

3 Technology Opportunities

3.1 Opportunities of CHS of AMTs (identification, evaluation and selection)

Good ideas are not necessarily good opportunities. The idea of CHS of AMTs is an opportunity if it is:

- Attractive
- Durable
- Timely
- A service which creates or adds value for its end user.

An **opportunity** is a favourable set of circumstances that creates a need for a new product, service or business. A **business venture** should capitalize on an opportunity when the "window of opportunity" is open.

Window of opportunity is the period in which a company can enter a new market. For a new product or service, the window of opportunity opens and new players come in. When the market matures, the window of opportunity may close.

a) Idea versus opportunity
   - An idea is a thought, impression or notion, which may or may not meet the criteria of an opportunity.
   - Many businesses fail because there was no real opportunity to begin with.

b) Opportunity versus personal characteristics

Figure 3.1 Opportunity recognition

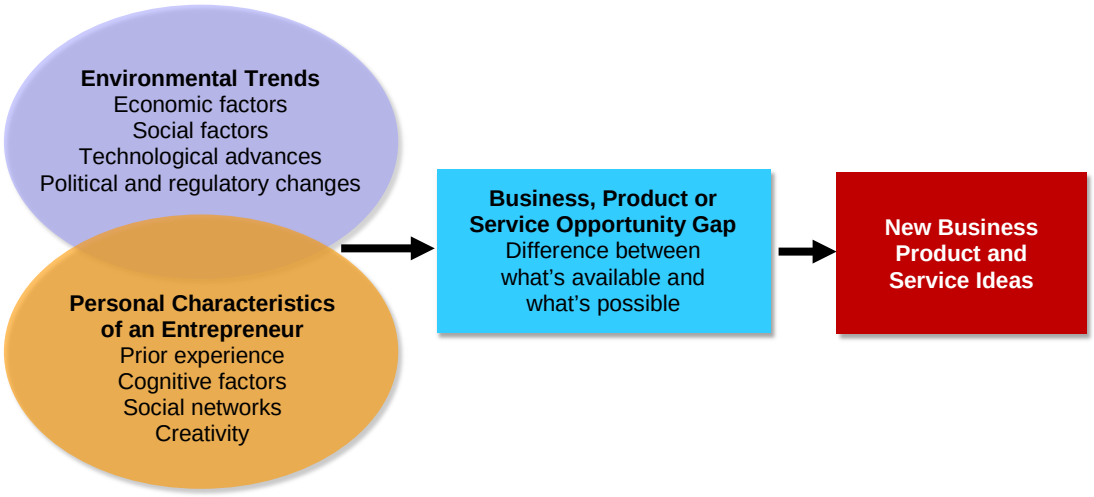
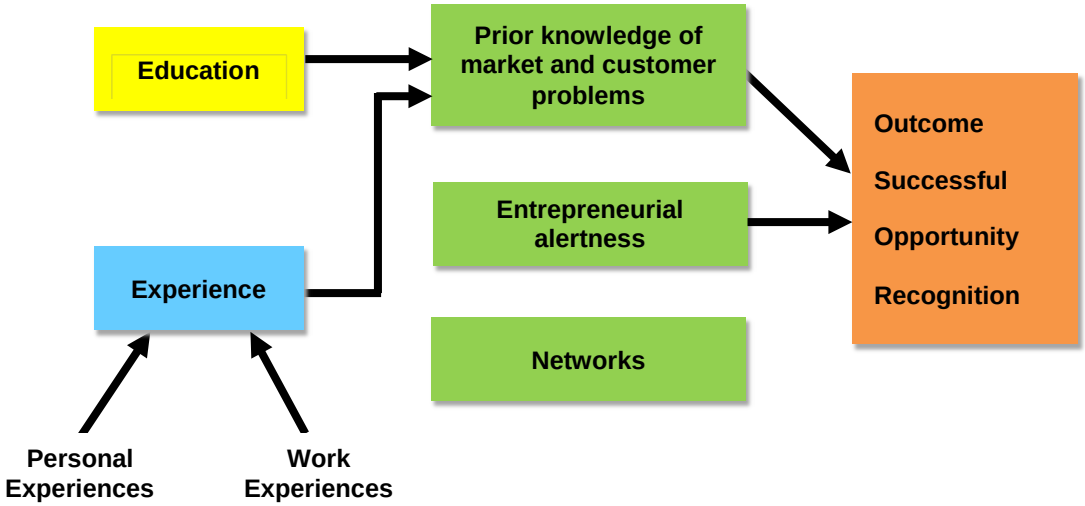


Figure 3.2 Personal characteristics



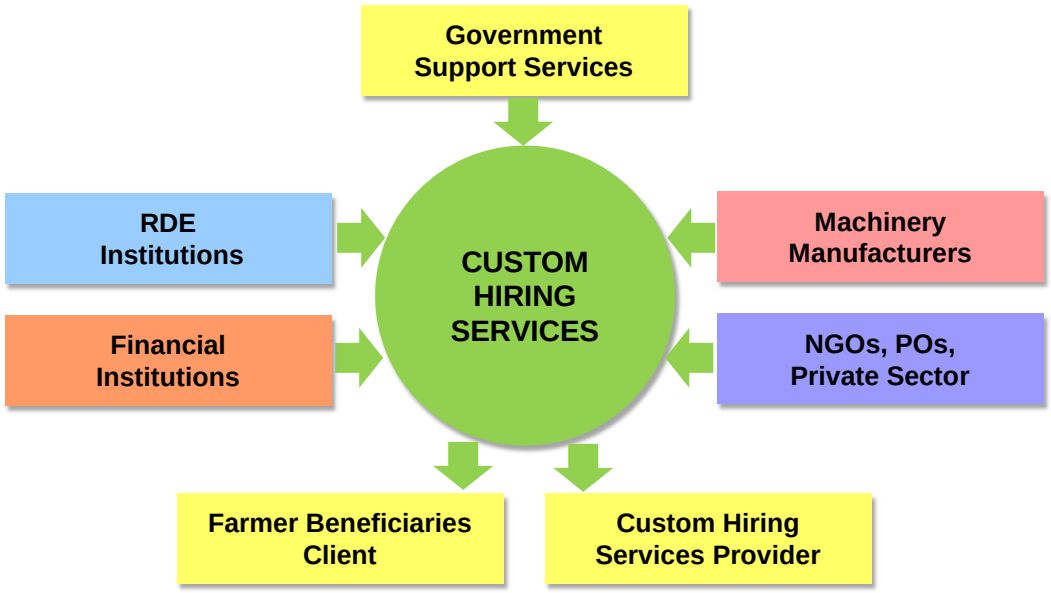
Source: J.M. Pant, undated

3.2 Characteristics of a good business on CHS of AMTs

- CHS of AMTs should be profitable.
- CHS of AMTs should be easy to implement given an enabling environment.
- CHS of AMTs, when implemented, should require minimal capital investment.

a) Enabling environment

Figure 3.3 Enabling environment for custom hiring services



b) Substantial market
- Services must appeal to a large market.
- Similar services indicate a substantial market.
- Who and where are the stakeholders/customers?

Remember: No customers → No sales → No business → **NO PROFIT**

c) Existing technology
- You must know the appropriate technology for the service area.
- New technologies are expensive and are cost-prohibitive.
- Technologies should be user-friendly.
- Consult experts for advice.

d) Acceptable service price
- How much will the services cost?
- What margin are you looking to achieve?
- Compare your service price to similar/existing projects.

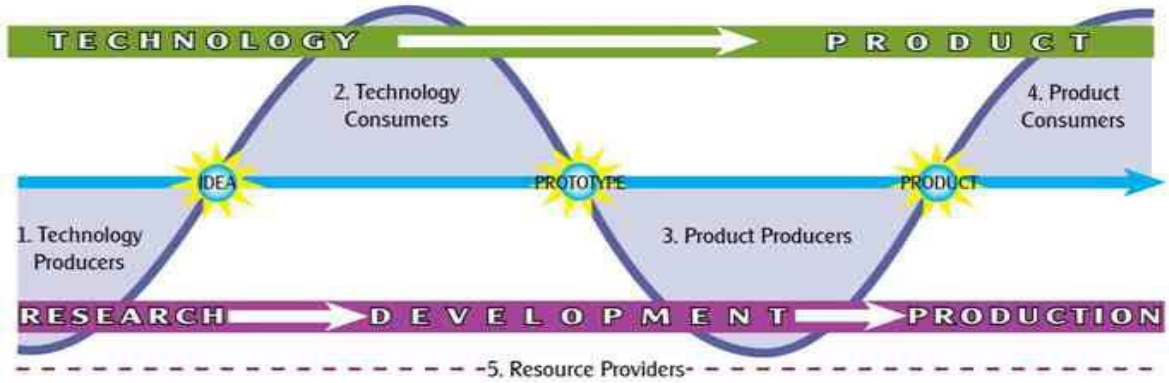
e) Easy to explain
- Sell benefits that motivate your potential stakeholders/adopters.
- Describe the benefits of the services to be rendered.

4 Enabling Factors and Barriers in Commercializing CHS of AMTs

4.1 Commercializing CHS of AMTs

a) Technology commercialization

Figure 4.1 Technology transfer model

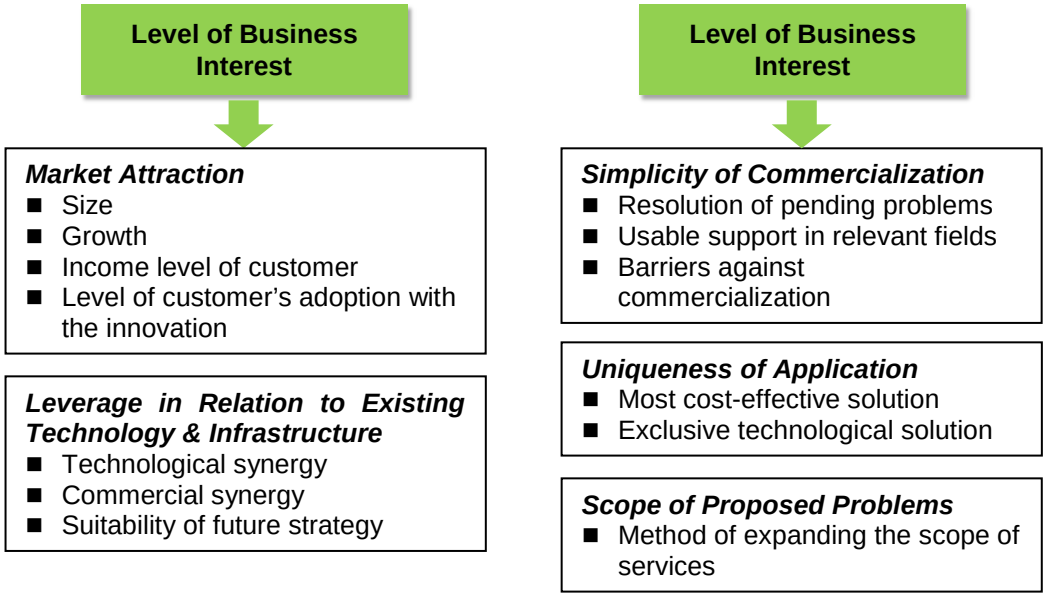


Source: Leahy and Lane (2010)

Transforming ideas into useful products or services can contribute to the development of a country. Technology commercialization is only effective given an **ENABLING ENVIRONMENT** for technology transfer.

b) Level of business interest versus commercializing possibility

Figure 4.2 Level of business interest versus commercializing possibility



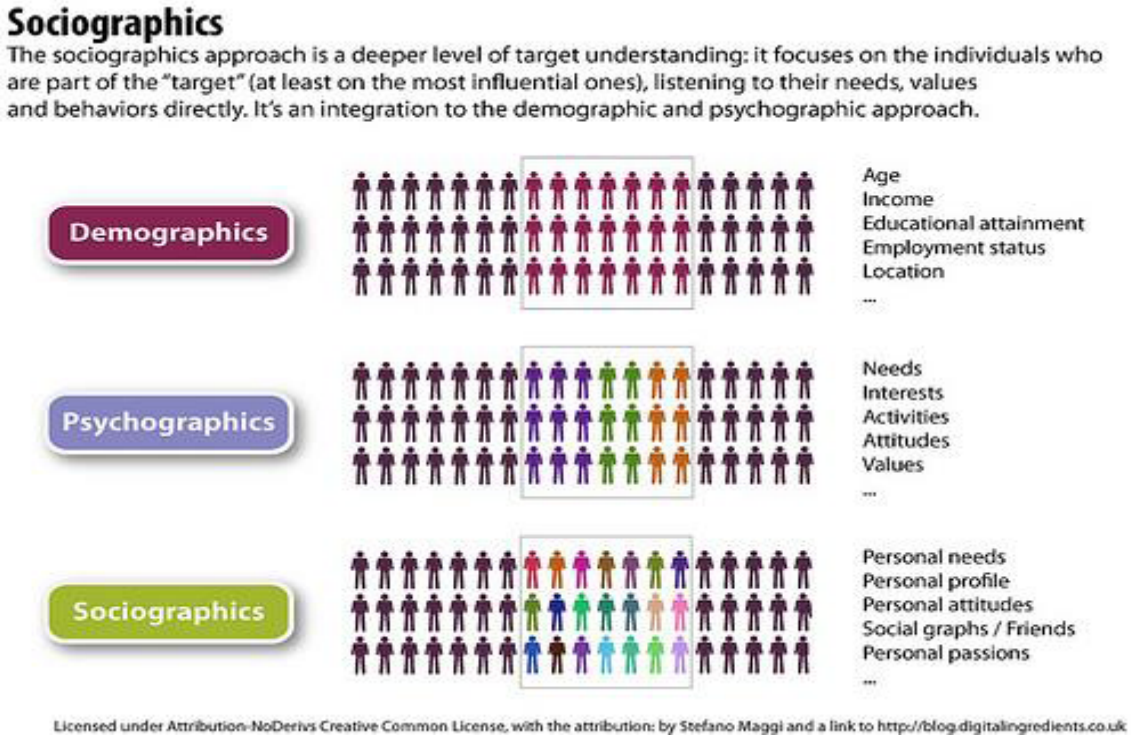
4.2 Choosing the market

Your idea is a successful business opportunity if anchored to a **SERVICE that adds value to the CUSTOMER (MARKET) where demand (sales) is high and sustainable (to earn profit).**

Key factors to be considered:

a) Who will use the CHS of AMTs? On whom do you now test your ideas?
Simplify your target market: WHO?

Figure 4.3 Sociographics



b) Simplify your target market: WHERE

Concepts: Geographics

i. Macromarket
ii. Micromarket.

Always narrow down your market. The advantages are:

- Existing players are not directly competitors
- Limited funding is focused on a small profitable project.

4.3 Intellectual property issues (e.g. patents, licences, etc.)

Intellectual property laws are enacted to safeguard the rights of creators and other producers of intellectual goods. Intellectual property (IP) refers to any creation of human mind or intellect. Intellectual property rights (IPR) refer to the legally secured rights of the person holding the IP to benefit from his/her work/invention and investments.

Major categories of IP

a) Industrial property

i. *Patents* are protection against unauthorized use of a product or process.
ii. *Utility models* are inventions in the mechanical field which are useful and new, but the inventive step or technological progress involved is much less than those of patented inventions.
iii. *Industrial design* is the original ornamental and non-functional features of the article or product as a result of the design activity. The aesthetic appeal, not the technical performance, is the subject of legal protection.

iv. *Trademarks* individualize a product enabling consumers to distinguish one product or service from another. Trademarks must be distinctive and must not be deceptive or contrary to morality or public order.

b) Copyrights and other related rights

Copyright laws protect the form of expression of ideas, not the ideas themselves. Copyright owners are protected against those who take and make use of the work in the original form (e.g. books, pamphlets, drawings, illustrations, photos, computer programmes and other literary, scientific and artistic works including multimedia presentations) by which the ideas were expressed.

4.4 Financial and investment management

a) Benefits and costs of machinery operation

i. *Fixed costs* are expenses incurred regardless of whether the machine is operated or not:

- Depreciation
- Interest on investment
- Shelter
- Taxes and insurance
- Repair and maintenance.

ii. *Variable costs or Operational costs* are expenses incurred as a result of machine operation:

- Fuels and oils
- Labour/wages
- Other inputs.

b) Capacities and coverage areas

i. Rate of work in the field (capacity)

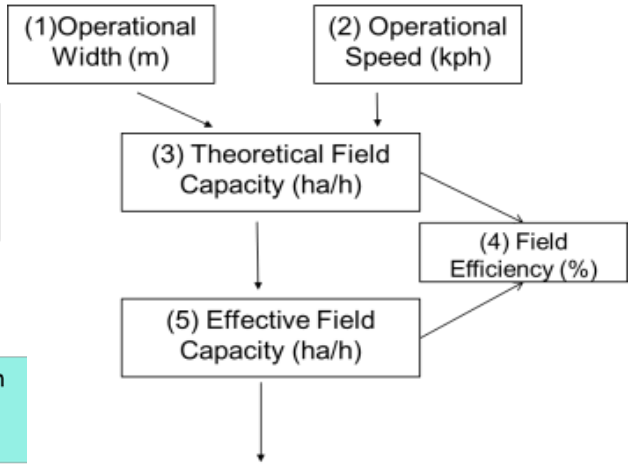
Figure 4.4 Rate of work in the field (capacity)

$$TFC = \frac{SWEFF}{10}$$

where: TFC = Field Capacity, Ha/h
S = Speed, Kph
W = Width of cut, m
EFF = Field Efficiency, decimal

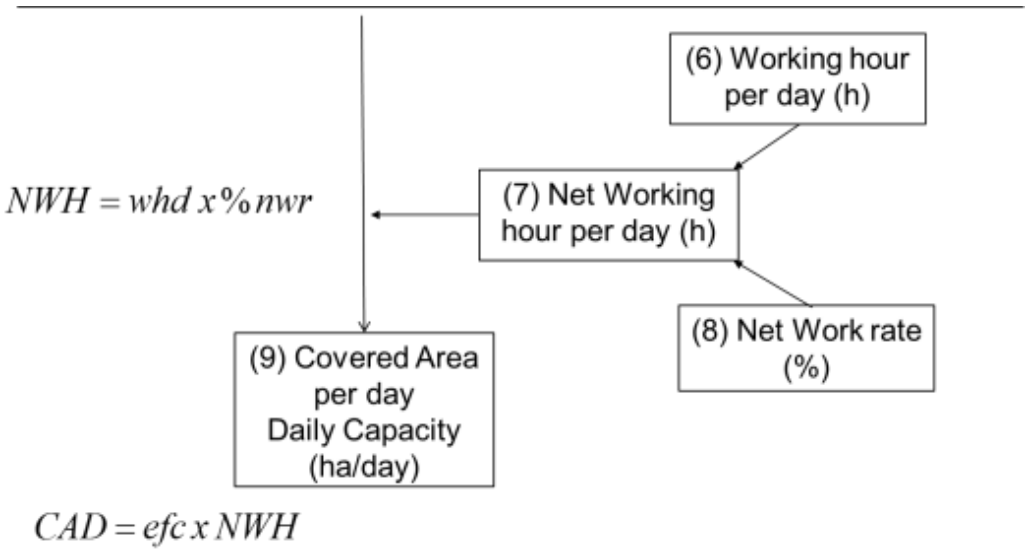
$$EFC = \frac{A}{T}$$

where: EFC= Actual field capacity, Ha/h
A= actual worked area, ha
T= time to work the area, T



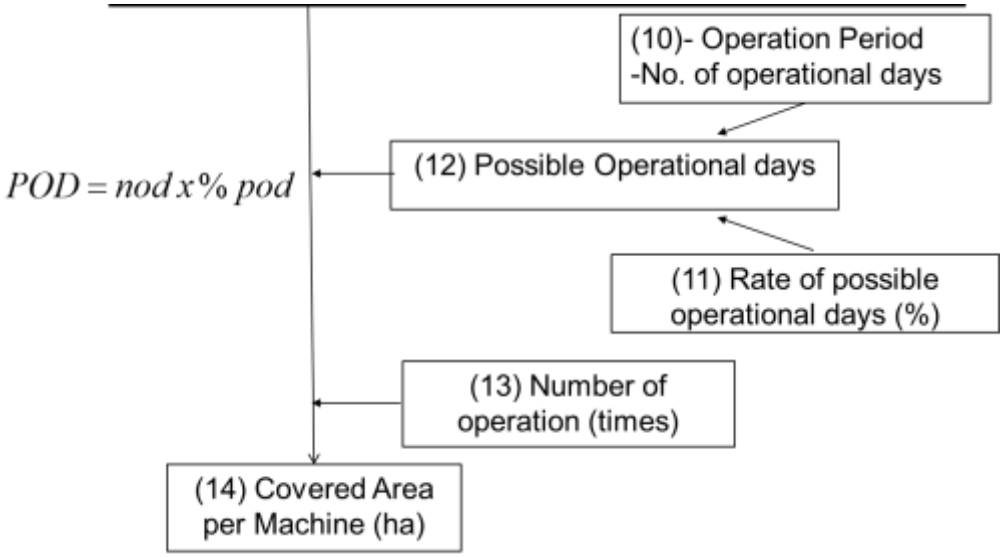
ii. Operation area/day (daily capacity area)

Figure 4.5 Operation area/day (daily capacity area)



iii. Operational days-coverage area

Figure 4.6 Operational days-coverage area



iv. Exercises

Exercise 1. Capacities of machinery

FARM OPERATION	AGRICULTURAL EQUIPMENT AND MACHINERY	Field Capacity					Daily Covered Area				
		Working Width (m)	Operating Speed (km/h)	Theoretical Field Capacity (ha/hr)	Field Efficiency (%)	Actual Field Capacity (ha/hr)	Working Hours per day (h)	New Work Rate (%)	Net Working Hours (hr/day)	Net Working Hours (hr/day)	Daily Capacity (ha/day)
	Four-Wheel Tractor	-	-	-	-	-	-	-	-	-	-
Land Preparation	Disc Plow	1.0	5.0								
	Rotary Tiller (1st Pass)	1.6	5.0								
	Rotary Tiller (2nd Pass)	1.6	6.0								
Transplanter	Self-propelled Rice Transplanter	1.8	5.0								
Crop Protection	Knapsack Power Sprayer	8.0	1.2								
Harvesting and Threshing	Combine Harvester	2.0	4.4								

Table 4.1 Sample machinery field efficiency

Name of works	Equipment	Field efficiency (%)			Remarks
		Low	Standard	High	
Fertilizer application	Manure spreader	20	30	40	Including the feeding and transporting
	Lime sower	40	50	60	
	Broad-castor	45	55	65	
Sowing and fertilizing	Grain drill (Drill seeder)	54	65	76	Power driven (working type)
		30	45	60	Direct mounted type
		38	52	66	Traction type
Pest and disease control	Knapsack type power duster	35	50	65	Dusting
	Power sprayer	35	50	65	Used horizontal nozzle
		24	35	46	Swath-nozzle
	Power duster	35	50	65	
	Manual hand sprayer	37	54	71	
Reaping and binding	Reaper binder	47	65	83	
Threshing	Self-propelled power thresher	47	65	83	
Harvesting and threshing	Head-feeding type Combine	34	50	66	Including harvesting by hand in corner
		51	65	79	Not including by hand harvest
	Standard type Combine	43	55	66	

Source: JICA-TBIC (2001)

Exercise 2. Coverage area of machinery

FARM OPERATION	AGRICULTURAL EQUIPMENT AND MACHINERY	Coverage area of the machine						
		Working Width (m)	Operating Speed (km/h)	Operating Period (days)	Rate of operation Days (%)	Possible operations Days	No of Times of operation	Coverage Area per Machine
Land Preparation	Four-Wheel Tractor	-	-					
	Disc Plow	1.0	5.0					
	Rotary Tiller (1st Pass)	1.6	5.0					
	Rotary Tiller (2nd Pass)	1.6	6.0					
Transplanter	Self-propelled Rice Transplanter	1.8	5.0					
Crop Protection	Knapsack Power Sprayer	8.0	1.2					
Harvesting and Threshing	Combine Harvester	2.0	4.4					

c) Choosing the appropriate technology

i. Matching the power rating (e.g. tractors)

$$Hp(tractor) = \frac{Hp(draft)}{0.80}$$

where: *Hp* (draft) is the power needed to work the soil, *Hp*

$$Hp(draft) = \frac{D_a xS}{274}$$

where: D_a is the adjusted draft, kg
S is the speed, km/h

$D_a = D_s \times$ % adjustment (speed)

where: D_s is the draft required to work the soil, kg

$D_s = SD \times w \times d$

where: *SD* is the specific draft of soil, kg/cm^2
w is the effective working width, cm
d is the depth of cut, cm

Table 4.2 Specific draft of different soils

Soil Type	Specific Draft, SD	
	kg/cm^2	(Lbs/in^2)
Sandy soil	0.21	(3)
Sandy loam	0.21 - 0.42	(3-6)
Silty loam	0.35 - 0.49	(5-7)
Clay loam	0.42 - 0.56	(6-8)
Heavy clay	0.70 - 0.77	(10-11)
Virgin soil, clay	0.85 - 1.06	(12-15)
Gumbo, moist	1.13 - 1.27	(16-18)
Dry adobe	1.27 - 1.41	(18-20)

Table 4.3 Increase in draft due to speed

Speed, km/h	Draft, %	Speed, km/h	Draft, %
1.6	100	6.0	138
2.0	104	6.5	143
2.5	108	7.0	147
3.0	112	7.5	152
3.5	117	8.0	156
4.0	121	8.5	160
4.5	125	9.0	165
5.0	130	9.5	169
5.5	134		

ii. Exercises: choosing the appropriate technology

Exercise 1. *Tractor size*
Determine the size of the tractor travelling at 6.4 km/h and is pulling four 36-cm moldboard bottoms at a depth of 20 cm operating in a clay loam soil.

Solution:
Step 1. Draft requirement based on soil type:

$$D_s = SD \times w \times d$$

SD = (0.42-0.56 kg/cm^2) (from Table 4.2)
SD average = 0.49 kg/cm^2
$D_s = 0.49 \times (4 \times 36) \times 20 = 1{,}411$ kg

Step 2. Adjusted draft requirement due to speed of ploughing (from Table 3):
$D_a = D_s \times$ % adjustment (speed)
D_a = 1,411 kg x 1.42 = 2,004 Kg

Step 3. Draft horsepower requirement:

$$Hp(draft) = \frac{2{,}004 \times 6.4}{274}$$

Hp(draft) = 46.81 hp

Step 4. Tractor horsepower:

$$Hp(tractor) = \frac{46.8\,\text{hp}}{0.8} = 58.5\,\text{hp}$$

Commercially available: 60 hp, 61 PS, 45 KW

Exercise 2. Financial feasibility

Myanmar Machinery Pool, Inc. needs to provide land preparation, transplanting, harvesting and threshing services for rice production.
The following machines/equipment with their specifications are selected.

2W Tractor		
Power (hp)	Gasoline	7
	Diesel	7 to10
Capacity (ha/day)(8 hr operation)	1st pass	1
	2nd pass	2
Walk-Behind Type Transplanter		
Power (hp)	Gasoline	7
	Diesel	7 to 10
Capacity (ha/day)		1
1-M Rice Reaper		
Power (hp)	Gasoline	7
	Diesel	7 to 10
Capacity (ha/day)		2
Axial Flow Thresher		
Power (hp)	Diesel	10
Capacity (kg/h) (rough rice)		1 000

- Assumptions

Items	Value
Service Area (ha)	30
Life of Equipment (years)	5
Fuel Consumption (L/h)	2
Fuel Cost ($/L) (Diesel)	0.50
Oil Consumption (L/h)	0.10
Oil Cost ($/L)	3.00
Custom Fee Charges ($/ha)	
Land Prep (2 passes)	60
Transplanting	30
Harvesting	30
Threshing (10% of Output)	180
Wages ($/day)	
Land Prep (per operator)	8
Transplanting (per operator)	8
Harvesting (per operator)	8
Threshing (30% of share of custom fee)	48
Average Yield (tons/ha)	6
Croppings per year	2
Price of Palay ($/kg)	0.30
Price of Palay ($/ton)	300.00

Items	Value
Equipment Cost ($)	
2W Tractor	1 000.00
Walking Type Transplanter	2 000.00
1-M Rice Reaper	1 500.00
Axial Flow Thresher	1 000.00
Engine (10hp Diesel)	1 000.00
Shed Area (m^2)	40.00
Price of Shed ($/$m^2$)	100.00
Cost of Shed ($)	4 000.00
Initial Cost	**10 500.00**
Salvage Value (10% of IC)	0.10
Interest Rate (5%/100)	0.12
Repair and Maintenance (%/100)	0.10
Working Day (hrs/day)	8.00
# of Operators	2.00
Amortization (3 equal payment for 3 years)	**3 500.00**

Based on Philippine Condition

Conversion Rate: 1USD=Php 50.00

- Costs and Returns

Item	Value	
Fixed Costs Initial Investment ($17,750.00)	**$/ha**	**$/year (60 ha)**
Depreciation	31.50	1 890.00
Interest on Investment	11.55	693.00
Repair & maintenance	17.50	1 050.00
Total Fixed Cost	**60.55**	**3 633.00**
Variable Costs		
Fuel		
Land Preparation (2 passes)	12.00	720.00
Transplanting	8.00	480.00
Harvesting	4.00	240.00
Threshing	6.00	360.00
Total	**30.00**	**1 800.00**
Oil		
Land Preparation	3.60	216.00
Transplanting	2.40	144.00
Harvesting	1.20	72.00
Threshing	1.80	108.00
Total	**9.00**	**540.00**
Wages		
Land Preparation	24.00	1 440.00
Transplanting	16.00	960.00
Harvesting	8.00	480.00
Threshing	54.00	3 240.00
Total	**102.00**	**6 120.00**
Total Variable Cost	**141.00**	**8 460.00**

Item	Value	
Return	**$/ha**	**$/year (60 ha)**
Land Preparation	60.00	3 600.00
Transplanting	30.00	1 800.00
Harvesting	30.00	1 800.00
Threshing	180.00	10 000.00
Grand Total	**330.00**	**18 000.00**

Items	Value ($)
Fixed Costs	3 633.00
Variable Costs	8 460.00
Total Returns	18 000.000

Based on Philippine Condition

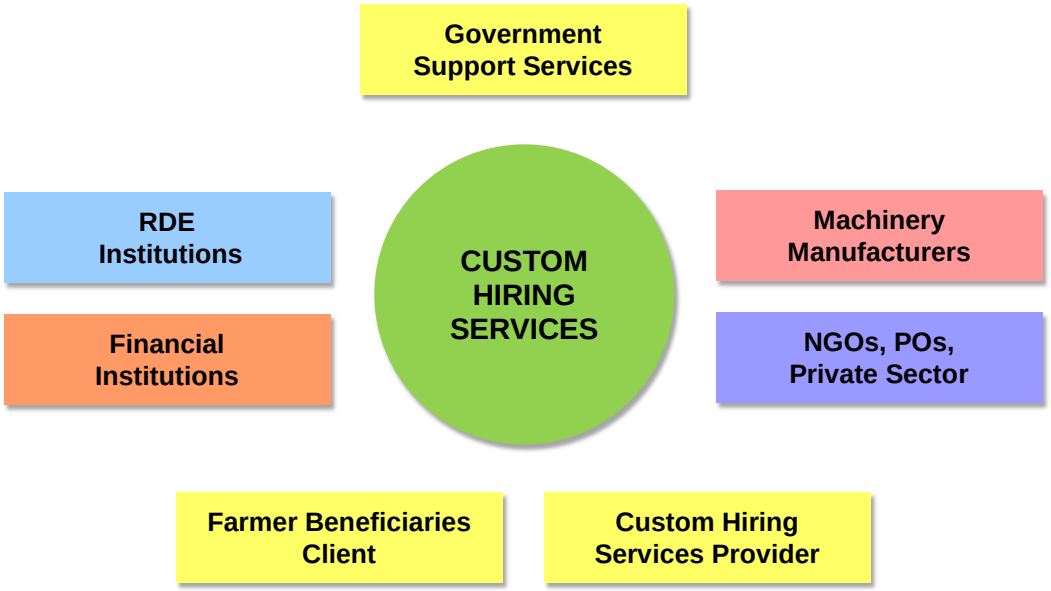
Conversion Rate: 1USD=Php 50.00

- Project worth evaluation

ITEM	VALUE	DECISION
Payback Period (PBP)	1.96 yr	If less than economic life ACCEPT 1.96 < 5 yrs **ACCEPT**
Break-even Point (BEP)	19.22 ha/yr	If less than service area ACCEPT 19.22 ha/yr < 60 ha/yr **ACCEPT**
Benefit-cost Ratio (BCR)	1.39	If greater than 1.0 Accept 1.39 >1.0 **ACCEPT**
Internal Rate of Return (IRR)	76.09% (Evaluated at 75% to 77% interest rates)	If greater than prevailing interest rate Accept 78.51 % > 12% **ACCEPT**

4.5 Barriers in commercializing CHS of AMTs

Figure 4.7 Key players for CHS of AMTs



Barriers: Absence or lack of support from the key players for CHS of AMTs.

5 The Business Plan for CHS of AMTs

5.1 Components of the business plan

i. Cover sheet: Company profile
ii. Executive summary
iii. Product or service description (including the current status of development)
iv. Customer/market analysis (market size and potential market share)
v. Sales and marketing plan (marketing strategies)
vi. Intellectual Property Status (e.g. patents, licences, etc.)
vii. Competitor analysis (competitors and your competitive differentiation)
viii. Management team (including advisers with relevant experience)
ix. Financial highlights (cash flow, income statement and balance sheet)
x. Investment offering of the company (how much investment you are willing put in the project)

5.2 An exercise: drafting of the business plan for CHS of AMTs

6 Cases from the Asia-Pacific Region

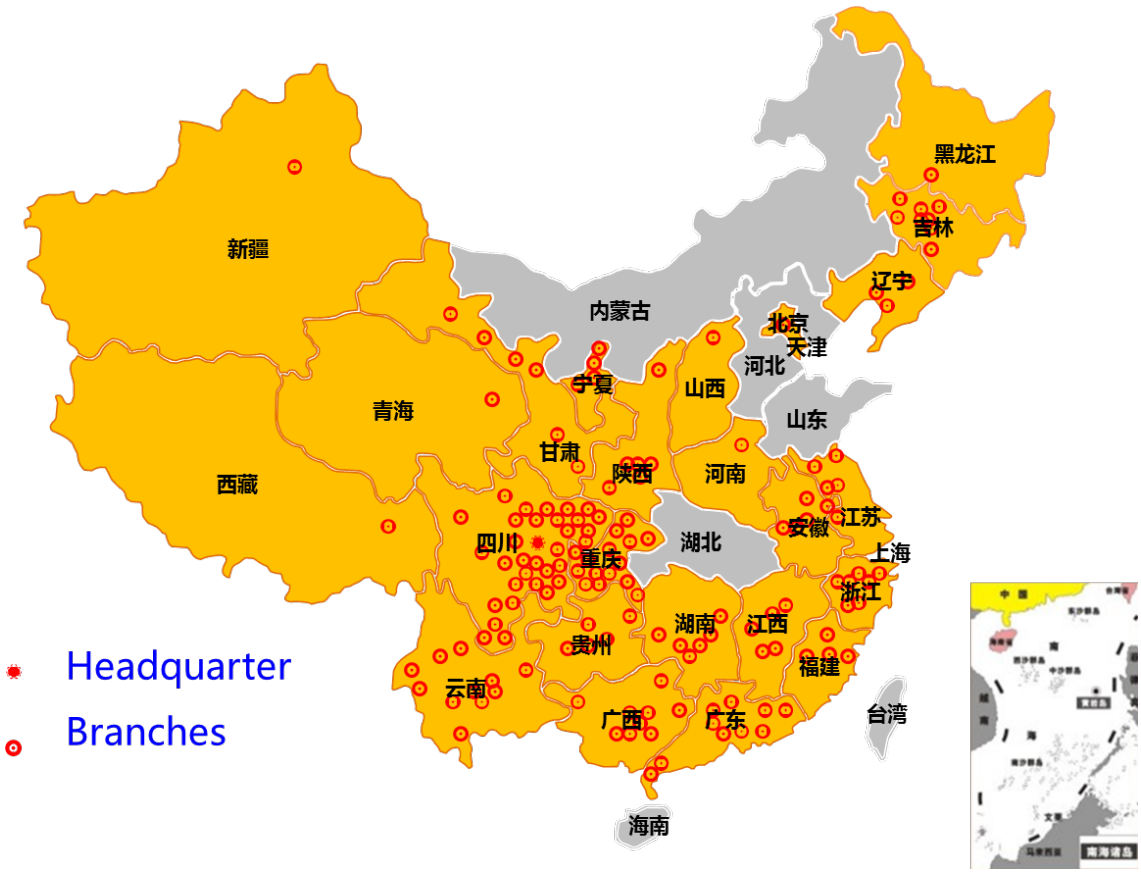
6.1 Financial lease for agricultural machinery: Gifore agricultural machinery

a) Introduction to Gifore

Gifore is the largest agricultural machinery distribution company in China and the only listed company in the agricultural machinery distribution industry. The company's main businesses are: agricultural machinery, trucks, construction engineering, and general machinery and electronic products. It has 238 subsidiaries, over 2,000 distribution services network in 24 provinces in China. The sales revenue was nearly USD 700 million in 2014.

The company was established from 1998 to 2002 with an average annual sales revenue of USD 1.1 million. The network expanded from 2002 to 2009, with an increase in annual sales revenue from USD 18 million to 264 million. In 2009, Gifore became a public company and thus started its group development. The annual sales revenue reached USD 600 million by 2013. From 2014, the company entered strategic transformation and upgrading, aiming to become a comprehensive service provider, and started to develop the business in e-commerce and overseas, etc. The projects have now spread to Myanmar, Uganda, Kazakhstan, among others.

Figure 6.1 Network of Gifore

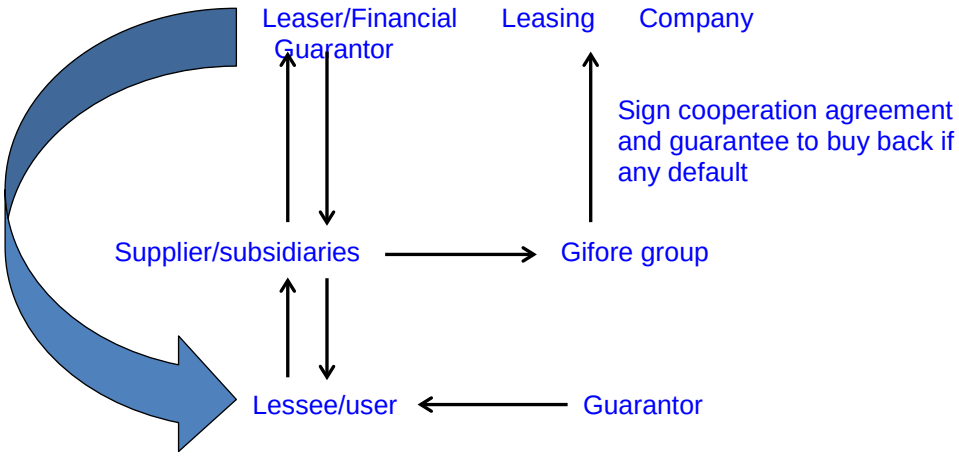


b) Business model

i. Business background: to improve agriculture mechanization and to solve farmers/users who need to buy machines, but they cannot afford to buy. Meanwhile they cannot get loan from the bank.

ii. Business Model:

Figure 6.2 Business model of Gifore



The purpose is to meet the capital demand of users. First, the subsidiary companies audit and inspect users, and then submit their report to Gifore headquarters to audit and verify. After verification, the user, subsidiary, Gifore and the financial leasing company sign a PRODUCT SALES CONTRACT and FINANCIAL LEASING CONTRACT.

The financial leasing company provides capital support to buy the machine; the user pays the rental charge by instalments to the financial leasing company; if the user defaults on payment, the subsidiary company has to make the payment. If the subsidiary company cannot pay, Gifore headquarters has to pay or buy the machines back from the financial leasing company.

iii. Operation process

(1) Application to conduct financial leasing business

The subsidiaries who wish to conduct a financial leasing for agri-machinery submit an application to headquarters. Subsidiary companies must meet the following basic conditions before application:

- Has been established and operating normally from an operations site with a stable sales network for more than 1 year
- Has a demand for financial leasing for agri-machinery and has risk management staff
- Has an asset: liability ratio within 70 per cent, no poor credit record and the ability to fulfil the contract
- Has communicated with local agricultural machinery department and ensured that it is permitted to file for a subsidy if buying machine under financial leasing.

(2) Inspection of end users

The end user must meet the following conditions:

- Natural person user:
  - Aged between 18 and 60, has full capacity for civil conduct
  - No default records in financial institutions
  - Has stable residence and enough income to pay rental charge
  - Guarantor normally required.

- Legal person user:
  - Legally registered, registered capital above USD 100,000
  - No default records in financial institutions
  - Company is well operated and managed, has ability to make profit and make payment
  - Guarantor normally required.

(3) Guarantor for end user

A guarantor, including personal guarantee or real securities, is required when purchasing agricultural machinery with financial leasing. Requirements are as follows:

- If the guarantor is natural person:
  - Age between 18 and 60, has full capacity for civil conduct
  - No default in financial institutions
  - Has fixed residence and stable income with certified documents
  - Is not the direct relative of lessee.

- If the guarantor is legal person:
  - Legally registered, registered capital above USD 100,000
  - No default in financial institutions
  - Registered more than 1 year and has enough profit in the latest financial statement.

(4) Submit to headquarters to inspect for permission

(5) Submit to financial leasing company

(6) Payment

Lessee pays rental charge to financial leasing company, and leasing company makes payments to buy the product. The user/lessee only has the right to use the machine. Per the contract, the user would not have ownership of the products until they pay all the rental charge.

iv. Exceptions

Financial leasing is prohibited if:

- The users make down payment less than 15 per cent of the value of the products
- The price of the product is under USD 15,000. In this case, the company would require full payment. Agricultural machines sold by the way of financial leasing are usually expensive machines, for example, big tractors and harvesters.

In different places or countries, there can be adjustments according to the local economic conditions.

v. Management after rent

Subsidiary companies are responsible for all service work after rent, including training, maintenance, repair, GPS maintenance, telephone follow-up, etc.

c) Risk management

During management after rent, if there is any indication that the user may default, subsidiary companies need to take proper actions to warn of the risk, collect the rent and preserve the equipment.

i. If the default happens during the period of financial leasing, the subsidiary should handle it as following process:
   - Within 2 days of default, the subsidiary company should visit or telephone users to determine the reason for the default
   - Within 7 days of the default, the subsidiary company must submit a situation analysis and solutions to headquarters
   - Debt collection from the user or guarantor is implemented, if the user still cannot pay to financial leasing company, subsidiary company must make payment to the leasing company.

ii. If any of following occurs, the subsidiary company must take enforcement measures to preserve equipment and debt; the measures include but are not limited to towing the machine away, filing lawsuits, etc.
   - lessee's defaults extend over four periods
   - lessee no longer has the ability to fulfil the contract
   - lessee or equipment disappear
   - any other credit default or illegal operation of the lessee.

iii. If the subsidiary company is not operating well and cannot bear the payment for the users, the subsidiary company must report to Gifore headquarters and borrow money from the headquarters.

iv. Risk assessment
Every half year, Gifore headquarters evaluates the subsidiary's operation. Rewards are given to well-operated companies. Less well-managed companies receive advice and may incur penalties.

d) Suggestion
To conduct business using this model, risk management is very important. When the market is good, every party makes money and every party gets paid. However, if the market goes bad, the lessee may not be able to make enough money and there might be problems. Therefore, the choice and inspection of user is very important.

6.2 Pay for use: Zamindara Farm Solution Pvt. Ltd.

a) Introduction to Zamindara Farm Solution Pvt. Ltd.
Zamindara Group is headquartered in Fazilka, Punjab, India. The group has been on the cutting edge of the agriculture business for six decades and it has transformed itself in to a large supplier of agriculture goods and services. In operating its business, the Zamindara team realized that the selling model cannot bring in farm mechanization as small and marginal farmers cannot, and should not, buy expensive machines. To solve this problem, Zamindara started a unique "pay for use" of farm machines scheme. Zamindara is aggressively working on the campaign *karz mukt kisan* (Debt-free Farmer).

b) Introduction of the custom hiring business

Financial crises of small and marginal farmers and increasing numbers of farmer suicides due to debt made the company realize that ownership of expensive farm machines was a cause of farmers' financial stress. Besides blocking capital, the machines also remain underutilized. Buying machines creates fixed costs in the shape of Equated Monthly Installments (EMI) which can be difficult to meet as farm incomes are variable due to weather, availability of water and fluctuating prices of farm produce. Hence, there is a need for farm machine rentals/custom hiring business, with which farmers could convert a fixed cost to a variable one. Zamindara started such operation in 2003-04.

i. Need for farm equipment rentals

- Small land holdings
- Underutilized equipment leading to lack of economic viability
- Equipment uses up a bulk of the capital leaving no money for allied activities, such as dairy or poultry.
- Equipment ownership leads to a build-up of fixed costs, whereas agriculture is a weather-dependent, price-dependent variable output activity, which should have higher variable costs
- Labour welfare measures such as "Mahatma Gandhi National Rural Employment Guarantee Act" are continuously driving down labour availability, creating greater need for larger machines, such as cotton harvesters.

ii. Benefits of farm equipment rentals

- Lower input costs, with consequent increase in interest outflow
- Customer pays for use
- Larger variety of equipment, allows farmers to match use with equipment rather than adopting a one-size-fits-all approach
- Increased access to technology, provides previously unavailable products/technologies to the average farmer
- Access to eco-friendly technology, e.g. water conservation technologies, such as laser levelling, become accessible to small and marginal farmers
- Regular updating of equipment, professional equipment providers keep updating their equipment bank to provide latest equipment
- Minimizing losses, with post-harvest losses minimized (storage and logistics being the other factors).

A farmer needs an array of equipment throughout the year but cannot buy all of that is needed.

c) Business models

i. Library model

This business model runs just like the library. It requires SOPs (Standard Operation Procedures), a checklist and a very strong quality control mechanism. It is only suitable for basic machines.

- Farmers rent tractors/machinery
- Run them on their own

ii. Radio taxi model

Farmers call the company's call centre and machines are sent with a driver and fuel.

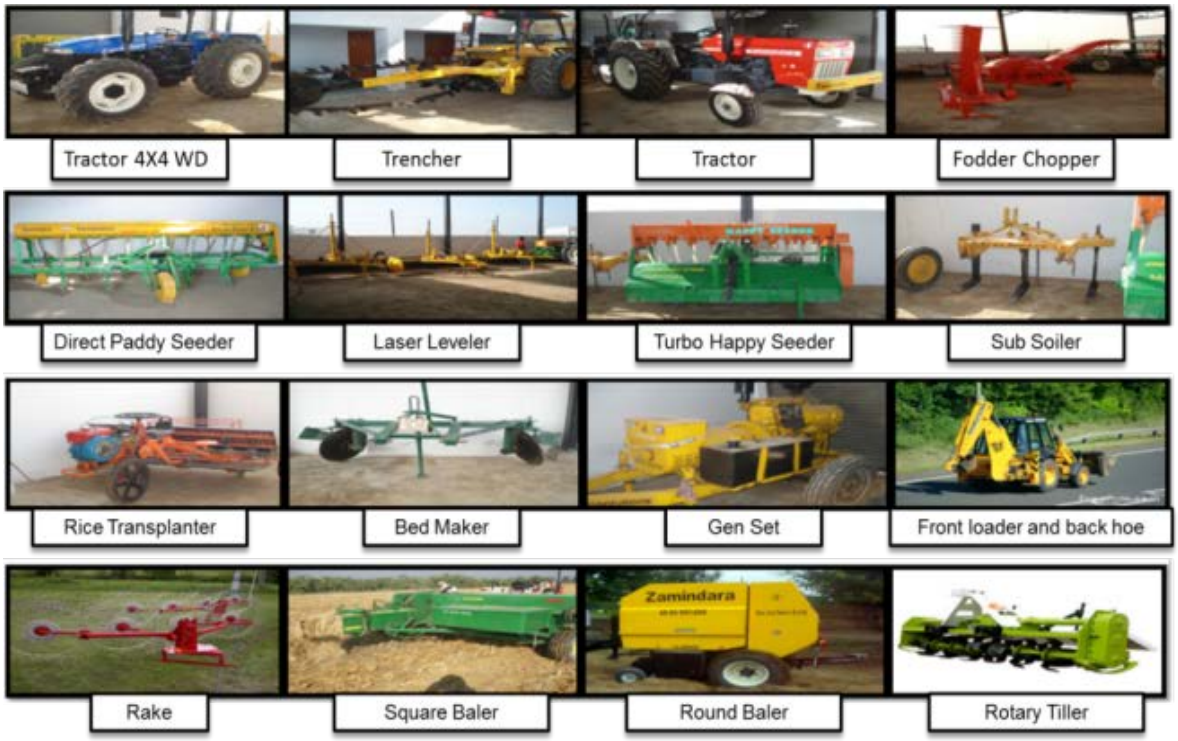
The radio taxi model is a partnership model. "Chalak Bane Malak" Profits are shared and the value of the asset is transferred to the owner. This creates a strong motivation:

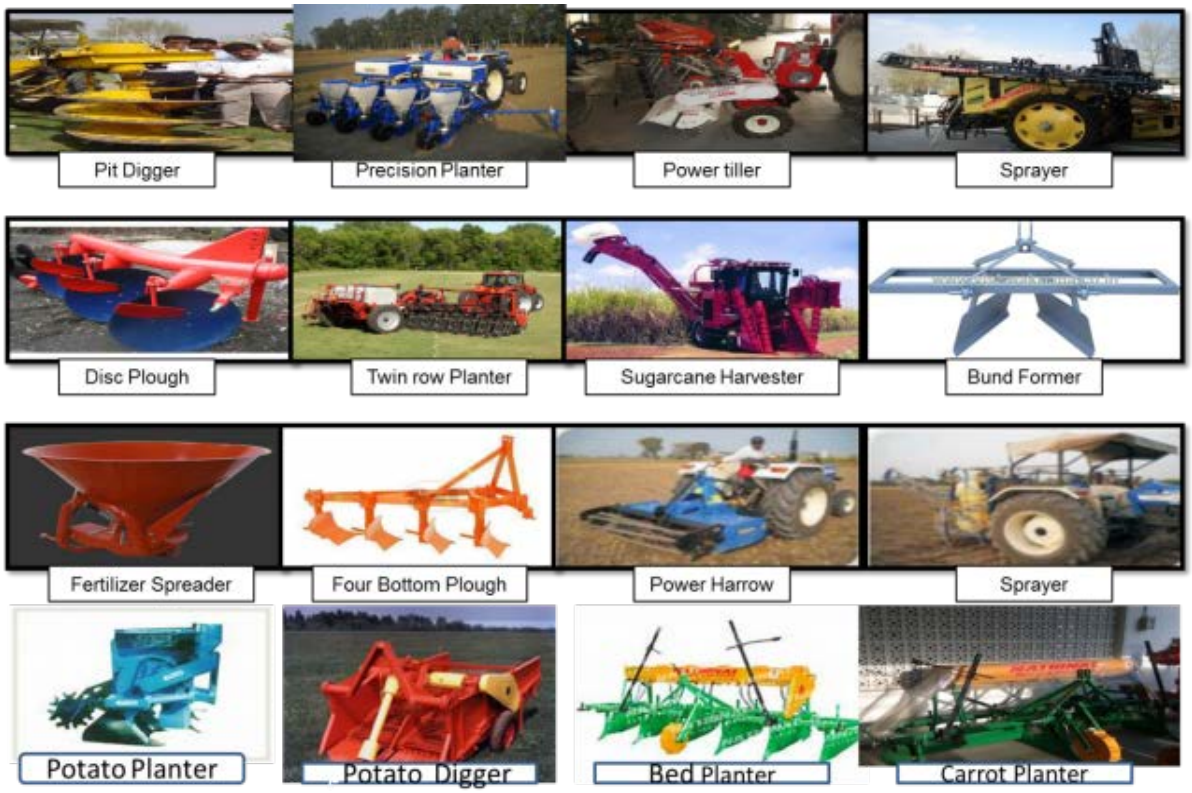
- To make maximum use of machine
- Keep the machine in top condition for a good residual value
- Keep the machine serviced
- Maximize usage so as to cover EMI + DEPRECIATION + Operating expenses direct/indirect + Profit.

iii. Points for consideration

- Price and durability of machines, selection of machines
- Hours can be put to use in a year or the life cycle of the machine/number of years × affordable rate
- Cost of capital - long-term benefit; targeted return on investment (ROI)
- Service back up, ensuring no breakdowns during the working season
- Providing standby units
- Cost-benefit analysis for farmers.

Figure 6.3 Equipment bank at ZFS





d) Difficulties and recommendations - REQUIREMENTS

The need for equipment rental in the agricultural sector arises due to:

- Small land holdings
- Underutilized equipment leading to lack of viability
- Equipment uses up a bulk of the capital leaving no money for allied activities, such as dairy, poultry, etc.
- Equipment ownership leads to build-up of fixed costs, whereas a weather-dependent, price-dependent variable output activity should have higher variable costs.

e) Challenges

- High cost of capital
- Lack of matching implements
- Sparse repair facilities
- Inadequate guidance to farmers/service providers on selection and operations (manufacturers push their products along with knowledge)
- Lack of trained manpower
- Underlying activity is highly seasonal leading to lower man/machine utilization and hence greater pressure on returns
- Low participation by government/ State institutions
- Dealing with India's very small sized holdings leads to a large number of low value transactions
- Equipment manufacturers have a sale only mindset and view this as a threat rather than an opportunity.

f) Benefits

- The customer pays for use, and so equipment becomes a variable cost leading to lower cash requirements.
- Greater range available allows the customer to match usage with equipment rather than a one-size-fits-all approach; the right implement for the right farming process results in improved yield.
- Provides previously unavailable products/technologies to the average farmer; e.g. earlier smaller farmers had no choice but to burn crop residue, but now they can easily obtain equipment such as balers. This also has positive consequences for the environment.
- Water conservation technologies, such as laser levelling, now become accessible to small and marginal farmers.
- Professional equipment providers can keep researching and adding to the equipment bank; something the smaller farmer just cannot do.
- One of the major problems of post-harvest losses is minimized (storage and logistics being the other factors).

g) Suggested role of government

- Agricultural equipment hiring should be included in the priority sector list.
- A favourable tax/duty/excise structure should be developed for this sector; i.e. lower excise rates for cars to be used in the taxi sector, equivalent to the benefits offered to hospitality and tourism sector to import vehicles/ machines.
- A support and guidance mechanism should be provided for the early stages of companies.
- Help should be given in public relations/communications, such as that done by Petroleum Conservation Research Association on fuel conservation.
- Skills development in agriculture should be promoted. If the government cannot train people directly, it should provide incentives to private sector players willing to do so. (It should be noted that, outside India, skilled manpower in agriculture earns much more than in other trades.)
- Large and serious players should be encouraged. A small number of marginal players will reflect the same underutilization as in the case of farmers owning equipment themselves. This could be done, for example, by providing an interest subsidy (instead of capital subsidy) to players having an equipment bank larger than a prescribed minimum.
- In the present (Indian) context, where a large number of small and marginal farmers need urgent support, such blended value business models should be promoted. To make effective use of government resources equity participation by government should be considered.

6.3 Custom hiring of agricultural machinery in Laguna, Philippines

a) Introduction to Zantander

Zantander Trading and Engineering's major line of custom hiring services focus on land preparation on wetland/upland paddy field, utilizing mostly light equipment, such as power- and hydro-tillers. The company also manufactures and fabricates their machinery and equipment, as well as conducting repair and maintenance.

b) Land preparation

Figure 6.4 Land preparation on paddy field during 2013WS (wet season) to 2016DS (dry season)

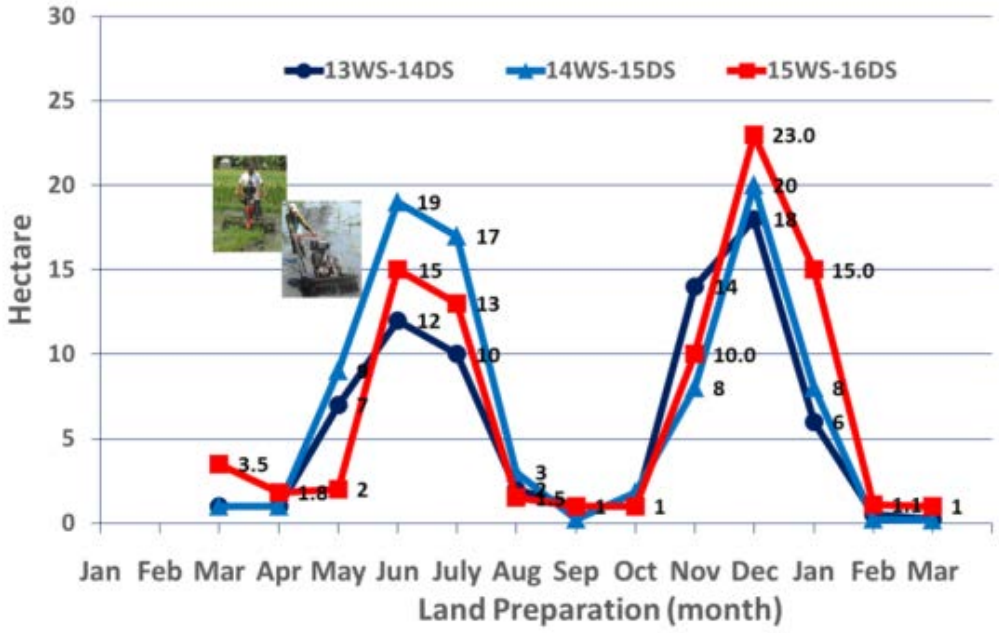


Table 6.1 Cost of land preparation per activity as of 2016DS

Activity (Land preparation operation)	Cost/activity/ha. USD	Cost/activity/ha. Php	Cost/activity/ha. Ks
Ploughing	$73	3 300	
Puddling 1st	$40	1 800	
Puddling 2nd	$40	1 800	
Harrowing 1st	$38	1 700	
Harrowing final	$38	1 700	
Levelling	$38	1 700	
Total: Complete Land Prep	**$267**	**Php12 000**	

@Php45.00/$

Table 6.2 Cost breakdown for land preparation as of 2016DS

Detailed cost	Cost breakdown complete land prep $267/ha, %	USD/ha	Php/ha	Ks/ha
Engine fuel Gasoline and diesel	8%	$21	960	
Operator's salary,	26%	$70	3 120	
Consumables, (V-belts, motor /gear oils)	2%	$5	240	
Equipment Transport, w/in 5km radius from base	9%	$24	1 080	
Equipment rental, (Includes maintenance)	18%	$48	2 160	
Custom hiring, 1xHand tractor, 1xHydro tiller	22%	$59	2 640	
Overhead, taxes	15%	$40	1 800	
Total cost/ha.	**100%**	**$267**	**Php12 000**	

@Php45/USD, 3 April 2016

Table 6.3 Cost of power tiller, hydro-tiller & trailer as of 2016DS

Agricultural machinery (Light equipment)	Cost/ unit USD	Cost/unit Php	Cost/unit Ks
Power tiller /Hand tractor 6 to 7hp air-cooled gasoline engine	$1 750	78 750	
Hydro-tiller/Floating tiller mounted w/ a 10hp air-cooled diesel engine	$2 800	126 000	
Equipment trailer (transport mode) Levelling board, front lug tyre, others	$680.00	30 600	
Total cost (1 unit Power tiller and 1 unit hydro-tiller)	**$5 230.00**	**235 350**	

@Php45.00/$

c) Examples of operations

Figure 6.5 Ploughing example 1

The power-tiller ploughs, puddles, cultivates and transports. Tiller mounted with 7 hp air-cooled gasoline engine with moldboard plough attachment and steel cage wheel for ploughing. Average field capacity of 1 ha/day at machine speed of 3.5 km/h.

Figure 6.6 Ploughing example 2

The power-tiller ploughs, puddles, cultivates and transports. Tiller mounted with 6 hp air-cooled gasoline engine with moldboard plough attachment and steel cage wheel for ploughing operation. Average field capacity of 0.6 ha/day.

Figure 6.7 Puddling by hydro-tiller

A 1-m swath hydro-tiller/float-tiller mounted with 10 hp air-cooled diesel engine operates both on standard and extreme field conditions having deep mud and/or water. Average puddling field capacity of 1.25 ha/day depending on soil conditions.

Figure 6.8 Initial harrowing

A power-tiller mounted with a 6 hp air-cooled gasoline engine with comb harrow attachment and steel cage wheel for harrowing. Average field capacity of 1.25 ha/day.

Figure 6.9 Final harrowing

A power-tiller mounted with a 6 hp air-cooled gasoline engine with comb harrow attachment and steel cage wheel for harrowing. Average field capacity of 1.5 ha/day for final harrowing.

Figure 6.10 Final levelling

A power-tiller mounted with a 6 hp air-cooled gasoline engine with steel cage wheel attachment for final levelling of paddy field. A 3-m long levelling board with handle is used. Average field capacity of 1.5 ha/day

Figure 6.11 Transport

The power-tiller itself can be used to move equipment fitted to the tractor hitch. Additional rubber tyres can be used for transport. All tiller attachments are accommodated in the trailer including cage wheel, plough harrow and counterweight.

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Appendix 1

Gifore Financial Leasing Case

Product 1			
Financing proportion	80% value of the equipment		
Service fee	1-4%（1%/year）	Service fee collection time	Beginning of lease
Initial margin	5%	Return of initial margin	Deduction from last period payment
Leasing time	1，2，3，4 year	Number of period	4，8，12，16
Interest rate	6%		
Payment term	Every season	Nominal price	100 RMB/contract
Rental charge	Rental charge(every period)=financing amount*（1+interest*leasing time/number of period		
Example	Equipment value USD 150,000，Financing amount USD 120,000，Financing time 12 periods within 3 years. Rental charge/every period 120,000 × (1 + 6% × 3)／12 = 11,800 period		

Product 2							
Application：unit price of agricultural machinery above 46,000 USD							
Financing proportion：less than 70% of the product value							
Serial number	**Repayment of principal**	**Leasing time (month)**	**Payment term**	**Initial margin**	**Service fee**	**Interest rate**	**Nominal price**
1	3	25	Pay interest every month and repayment of principal on every Feb 15	5%	3%	6.00%	100
2	3	26	“”	5%	3%	6.00%	100
3	3	27	“”	5%	3%	6.00%	100
4	3	28	“”	5%	3%	6.00%	100
5	3	29	“”	5%	3%	6.00%	100
6	3	30	“”	5%	3%	6.00%	100
7	3	31	“”	5%	3%	6.00%	100
8	3	32	“”	5%	3%	6.00%	100
9	3	33	“”	5%	3%	6.00%	100
10	3	34	“”	5%	3%	6.00%	100
11	3	35	“”	5%	3%	6.00%	100
12	3	36	“”	5%	3%	6.00%	100
13	4	37	“”	5%	4%	6.00%	100
14	4	38	“”	5%	4%	6.00%	100
15	4	39	“”	5%	4%	6.00%	100
16	4	40	“”	5%	4%	6.00%	100
17	4	41	“”	5%	4%	6.00%	100

Serial number	Repayment of principal	Leasing time (month)	Payment term	Initial margin	Service fee	Interest rate	Nominal price
18	4	42	“”	5%	4%	6.00%	100
19	4	43	“”	5%	4%	6.00%	100
20	4	44	“”	5%	4%	6.00%	100
21	4	45	“”	5%	4%	6.00%	100
22	4	46	“”	5%	4%	6.00%	100
23	4	47	“”	5%	4%	6.00%	100
24	4	48	“”	5%	4%	6.00%	100
Rental charge calculation			(1) Monthly rental charge (except February) = financing amount × interest rate÷12				
			(2) if leasing time is 25 to 36 months, rental charge in February = monthly rental charge (except February) + financing amount ÷ 3				
For example			Equipment value USD 150,000, financing amount USD 120,000, leasing time 30 months, monthly rental charge (except February) = 120 × 6% ÷ 12 = USD 600; rental charge (in February) = 600 + 120,000/3 = USD 40,600				

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