

**ECONOMICS OF TRACTOR USE ON MEDIUM AND
SMALL FARMS IN PUNJAB**

RESEARCH PROJECT REPORT

Submitted to the Punjab Agricultural University
in partial fulfilment of the requirements
for the degree of

MASTER OF BUSINESS ADMINISTRATION

(Minor Subject : Statistics)

DUPLICATE

By

Harpreet Singh

(L-98-BS-08-MBA)

Department of Business Management
College of Basic Sciences and Humanities
PUNJAB AGRICULTURAL UNIVERSITY
LUDHIANA - 141 004 INDIA.

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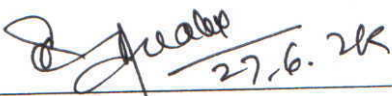
Department of Business Management
College of Basic Sciences and Humanities
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LUDHIANA - 141 004 INDIA.

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CERTIFICATE - I

This is to certify that the research project report entitled "**Economics of tractor use on medium and small farms in Punjab**" submitted for the degree of **Master of Business Administration** in the subject of **Business Management (Minor subject: Statistics)** of the Punjab Agricultural University, Ludhiana is a bonafide research work carried out by **Harpreet Singh (L-98-BS-08-MBA)** under my supervision and that no part of this research project has been submitted for any other degree.

The assistance and help received during the course of investigation have been fully acknowledged.


27.6.20

MAJOR ADVISOR
(Dr. M.A. Zahir)
Dean College of Basic Sc. & Hum.
Punjab Agricultural University
Ludhiana.

Deon, P.S.S.

Main Lib. Thesis

6-8-01

CERTIFICATE - II

This is to certify that the research project entitled **“Economics of tractor use on medium and small farms in Punjab”** submitted by **Harpreet Singh (L-98-BS-08-MBA)** to the Punjab Agricultural University, Ludhiana in partial fulfillment of the requirements for the degree of **Master of Business Administration** in the subject of **Business Management** (Minor subject: **Statistics**) has been approved by the Student’s Advisory Committee after an oral examination on the same, in collaboration with an External Examiner.



MAJOR ADVISOR
(Dr. M.A. Zahir)



HEAD OF THE DEPARTMENT
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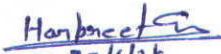
Sincere thanks are also due to the respondents who extended their Co-operation by providing the information for this study.

My mind fails to collect the words to put on records my heartfelt appreciation for my dear friends whose co-operation help full attitude and loving care made this study possible.

I owe special thanks to my parents for their invaluable moral support and encouragement in accomplishing this endeavour.

Lastly, I am overwhelmingly indebted to 'Almighty' for best owing strength to complete this small piece of work.

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27/6/2k
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Title of the research project : **Economics of Tractor use on medium and small farms in Punjab.**

Name of the Student and Admission No. : Harpreet Singh
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Major Subject : Business Management

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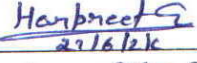
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ABSTRACT

The research "Economics of tractor use on medium and small farms in Punjab" was conducted with a sample size 80 farmers comprising 24 small farmers (land holding 1-2ha), 24 semi-medium farmers (2-4ha) and 32 medium farmers (4-10ha) from two districts Ludhiana and Kapurthala respectively. Majority of farmers have their own tractors. Of these only 8.75 percent of farmers have purchased from their own resources, while the remaining 73.75 percent purchased their tractor by taking loans from banks and other financial institutions. Others 17.50 percent of farmers hired the tractors. Four main reasons given by farmers for buying a tractor were timeliness of operation, reduced labour availability during peak season, faster work and status symbol. Small farmers gave more Weightage to resale value, horse power and maintenance cost, while deciding the purchase of new tractor. Medium & semi-medium farmers gave more weightage to horse power and resale value. The small farmers who have purchased their own tractors bear Rs 95.97 per hour more cost than the farmers who hired the tractors from others. Semi-medium and medium farmers also bear excess cost of Rs 77.42 per hour and Rs 13.15 per hour over hiring cost.


Signature of Major Advisor


Signature of the Student

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CHAPTER I

INTRODUCTION

India is primarily an agrarian nation, with more than 50 percent of our GDP being contributed directly or indirectly by agriculture. No wonder, India is considered the largest tractor market in the world. If that sounds great, let us face hard facts. In terms of total tractors in use in the country, we are ranked a distant eighth. In terms of penetration India has a tractor density of 10.5 tractors per thousand hectares of Gross cropped Area (GCA) as compared to international average of close to 30 tractors per thousand GCA (Kumar, 1999).

The development of the tractor industry in the 60's was dictated by the anxiety to promote mechanization of agriculture by encouraging local manufacturing of tractors and, at the same time, protecting the interest of farmers by making tractors available at reasonable prices. Tractor manufacturing in India started in 1961. The names of the units, their collaborators and the year of commencement of local manufactures are given in Table 1.1.

Table 1.1. Tractor manufacturing units and their collaborators

Sr. No.	Manufacturer	Collaborator	Year of establishment
1.	Eicher Tractors Ltd.	Gebr, Eicher Tractor fabric, west Germany	1961
2.	Gujrat Tractors.Ltd./ Tractors and Bulldozers Ltd.	Motokov-Praha, Czechoslovakia	1963
3.	Tractor and farm equipment Ltd.	Messy Ferguson, UK	1961
4.	Escorts Ltd.	Moloimport Warazawa Zaklady Mechaniczne Ursus,Poland	1964
5.	Mahindra & Mahindra Ltd/International tractor co. of India Ltd.	International Harvesters, UK	1965
6.	+ Escorts Tractor Ltd. (Farmtrac free Division)	Ford, UK	1971
7.	Hindustan Machine Tool Ltd. (central sector PSU)	Motokav-praha, Czechoslovakia	1971
8.	* Kirloskar Tractors Ltd.	Klochner-Humboldt Deutz,Germany	1974
9.	Punjab Tractors Ltd. (state sector)	CMERI, India	1974
10.	* Pittie Tractors Ltd.	Own know how	1974
11.	* Harsha Tractors Ltd.	Motoimport, Russia	1975
12.	* Auto Tractors Ltd.	British leyland, UK	1981
13.	** Haryana Tractors Ltd./ Pratap steel Rolling mills Ltd.	Own know-how	1983
14.	Vst Tillers & Tractors Ltd.	Mitsubishi, Japan	1983
15.	* United Auto Tractors Ltd.	Uzina Tractorul Romania	1986
16.	* Asian Tractors Ltd.	Own know-how	1989
17.	Bajaj Tempo Ltd.	Own know-how	1997
18.	International Tractors (Sonalika Ltd.)	Own know-how	1998
19.	New Holland Tractor (India) PVT	New Holland Tractors , Italy	++
20.	Larsen & Tubro Ltd.	John Deere, USA	++
21.	Greaves Ltd.	Same Deutz-Fahr, Italy	++

* Currently not in production ** Have been producing small quantities

+Now producing Farmtrac tractors ++ Product under test & evaluation.

Source : Agricultural Mechanization in Asia, Africa & Latin America 30 (2) : 1999.

The first four entrepreneurs were representing trading houses as dealer or sub-dealer of tractors, the fifth Mahindra & Mahindra was a major player in the automobile sector. These units were licensed in 1960-61 with aggregate capacity to manufacture 11000 tractors. Though all these units went into production, it was subsequently noted that the pace of installation of production capacity was slow. On the other hand the demand for tractors was increasing at a steep rate and expected to grow further in the ensuing years (thanks to the Green Revolution in the mid-sixties). To meet the growing demand, the Government decided to invite additional entrepreneurs into tractor manufacture in 1968. Of these only 6 units established the manufacturing facilities (Number 6 to 11 in table 1.1). Escorts established the Escort Tractors Limited and started manufacturing Ford tractors in 1971 in collaboration with Ford, UK. Three of these units, namely, Kirloskar Tractors, Harsha Tractors and Pittie Tractors could not survive and closed down their plants. During the period , the emphasis was on indigenous production of tractors and Government extended full support to old and new entrepreneurs to establish local manufactures. The credit facilities to the farmers for the purchase of tractors were increased and liberalized to enlarge the market.

The expansion in the tractor market during the late seventies led to the setting up of five more units for the manufacture of tractors. These units are listed in Table 1.1 at serial number 12 to 16. However, except VST Tillers & Tractors other four newly established units during the eighties could not sustain the market competition and closed their plants. The industry grew slowly in the early eighties and produced about 75000 tractors in 1985. In the later half of eighties the industry grew very fast and produced almost 140000 tractors in 1990. Export of tractors, mainly to the African countries, also started in the eighties. Thus , India, a net importer up to mid-seventies became an exporter during the eighties. The collaboration of Escorts with Ford came to an end in 1994 and Escorts started to produce, Farmtrac tractor in place of Ford tractor. Haryana Tractors has been producing tractors on a very irregular basis. Bajaj Tempo started manufacturing in 1997 and International Tractors (Sonalika) started production in 1998. The number of tractors in use, in India, reached one million units mark in 1989 and in 1990 the population of tractors touched 1.2 million units (Singh & Doharey, 1989). The number of tractors in use, in India, at the end of 1997 was estimated to be over two million units.

The tractor manufacturing industry is now well established in India. Out of 16 units who took up manufacturing

before 1990, six units, namely, Eicher, Escorts, HMT, Mahindra & Mahindra, PTL and TAFE are major manufacturers. Amongst these, M & M has emerged as a clear leader across almost all the HP categories with a market share of 27.00 percent (Mannan, 1999). Tractors are available in five configurations in India based on the engine horse power : under 20 HP, 21-30 HP , 31-40 HP, 41-50 HP and over 51HP.

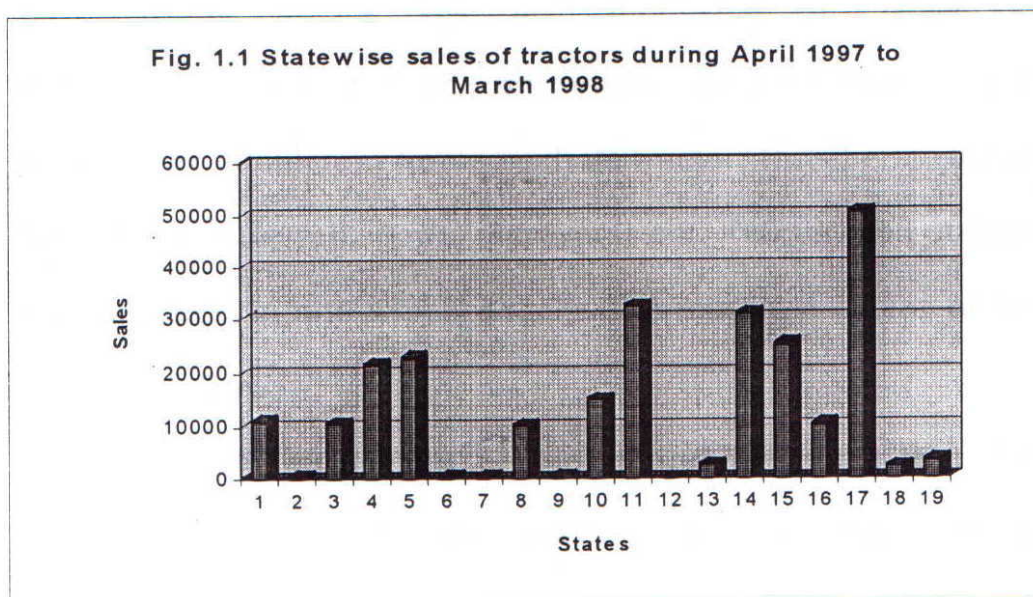
Table 1.2 Market shares of various manufacturers

Company	HP	MARKET SHARES			(Percentage)	
		1994	1995	1996	1997	1998
Eicher	21-30	37	36	41	48	38
	31-40	-	01	04	04	04
Total		13	11	11	10	10
Escorts	21-30	13	11	11	11	11
	31-40	12	14	13	14	14
	41-50	66	65	54	48	51
Total		21	21	21	20	19
HMT	21-30	08	12	10	11	18
	31-40	10	09	08	06	06
	41-50	06	02	07	09	06
	51+	52	43	31	41	41
Total		11	11	09	09	08
M&M	21-30	29	29	27	15	26
	31-40	23	25	27	29	28
	41-50	20	22	29	32	31
Total		25	25	26	26	27
Punjab Tractors	21-30	07	06	06	07	09
	31-40	20	21	19	19	20
	51+	42	54	66	58	58
Total		13	14	14	15	16
TAFE	21-30	05	03	05	07	08
	31-40	33	30	30	28	27
	41-50	66	65	54	48	51
Total		17	18	19	20	20

Source: Industrial Herald Dec. 1999.

Three manufacturers who are likely to start production in near future are listed in serial numbers 19 to 21 in table 1.1. New Holland Tractor (India) launched 70 HP Ford tractor in 1998. On its part, the capacity of tractor industry is expected to increase from the current 2.9 lac units to close to 4 lac units by 2001. The increase in capacity would be from expansion projects of existing players and entry of the three new players in the segment.

The state-wise sale of tractors during 1997-98 is shown in fig. 1.1.



Source: Agriculture Today Jan-Feb, 1999

States :

- | | |
|---------------------|---------------|
| 1. AP | 11. MP |
| 2. Assam | 12. Manipur |
| 3. Bihar | 13. Orissa |
| 4. Gujarat | 14. Punjab |
| 5. Haryana | 15. Rajasthan |
| 6. Himachal Pradesh | 16. TN |
| 7. J & K | 17. UP |
| 8. Karnataka | 18. WB |
| 9. Kerala | 19. Others |
| 10. Maharashtra | |

1.1 Research problem

The introduction of farm machinery has played a significant role in increasing agricultural production due to timely performance of crucial farm operations. Substitution of mechanical power in lieu of manual and animal labour became essential in view of the fast rising wages of human labour and escalation in the maintenance cost of animals. Drudgery of human labour and the upkeep of animals have also been an important consideration in mechanization. Various social and psychological factors have also motivated the farmers to mechanize their farms. The mechanical inputs adopted by the farmers are of different forms such as tractor, threshers, combine harvesters, tubewell, power sprayers, etc. Tractor and tubewell are the basic inputs which largely determine the extent of farm mechanization.

Punjab Department of Agricultural estimates that there are at present over 3.6 lakh tractors in the state. Infact, Punjab with just 1.53 percent of Indian geographical area accounts for 22 percent of tractors in the country. The sale of tractors, a status symbol in Indian villages, has been showing an overall upward graph (Philipose, 1998). In a study conducted by PHD Chamber of Commerce and Industry , it was indicated that despite an overall slump in the automobile industry, production

of tractors in India is set to be doubled by the year 2005. It is generally believed that liberal loaning policy of bank is one of the main reasons for an increase in number, although the tractors purchased by many of the small farmers remain under-utilized. Also investment on tractor, which seems irrational purely from economic view point may not be so for an individual small farmer because of the social status attached to it. How far is it advisable to ignore economics of tractor use, particularly by the small farmers? Will it be more economical for small farmers to hire tractors? These are some of the questions/issues which need further investigation. The present work has been undertaken to find answers to some of these questions.

1.2 Objectives of the Study

Keeping in view the above facts, the study has been conducted with the following specific objectives :

- 1) To study the factors influencing the decision making of farmers for purchasing tractors.
- 2) To study the advantages and disadvantages of buying and hiring a tractor for cultivation in medium and small farms.
- 3) To study the economic viability of buying a tractor for medium and small farms in terms of costs, maintenance and returns.

CHAPTER II

REVIEW OF LITERATURE

Tractor involves a large capital investment, besides operational as well as depreciation costs. It is a major part of total investment of farm enterprises. It increases the cost of agriculture produce. However, often farmers are found to be ignorant about the nature of these costs. Many studies were carried out in the past to understand the cost and utilization of tractors. Some of these having direct or indirect bearing on the present study have been reviewed in this chapter.

Bawa (1978) concluded from the survey that 55 percent of the farmers replaced their tractors after five years and 43 percent considered the replacement period more than five years. Most of the subjects thought that the replacement should be made just before the major overhauling as it increases the operating cost by a large amount. It was also stated that H.P of a tractor did not affect the economics of operating tractor and its replacement period.

Kahlon and Singh (1978) investigated the use of tractors for different operations on the farm and off the farm. They

reported that the total hours of tractor utilization ranged from 310 to 720 hrs per year, with an average of 532 hours, which was much lower than the standard of 1000 hours found economical for tractors.

Garg and Mittal (1981) undertook a field study on tractor use and costs in Ludhiana and Jalandhar districts, which revealed that annual use of a tractor was the largest single factor affecting the hourly cost of operation. They calculated that the unit cost of operation of a tractor being used for 800 hrs per year and 1500 hrs per year came out to be Rs 26 and Rs 9.53 per hour respectively. They found that after 1400hrs of use the unit cost of operation almost levels upto become constant and beyond this point the use of tractor is not advisable because of very high repair and maintenance costs.

Singh and Tandon (1987) interviewed 37 tractor owner farmers in two districts in northern India regarding the use of their tractors and measured the field capacity and fuel consumption. They reported an average annual use of 1220 hrs of which 60 percent was related to agricultural operations and remaining 40 percent was for social and other activities. Tractor use was related to farm size and the number of equipment associated with it.

Kumar and Ahmad (1988) determined the maintenance cost of international B-275, Escorts-335 and Zetor 2511 tractors. The maintenance cost increase with age and the relationship is near exponential. The maintenance cost is maximum in the case of international B-275 tractor and the minimum in case of zetor 2511 tractor.

Saddoun (1989) studied the selection, operation and replacement of farm machinery as encapsulated in the term "Machinery management". The number, size complexity and cost of machine have major impact on farm profitability. The study found the inclusion of tax allowance and accurate resale values were the important factors in the assessment of machinery ownership costs.

Ward (1990) said that good second hand tractor (less than 4 years old) are the best option for farmers with low annual use levels but a new tractor is preferred option where annual use levels are high. The tractor ownership is prohibitively expensive at annual use levels less than 200 hrs. The break-even point between buying a new or second hand tractor is dependent on the repair costs and any reduction in repair costs will increase the replacement life.

Chatha and Grewal (1991) conducted a study on tractorization in Punjab. The study revealed that there was a considerable market for second hand tractors which emerged after 1975 because of breakthrough in paddy production technology. The purchasers were mostly small farmers who felt the necessity of having their own tractor for enhancing production efficiency but were unable to make heavy investment on new tractors.

Singh and Singh (1991) Studied the utilization percentage of seven models of tractors in the power range of 30 to 90 bhp on mechanized farm having an area of 4000ha. They found that the tractors in the power range of 35-50 bhp have higher utilization percentage than the 50-90 bhp tractors during their first year of use. However, beyond this period 50-90 bhp tractors have comparatively more utilization percentage and they found that the foreign make tractor had higher utilization percentage than indigenous models.

Shukla and Jain (1992) found that the farmers preferred to keep their tractors just for 4 to 8 years and after that period, they replaced it. In the survey a majority of farmers were those who had purchased the new tractors for the first time. In most of these cases, first time purchasing were due to division of joint

family. It was also found that most popular hp tractor was 35hp as about half of the tractors purchased by the farmers surveyed were of this size.

Singh and Dhawan (1994) studied in Punjab that the number of tractors has gone up to 265000 in 1990-91 while the cultivated area remained at about 4200 thousand hectare. The crop-wise use of tractor showed that paddy and wheat were the main crops in the crop mix farming which accounted for 33.96 percent and 39.60 percent of the total use of tractors, respectively. Seedbed preparation, sowing of seed, marketing of products, threshing and puddling were the important farm operations for which tractors were being used. About 37.20 percent of the tractors were being used for less than 300 hours per annum and their use could be considered uneconomical.

Singh and Balishter (1997) studied that there is no specific relationship seems to exist between the farm size and tractor size. Tractors are purchased not only for own farm work but to cater to custom work too and also studied that more than 90 percent of the tractor sales were financed through credit at defined rates, essentially through commercial banks, regional rural banks and state level land development banks. Farmers needed to put up around 10-15 percent of the total price of the

tractor. NABARD, the National Bank for Agricultural and Rural Development, plays an important role in this system, for it provides refinance to other banks for agricultural credit.

Mannan (1998) studied that the higher hp tractors was having the maximum growth potential as the demand is shifting from 21hp to higher hp segment. This was because of the revised excise policy, which had reduced the gap in the prices of 21hp and higher hp segment. Earlier there used to be zero excise duty on tractors in 21hp segment which was withdrawn, thus raising their cost considerably, on the other hand excise duty on higher hp segment has been brought down from 15 to 10 percent. The study also revealed that the easy availability of the agricultural credit was also the main reason for pushing the industry growth upwards, more than 90 percent of tractors in our country were sold on credit.

Philipose (1998) reports that tractors have long been regarded a status symbol in Punjab irrespective of their economic viability. Ironically, therefore, they sometimes represent the extent of debt a family is in. Optimal utilization of tractor requires that it be operated for at least 1000 hours a year. The level in the state are less than half of this. There have been numerous cases of people borrowing at high rates of interest to

buy a tractor and then having to give it up, some years later to recover from their debt.

Shrivastava & Shrivastava (1998) in a study conducted in Madhya Pradesh, found that wheat, paddy and soya-bean were the important crops grown by the respondents which represented more than 70 percent of gross cultivated area of sample farms. A personally-owned tractor at the start is capital intensive but its operational cost was lower than the hiring rates of tractors per hour prevalent in the locality. Hence it was economical to own a tractor than to hire it. In the case of a pair of bullocks, it was more profitable to hire it than to own one. The study also revealed that the tractor and bullock power were under-utilized at the existing use pattern, the main reason being that farms are small in size and scattered. The question of displacement of labour does not arise at all since tractors are mainly involved in preliminary tillage operation and hence there is no reduction of labour input in tractor farms. The use of tractor influenced the increased use of inputs, generating more employment opportunity through extensive as well as intensive utilization of land, expanded output and maximized net return. Therefore, tractor power is viable and more economical over the use of bullocks.

Balasankari & Salokhe (1999) studied the tractor utilization by farmers in coimbatore district of Tamilnadu. In all, 88 farmer respondents were interviewed. It was found that only about 12.5 percent of the farmers surveyed had proper training for use and maintenance of tractor and about 45 percent of them had a license to drive the tractor. Inconveniences involved in maintaining animals, reduced labour availability during peak seasons and timeliness of operations were the main reasons given by the farmers for buying a tractor. Farmers used their tractors for about 1241 hrs a year, out of which they used them for 611 hrs for their own purpose. About 65.7 percent of the farmers hired out their tractors to other when not in use in their own farm.

NASIR (1999) maintains that bank finance is very liberal and is the backbone of the tractor industry. NABARD gives approval to the banks for refinancing after testing the tractors at Budhni in Madhya Pradesh. Tractors are tested here for one full year and the report is submitted to the Agriculture Ministry. After examining the report, the Agriculture Ministry advises NABARD for loan allocation. More than 95 percent of the tractors are purchased through the bank's refinancing.

Singh & Doharey (1999) studied that Punjab has reached a saturation level with 82 tractors per 1000 ha followed by two neighbouring states, Haryana with 63 tractors per 1000 ha and Utter Pradesh with 24 tractors per 1000 ha. The sale of tractors continues to be high in the northern and western states (UP), Punjab, Madhya Pradesh, Haryana, Rajasthan, Gujrat and Maharashtra using dry land preparation and growing mainly wheat. Easy availability of agricultural credit has contributed significantly towards the growth of the tractor industry.

The existing body of knowledge has a dearth of literature regarding the economics of tractor use on medium and small farms in Punjab. Since majority of farms in the state as well as the country fall in this category, a need was felt to undertake an in-depth analysis of the before mentioned problem. For this reason, the present study is being undertaken.

CHAPTER III

RESEARCH METHODOLOGY

This chapter describes the brief procedure adopted to achieve the objectives of the study. The study was conducted in Punjab state.

The study was divided in two phases

- a) Field Survey
- b) Data analysis

3.1 Field Survey

3.1.1 Selection of Object for Study:

The small, semi-medium and medium farmers, owning/hiring tractors, living in rural area of Punjab constituted the population of this study. Small, semi-medium and medium farmers were defined as under :

Table 3.1 Farmers to be categorised on the basis of land holding

Category	Land holding
1) Small	1-2 ha
2) Semi-medium	2-4 ha
3) Medium	4-10 ha

(Source: Statistical Abstract of Punjab, 1999)

3.1.2 Sampling Procedure

A four-stage stratified sampling technique was adopted for selecting the farmers.

Stage I : Selection of Districts

The study was carried out in two districts of Punjab namely, Ludhiana and Kapurthala. These districts were selected randomly from wheat paddy belt.

a) Ludhiana district is the most populous in terms of tractor per unit area in Punjab. There was 14.58 ha of agricultural land for each tractor in 1998. (Statistical abstract of Punjab, 1999)

b) In Kapurthala district, there was 19.01 ha of agricultural land for each tractor in 1998. (Statistical abstract of Punjab, 1999)

Stage II : Selection of Blocks

There are eleven and five blocks in Ludhiana and Kapurthala districts respectively, out of which two blocks from each district were selected randomly by using random no. table for the survey. These blocks were Pakhowal, Sidhwan Bet (in Ludhiana dist.) and Kapurthala, Dhilwan (in Kapurthala dist.)

Stage III : Selection of villages

Two villages from each selected block were chosen by convenience sampling. Thus in all, eight villages were selected for the study. The list of villages is given in annexure II.

Stage IV : Selection of farmers from villages

Ten farmers from each selected village were considered for the study, who were capable of understanding the importance of the study and had awareness to provide accurate information. The category-wise selection of farmers were as follows:

Table 3.2 Category-wise selection of farmers

Category	Land holding	No of resp. taken from a village	Total Resp.
1) Small	1-2ha	3	24
2) Semi-medium	2-4ha	3	24
3) Medium	4-10ha	4	32
Total		10	80

Thus, total in all, the sample consisting of 80 farmers were selected for an in-depth analysis of problem. The total percentage of small, semi-medium, medium and large farmers in Punjab State has been given in the annexure III.

3.1.3 Preparation of Sampling framework

After consulting relevant literature and view of experts a structured interview schedule was developed for collecting the data, which included demographic profile of farmers and information regarding the advantages/disadvantages of

buying/hiring a tractor, repair & maintenance cost, consumption of oil, annual use of tractor for various farm operations, etc.

The interview schedule was discussed with experts for their comments and further improvements were made in order to make it more compact and easily understandable. A pilot survey of Bhundri and Bhata Dhua villages (In Ludhiana district) of small and medium farmers (not included in the sample) was conducted for pretesting the interview schedule. On the basis of information obtained through pretesting, important additions and deletions were made in the body of interview schedule and final form of interview schedule was developed.

3.1.4 Collection of data

The data was collected from selected farmers as per the interview schedule developed. The data was collected personally by administering the final interview schedule to farmers to ensure the reliability of data. The objectives of the study were explained to the farmers and they were assured that the information provided by them would be kept confidential and used for the purpose of research study only. The information regarding the farm size, cropping pattern, factors influencing the farmers for purchasing a tractor, repair and maintenance cost of tractor, advantages and disadvantages of buying/ hiring a

tractor, purchase price of tractor and allied equipments, wages of operator, etc. were collected from the selected farmers.

3.2 Data analysis

For the purpose of analysis of some of the responses, mean scores and mean ranks have been used in addition to percentages.

3.2.1 Mean score :

The mean score for each factor was calculated by using the following formula.

$$\text{Mean score} = \frac{\text{Total score earned by individual factor}}{\text{Total No. of respondents}}$$

The scores have been assigned to various options to arrive at one consolidated figure. The scores which have been assigned to various options were as, Highly effective option has been given score of +4, Moderately effective +3, Less effective +2 and Not effective as +1. The frequency of respondents for each factor was calculated and then multiplied by their respective score then added it to get the total score for each factor. Highest score was given the rank one.

3.2.2 Mean rank :

Mean rank for each factor was calculated by using the following formula.

$$\text{Mean rank} = \frac{\text{Sum of all the ranks for each factor given by the respondents}}{\text{Total No. of respondents}}$$

The lowest mean rank was given the rank one.

For the purpose of calculating the economic viability, the costs were divided into fixed cost and variable cost.

3.2.3 Fixed cost

Fixed costs include all such expenditure which were independent of the use of an assets. These costs once incurred become sunk or fixed and include depreciation, shelter cost and interest on investment.

3.2.3.1 Depreciation :

Depreciation is the amount by which the value of a machine decreases with the passage of time whether used or rot. Practically, it is the amount that must be kept aside under depreciation head every year, so that, after the expiry of the economic life of machine, the amount accumulated under this head plus the salvage value of tractor should be equal to the original investment.

The deprecation is calculated by the simplest straight line method, by using the following formula :

$$D = \frac{C - S}{L}$$

D= Annual Depreciation

C= Initial cost

S= Salvage Value

L= expected life of tractor

The Salvage value is taken as 10 percent of the Initial cost of tractor and working life of tractor is assumed to be 10 years. Thus the formula for calculating the depreciation is

$$D = \frac{C - 10\% \text{ of } C}{L} = \frac{0.9 C}{L}$$

3.2.3.2 Interest on investment

Since the capital used to buy a tractor can not be used for other productive enterprises, the interest on the investment on tractor is included in fixed cost. The interest on investment was calculated at 15% per annum at the prevailing rate.

3.2.3.3 Shelter cost :-

A cost of shelter should be assigned to machinery, if a shelter was used. The cost can be determined and assigned over the life of the machine. If the machine is not sheltered, its cost was not considered for calculating the depreciation. This cost was calculated by asking the farmers, to how much amount they have spent on their shed.

3.2.4 Variable cost

This includes, all such costs which vary with the annual use of tractor. These costs include expenditure incurred on fuel, repairs and maintenance, operator's wages etc.

3.2.4.1 Fuel Cost

Fuel cost includes the expenditure made on diesel. Fuel cost is calculated by knowing the approximate consumption of diesel per hour from the farmers and multiplied by the no of hours tractor run in a year.

3.2.4.2 Oil Cost

This includes the costs incurred on replacement of lubrication oil of crank case, transmission system, hydraulic system and air cleaner oil. These were recorded by recording the expenditures made by the farmers on changing mobile oil once a time and multiplied by the no. of times mobile oil is changed in a year

3.2.4.3 Repair & Replacement cost

These costs are expenditure for parts and labour for installing, replacement of parts, after a part failure and reconditioning of renewable parts as a result of wear and tear. These were recorded by knowing the approximate repair and maintenance cost per year from the farmers.

3.2.4.4 Operator's wages

In most of the cases farmers operate the tractors themselves. But for calculation purpose it is taken as Rs 60 per day and multiplied by the no. of hours the tractor was operated to get annual charges made against operator's wages.

3.2.4.5 Insurance Cost

These costs have been calculated as per the procedure adopted by insurance companies which are into the business of tractor insurance. The insurance costs for one year were calculated as follows :

Charges made on annual basis from the owner

- 1) Rs 150 charged on damage head in order to compensate any type of damage caused to tractor due to accident.
- 2) Rs 507 charged under third party act in order to compensate the loss caused by the insured tractor to third party.
- 3) 1 percent of estimated insured value (EIV) of tractor.

Total premium (TP) = The sum of above three

Surcharge (sc) = 5% of TP

Total insurance charges of a tractor per annum = TP+SC

But, mostly, the farmers go for only third party insurance because, it is much less as compared to the total insurance value. So only third party insurance cost was taken for the purpose of calculation in present study.

3.2.5 Calculation of Hiring cost/hr

The farm operations required for the modern intensive agriculture vary from ploughing, leveling and puddling etc. All these farm operations require the use of tractor. To determine the hiring cost of tractor/hrs, first the cost of these individual farm

operation was ascertained. The prevailing market prices of these operations were taken. The prevailing prices are more or less inelastic and were found to be uniform over the entire state. After, this the no. of farm operations required per crop was ascertained. The number and type of operations vary with the crop and thus the costs vary too. The total hiring cost per crop was obtained by multiplying the hiring cost of individual operations with the no. of operations and adding them. This gave us the total hiring cost per year. Now to find out the cost per hour of the hired tractor, the total hiring cost per year was divided by the calculated annual use of tractor in hours. This gave us the hiring cost of tractor per hour.

3.2.6 Difference in Hired cost of tractor and ownership cost

The total cost in terms of fixed and variable cost and hiring cost of tractor as explained above was calculated. To determine the difference, the hiring cost was deducted from the total cost (ownership cost). This gave us the difference between the two costs. This difference in cost gives us an indication of the comparative profitability of owning a tractor V/S the cost of hiring them.

3.3 Limitations of the Study

This study was a one man's survey and the researcher concerned is a student, constrained by the limitations of time, money and other resources. So this effort is not devoid of the usual limitations of a one man's survey. More specifically, the following limitations may be pointed out so that the findings of the study could be seen in the right perspective :

- 1) The study was undertaken simultaneously with the regular academic session, so the sample size was limited to 80 farmers.
- 2) Taking into consideration, the illiterate and less educated farmers, it was very difficult to get right response from them regarding various structured questions. Thus, personal biases and reservations of farmers affecting their responses cannot be ruled out.
- 3) The answers of the farmers regarding their annual usage of tractor may not be precise, these are approximate.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter presents the analysis of primary data collected from farmers under study. Keeping in view the specific objectives of the study, the present chapter is divided into four sections. In section I, we discuss the general profile of farmers like age, occupation, education etc. Section II deals with the factors affecting the decision making of farmers for purchasing a tractor. In this section, we also study the effectiveness of sales promotion media on farmer's purchase decision and source of information from where the farmer's seek the information for purchasing a tractor. Section III is devoted to find the advantages and disadvantages of buying and hiring a tractor for cultivation in medium and small farms. In section IV, we try to find out whether the tractor use in small and medium farms is a viable proposition.

Section - I

4.1 General Profile of Respondents

The respondents consisted of farmers in the "Small", "Semi-medium" and "Medium" farms. The "small" farms were of size 1-2 ha and had 24 respondents in this category, the "semi-medium" farms were of size 2-4 ha and had 24 respondents and "Medium" farms of size 4-10 ha and had 32 respondents.

The demographic features of the respondents are presented in Table 4.1. As it is evident from the table, the sample of the study consist of 24 small farmers, 24 semi-medium farmers, and 32 medium farmers which made a total sample of 80 respondents.

4.1.1 Age:

A majority of the respondents were from middle age group (36 to 55 years) in all the three categories of farmers. There were 37.50 percent small farmers, 58.33 percent semi-medium farmers and 46.88 percent medium farmers making 46.25 percent of total farmers as shown in table. Only about one-fifth of the farmers were found in old age group (56 and above) and 33.75 percent farmers were found to be young (upto 35 years).

Table 4.1 Frequency distribution of sample farmers according to various variables

S.No	Variables	Categories	Small Farmers (1-2 ha)		Semi-medium Farmers (2-4 ha)		Medium Farmers (4-10 ha)		Total Farmers	
			No.	% Age	No.	% Age	No.	%Age	No.	%Age
1.	Age	Up to 35 years (young)	8	33.33	7	29.17	11	34.38	27	33.75
		36 to 55 years (Middle group)	9	37.50	14	58.33	15	46.88	37	46.25
		56 and above (old age group)	7	29.17	3	12.50	6	18.74	16	20.00
		Total.	24	100.00	24	100.00	32	100.00	80	100.00
2.	Education	illiterate	4	16.66	6	25.00	5	15.63	15	18.75
		up to primary	7	29.17	4	16.66	10	31.25	21	26.25
		up to junior High school	8	33.33	12	50.00	9	28.13	29	36.25
		up to Intermediate	2	8.34	1	4.17	5	15.62	8	10.00
		Graduate & above	3	12.50	1	4.17	3	9.37	7	8.75
		Total	24	100.00	24	100.00	32	100.00	80	100.00
3.	Occupation	Agriculture	14	58.33	18	75.00	23	71.87	55	68.75
		Ag.+Subsidiary Occupation	10	41.67	6	25.00	9	28.13	25	31.25
		Total	24	100.00	24	100.00	32	100.00	80	100.00
4.	Ownership of tractor	Purchased a tractor								
		a) on loan	13	54.17	18	75.00	28	87.50	59	73.75
		b)without loan	2	8.33	2	8.33	3	9.38	7	8.75
		Not owning	9	37.50	4	16.67	1	3.12	14	17.50
	Total	24	100.00	24	100.00	32	100.00	80	100.00	
5.	Social Participation	No membership	8	33.33	2	8.33	7	21.87	17	21.25
		Member in one organisation	9	37.50	13	54.17	19	59.38	41	51.25
		Member in more than one organisation	7	29.17	9	37.50	6	18.75	22	27.50
		Total	24	100.00	24	100.00	32	100.00	80	100.00

4.1.2 Education :

Education is one of the factor affecting the capability of the tractor operator. The literacy status of tractor operator may influence understanding about the use of tractor/implements because he can study the operation manual and understand all the instructions. On the other hand, less educated or illiterate are limited in their understanding of the idiosyncrasies of a tractor. The farmers under study had varied educational background, their level of education ranging from total illiteracy to post graduation.

From table 4.1, it is clear that majority of the farmers in the sample (81.25 percent) were educated. Out of which 26.25 percent were up to primary, 36.25 percent were up to matric, 10 percent were up to intermediate and 8.75 percent were graduate or post graduates. The percentage of illiterate farmers was highest (25.0 percent) in the semi-medium category. Since a large number (81.25 percent) of farmers were educated. They were expected to be more receptive to modern agricultural techniques. Education level has a bearing upon farmer's behaviour with regard to their attitude towards modern agricultural techniques.

4.1.3 Occupation :

Obviously, all the farmers under study were agrigent twist. However, a large majority of them (68.75 percent) depended

exclusively on farming, while the remaining 31.25 percent, on combined farming with allied activities like dairy farming, carpentry, etc. It may also be observed that a large number of medium and semi-medium farmers (72-75 percent) had farming as sole occupation, than the small farmers (58 percent). The reason for this may be sought in the fact that small farmers wanted to supplement their meager income from their small farms by indulging in allied activities.

4.1.4 Ownership of tractor

A vast majority of the farmers (82.5 percent) have their own tractors, of which only 8.75 percent have purchased tractors from their own resources only, while the remaining 73.75 percent did so by taking loans from banks and other financial institutions. Thus, only 17.50 percent of total farmers did not own tractors and hired the tractors for the purpose of cultivation. The incidence of not owning a tractor is much greater in the case of small farmers (37.5 percent).

As already indicated, a majority of farmers(73.75) having their own tractors, have purchased them on loan. Only 8.75 percent of the respondents have purchased their tractors without loan. The main reason for those having not taken loans from financial institutions, was that they have purchased their tractor from the second hand market. Most of the farmers were, however,

those who have purchased, whether the new tractor or second hand tractor have taken a loan from the financial institutions for purchasing their own tractors.

4.1.5 Social participation:

It is evident from table 4.1 that 78.75 percent of farmers indicated different levels of social participation in the form of membership of panchyat, cooperative society, village development committee, membership of kissan club etc. Of these, 51.25 percent of the farmers were the members in only one organization and 27.50 percent were the members in more than one organization. All the panchayat office bearers were also the members of cooperative society.

It was surprising to note that 21.25 percent farmers from the total respondents were not found the member in any social organisation. Perhaps, it might be due to less contact of the farmers with the extension agencies or officers from cooperatives from whom they can know the usefulness of social organisation or it might be due to less propaganda from social organisations. Also it may be possible that farmers might not be interested to enroll as members in these organisations for want of one on the other reasons.

4.1.6 Sources of Agriculture Information.

Preferences given by farmers to various sources from where they seek the information regarding the agriculture i.e. about machinery, seeds, pesticides etc. are presented in table 4.2.

Table 4.2 Preferences given by farmers to various sources of information

Source of Agriculture information	(Mean score out of 3.00)			Mean Score	Rank
	Often	Sometime	Never		
Radio prog. Related to Ag.	1	24	55	1.32	V
TV prog. Related to Ag.	13	62	5	2.10	III
Newspapers	55	22	6	2.68	I
Visit to kissan melas	29	47	4	2.31	II
Ag. Information Magazine	1	39	40	1.51	IV

Most of the farmers depended, to a large extent, on newspaper for information relating to agricultural. The next important source of agriculture information was found to be kissan melas. In kissan melas lot of information is provided to the farmers about the seeds and new agricultural machinery. Rank III goes to TV programme related to agriculture. This was one of the most popular media among the farmers followed by agriculture information magazine, such as changi kheti, agriculture today etc. The magazines issued by university and cooperative society played a significant role in providing information related to agriculture. The fifth place are occupied by radio program related to agriculture.

Section II

4.2 Factor's affecting the purchase decision

Purchasing of tractor is a major decision for a farmers, especially for those falling in the small and medium farmers category. There are various needs and factors that affect the decision making process while purchasing a tractor. It is, therefore, in the fitness of things to study the effect of these factors on the buying behaviour of farmers.

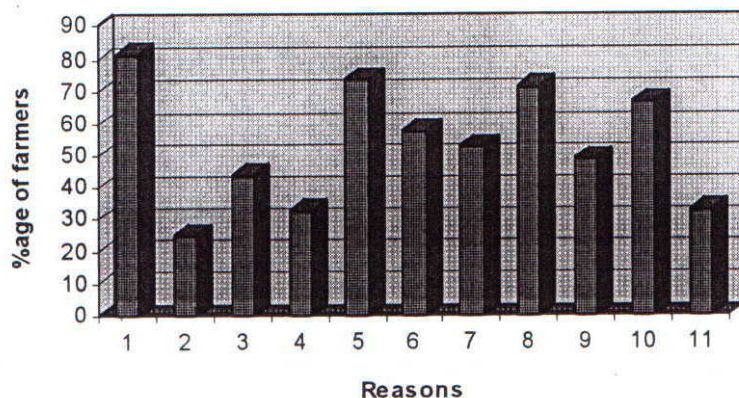
4.2.1 Reasons for buying a tractor

Most of the farmers agreed that it was worth buying a tractor for their farm. The respondents were asked to mark a set of "Reasons for buying a tractor". The results that obtained were shown in table 4.3.

Table 4.3 Reasons for buying a tractor

Reasons	No. of farmers	% age of farmers	Rank
Timeliness of operation	65	81.25	1
Convenient than feeding animals	20	25.00	11
Better quality of ploughing	35	43.75	8
Useful for many activities	26	32.50	9.5
Reduced labour availability during peak season	59	73.75	2
Labour and animal expensive	46	57.50	5
Easy to operate	42	52.50	6
Faster work	57	71.25	3
Transportation purpose	39	48.75	7
Status Symbol	53	66.25	4
Additional land available due to reduced grassland for animals	26	32.50	9.5

Fig. 4.1 Reasons for buying a tractor



Reasons :

1. Timeliness of operation
2. Convenient than feeding animals
3. Better quality of ploughing
4. Useful for many activities
5. Reduced labour availability during peak season
6. Labour and animal expensive
7. Easy to operate
8. Faster work
9. Transportation purpose
10. Status symbol
11. Additional land availability

4.2.1. Timeliness :

It is evident from the fig 4.1 that, 81.25 percent of the respondents believed that timeliness of operation was the major factor that influence the farmers for purchasing a tractor because this factor is significant in obtaining optimal yield from different crops. For instant the sowing of wheat is done during the first fort night of November. A delay beyond this period by every one week leads to about 1.50 quintals per acre decrease in the yield. This is also correct in case of other crops like paddy, cotton, potato. Similarly, other farm operations like hoeing, irrigation,

harvesting, threshing and marketing need to be performed at appropriate time. Otherwise, it is going to adversely affect the yield and income of the farmers.

4.2.1.2 Labour shortage :

It is clear from the fig 4.1 that, 73.75 percent of respondents said that reduced labour availability during peak season was another factor, which clearly justify farm mechanization. Not only the output per hour is more, the total labour requirement is also reduced. The displaced labour is of course absorbed in the other alternatives such as manufacturing, repair and service shops and the sales services etc.

4.2.1.3 Faster work :

It is observed that, 71.25 percent of respondents pointed that tractor helps in achieving the farm work in fast manner than the conventional method of farming. So it creates good scope for commercialization of agriculture.

4.2.1.4 Status symbol :

Most of the farmers (66.25%) believed that owning a tractor makes a status in the society. Infact, owning a tractor is considered a status symbol. Owning a tractor is so common that

not owning one may be considered a sign of failure or financial weakness.

Other reasons given were expensive labour and animals and easy to operate the tractor. The above main reasons given by the farmers are very relevant. Other interesting reasons given by the farmers as shown in fig 4.1.

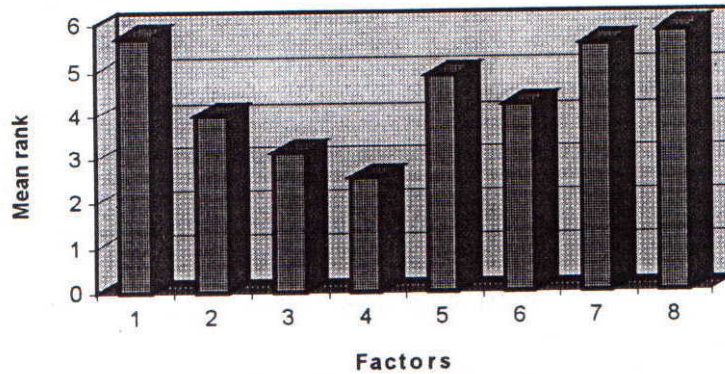
4.2.2 Importance given to various factors' while making the purchase decision

Various factors plays an important role in the decision making process of the farmer. The respondents were asked to rank the "various factors" according to the impact they make on the decision making process. The effect of various factors affecting the farmers choice of a tractor are given in table 4.4.

Table 4.4 Importance given to various factors.

Factors	Small farmers		Semi-medium farmers		Medium farmers		Total farmers	
	Mean Rank	Rank	Mean Rank	Rank	Mean Rank	Rank	Mean Rank	Rank
Easy availability	6.25	VIII	4.92	VI	5.94	VIII	5.73	VII
Maintenance	3.71	III	4.42	IV	3.87	III	3.98	III
Resale value	2.75	I	3.04	II	3.50	II	3.13	II
Horse power	2.79	II	2.58	I	2.34	I	2.55	I
Spare parts and repair facility	5.25	VI	4.54	V	4.87	V	4.88	V
Fuel efficiency	4.25	IV	3.75	III	4.53	IV	4.21	IV
After sale service	4.92	V	6.46	VIII	5.34	VI	5.55	VI
Low price	5.63	VII	6.33	VII	5.69	VII	5.86	VIII

Fig. 4.2 Importance given to various factors



Factors :

1. Easy availability
2. Maintenance
3. Resale value
4. Horse power
5. Spare parts and repair facility
6. Fuel efficiency
7. After sale service
8. Low price

It is evident from the table that the horse power (Mean rank 2.55) was the most important factor affecting the decision making of farmers. It is closely followed by resale value (Mean rank 3.13). The other factors are maintenance (Mean rank 3.98), fuel efficiency (Mean rank 4.21), spare parts and repair facility (Mean rank 4.88), after sale service (Mean rank 5.55), easy availability (Mean rank 5.73), Low price (Mean rank 5.86). According to small farmers resale value is the most important factor, while for semi-medium and medium farmers horse power is the main consideration.

4.2.3 Sources of information affecting the purchase

decision

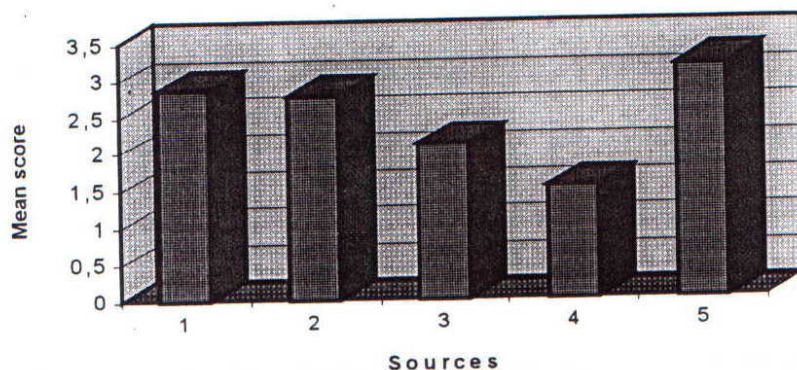
Various sources of information play an important role in the decision making process of the farmer. The respondents were asked to rate the "Various sources of information" according to the impact they make on the decision making process. The results are given below in table 4.5.

Table 4.5 Ranking given to "Various sources of information" by the farmers

(Mean score out of 4.00)

Source	Strongly	Moderately	Less	Not at all	Mean Score	Rank
Opinion leaders	28	26	14	12	2.87	2
Dealers	14	41	19	6	2.78	3
Sales Representative	7	18	32	23	2.11	4
Agriculture Officers	4	9	12	55	1.52	5
Relatives and friends	29	39	8	4	3.16	1

Fig. 4.3 Various sources of information affecting the purchase decision



Sources :

1. Opinion leaders
2. Dealers
3. Sales Representative
4. Agriculture officers
5. Relatives and friends

The results obtained from the farmers about the “ Sources of information affecting the purchase decision while making a purchase decision” are presented in table 4.5. Rank 1 goes to “Relatives and friends”. It was observed during the course of the study that farmers feel that they can trust the information obtained from their relatives and friends. They can also see the results in their fields. The second most significant source of information were the “ Opinion Leaders”. It was observed that opinion leaders in most cases were well-educated farmers with considerable land holdings. In most of the villages visited during the course of study, the Sarpanch or the local leaders fit the bill. They were also the farmers, who come under the “Innovators Category”, those who were more open to new ideas. The third place as a source of information went to dealers. It was seen that

many farmers made up their mind only to change it at the suggestion of the dealers . “ Sales Representatives” were accorded a dismal 4th place. The prevalent public opinion about the “Sales representatives” was that they would go to any lengths to sell their wares , even misguide the farmers. “Agriculture officers” was not at all important as source of information for purchasing a tractor. This was due to the fact that farmers were having less contact with the Agricultural Officers in their villages.

4.2.4 Effectiveness of sales promotion media on farmers purchase decision.

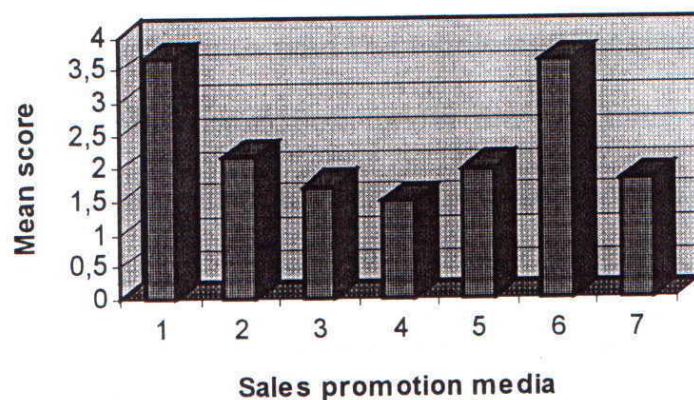
The importance of sales promotion media are more pronounced in farmer’s decision for purchasing a tractor. An exploration of the “ Effectiveness of Sales promotion media on farmers purchase decision” presented the results shown in table 4.6.

Table 4.6 Preference given to various sales promotion media

(Mean score out of 4.00)

Means of promotion	Highly effective	Moderately effective	Less effective	Not effective	Mean score
Spot demonstrations	55	23	2	0	3.66
Wall paintings	2	31	25	22	2.16
Leaflets	2	14	23	41	1.71
Hoardings	0	9	22	48	1.48
Ad on radio	2	17	39	22	1.98
Ad. On TV	50	29	1	0	3.61
Posters	2	14	31	33	1.81

Fig 4.4 Effectiveness of sales promotion media



Sales promotion media :

1. Spot demonstrations
2. Wall paintings
3. Leaflets
4. Hoardings
5. Ad. on radio
6. Ad. on TV
7. Posters

A part from spot demonstration (mean score 3.66), TV adds (Mean score 3.61) which were found by the farmers as highly effective. This was expected due to increasing influence of television even in remote areas. In essence TV adds are an extension of the spot demonstrations . In both the cases the farmers are able to see the product and its working. In the television adds, they are able to gather the information audio visually without having to 'read' the message content.

The noteworthy fact is that the top two positions are occupied by such means of activities that enable the farmers to "see" and "hear" rather than make them read. Since majority of

farmers are less educated , they will obviously prefer those means that increase the chances of audio visual inputs than those where they have to read the whole add message.

Other Sales promotion media did not have much impact on their purchase decision. The only exception was, however, wall paintings which was perceived by the farmers as moderately effective because the wall paintings with the picture of the tractor and prominent company Logo are taken note of.

Section III

4.3 Advantages/Disadvantages of Buying/Hiring a tractor

The use of tractor in the highly intensive farming culture is irreplaceable. However, the farmers have the option of buying a tractor or hiring it. Since the investment involved is huge amount, it is worthwhile to study the comparative advantages and disadvantages of purchasing a tractor versus hiring it. It may be recalled that while a majority of sample farmers own tractors, quite a large number of them, especially small farmers (37.5 percent) did not own tractors and hired them when needed.

4.3.1 Advantages of buying a tractor :

- 1.** Owning a tractor enables it to be used at any time at short notice. This reduces dependence on external sources for the tractor. In many cases these external sources prove to be unreliable like in peak seasons, the hiring charges tend to be demand driven and go up when the need or demand for tractors is highest.
- 2.** The availability of tractor all through the year ensures that farm operations are carried out at a proper time. Many of the farm operations are crucial for the crop production and thus their timelines is also a crucial factor in the final output.

3. The society in Punjab is agrarian in nature with its own peculiar socio-economic characters and yard sticks. The fact that the state is highly prosperous adds to the point that owning a tractor is considered a status symbol. Infact, owning a tractor is so common that not owning one may be considered a sign of failure or financial weakness.

4. Tractor is a common means of transportation for both people and goods in the state. Owning a tractor sometimes allows the use of tractor for transportation purposes as and when the need arises. On one hand it eliminates the need for a separate vehicle and on the other hand, it reduces dependence on external sources of transportation for carrying produce and goods to and from the market at proper time.

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5. Owning a tractor allows its use as a source of supplementary income. The farmers often lease out tractors to other farmers and other professions like brick kilns etc. This serves as a source of income during the off season, when income is not forthcoming from the primary agricultural activities.

6. The productivity of the farm and its efficiency is improved with the operations being mechanized and being out at the prescribed time. The use of tractors for operations like pesticide spray, application of filial nutrient supplements help increase the productivity and yield drastically.



7. Progressive farming is synonymous with large scale mechanization and timeliness of operations especially when the cropping intensities are so high as in Punjab. The possession of a tractor tends freedom to try out new ways and methods of crop production in essence, it aids in adoption of a "pioneer" attitude. This is directly beneficial in progressive farming .

8. Agriculture is a very labour intensive industry. During the peak season, the labour becomes scarce and the price shocks up. This increase the cost of production. Also the erratic supply of labour during the peak season endanger the timelines of farm operations, which is a very crucial factor in agriculture. So tractor helps in reducing the labour requirement during the peak season.

4.3.2 Disadvantages of buying a tractor

1. In Punjab state tractor generally remains underutilized. Due to seasonal nature of the agriculture the tractor remains idle for much of the time. Thus idle tractor means unnecessary high costs, unless proper alternate use of such machinery in the off time is made.

2. Majority of the small and medium farmers are not in a financial position to purchase a tractor by themselves. This leads them to take loans from financial institutions and many default

on repayment of the loans adding to the financial burden unnecessarily.

3. No doubt , the increasing farm mechanization is going to increase employment in secondary & tertiary sector, but its impact on creating unemployment in primary sector especially in the rural area is quite visible, where there is already limited scope of employment opportunities in non agriculture sector.

4. Many parts of the state don't have adequate after sales service and provision of spare parts. This makes maintenance and repairs a very expensive proposition. Many time farmers are seen to delay repairs till as late as possible. This leads to permanent damage and thus occur heavy financial losses.

5. There ever increasing shortage of fuel oil (diesel)and thus their rising costs makes the owning of a tractor an expensive proposition. The presence of a tractor at hand allows, its use for economically non-productive activities thus causing financial losses.

6. Mechanization of farm operation calls for a high level of awareness and knowledge regarding the technology and machinery. The literacy rates in the villages in the states are very low and consequently the awareness levels are also low. This leads to misuse and mis-handling of equipment resulting in nullification of the advantage and financial losses due to damage, resulting from improper use.

4.3.3 Advantages of custom hiring tractor

1. No ownership costs.
2. Costs of tractor and its equipment can be invested in some other area.
3. Producer with small jobs can gain benefits of large machines.
4. Custom operator is responsible for repairs, maintenance and materials.
5. Farmers can take advantage of newest machinery and techniques.
6. No worry about loan payments / installments.
7. Less equipment is needed by farmers, particularly specialized.
8. Hiring cost of tractor is less as compared to owning a tractor in case of small and medium farmers.

4.3.4 Disadvantages of custom hiring tractor

1. May not be possible to schedule when needed.
2. Less control on the quality of work.
3. Increased chances for losses because of delays.
4. Progressive farming can not be done without buying a tractor.
5. Increased risk of spreading weed seeds and diseases.
6. Small jobs have a greater chance of being postponed.
7. Costs for large jobs may be higher than owning machines.

Section IV

4.4 Economic viability of usage of tractor

On a tractorized farm, tractor is regarded as the prime asset of a farmer. In fact, it is real driving force on a farm. From the stand point of view it comes next only to land. Thus for an asset of so high value, it is important to study the extent of its utilization by the farmer. Usage of tractor is one of the common feature in most of the farm operations. Since the overall costs of farm operations play an important role in the profitability of the farm, the economic viability of tractor use assumes great significance for efficient management of farm operations. The economic viability is analysed for small, semi-medium and medium farms by finding the total cost of using own tractor and hired tractor and then calculating the difference between the ownership cost and hired cost. Thus difference between the two costs shows whether owning or hiring a tractor is profitable for farmers.

4.4.1. Tractor utilization pattern (on Small farms)

Beside using tractor on own farm, it was also hired out by the owner-farmer with a view to supplementing his family income. But a disquieting feature tractor use was its extensive

use for various social purposes. The utilization pattern of tractor on sample farms are as shown in table 4.7.

Table 4.7 Utilization pattern of tractor on small farms in Punjab

Type of use	Annual use (hr)	Percent of total
On own farm	57.00	55.33
Commercial purpose	26.00	25.25
Social work	20.00	19.42
Total	103.00	100.00

Table 4.7 shows that tractors were used about 55.33 percent of the time performing various farm operations. About 25.25 percent of tractor utilization was for commercial purpose and 19.42 percent for social activities such as attending festivals , marriages , religious functions etc. The use for social functions was considered unproductive but in some cases it was unavoidable because other modes of transport were more cumbersome though generally less expensive.

In order to arrive at the total use of tractor on a farm, it may be desirable to analyse tractor use for different operations of different crop enterprises. A split up of tractor use on users own farms for various crops is presented in table 4.8.

Table 4.8 Tractor use on small farms for different crops grown
in Punjab

Crop	Average Area Under the crop (ha)	Percent of total Cropped area	Annual use (hr.)	Percent of total use on own farm
Paddy	1.2	37.50	18.00	31.58
Wheat	1.4	43.75	29.75	52.19
Summer Fooder	0.2	6.25	1.75	3.08
Winter fooder	0.2	6.25	2.25	3.94
Vegetables	0.2	6.25	5.25	9.21
Total	3.2	100.00	57.00	100.00

Tractor utilization for different crops and crop pattern shows that paddy and wheat were the dominant crops and cover 81.25 percent of the total cropped area. Further, these crops accounted for 31.58 percent and 52.19 percent of the total use of tractors on user's own farm respectively. Vegetable crops accounted for over 9 percent of total tractor use.

4.4.1.1 Cost of Operation

The cost of operation was influenced by tractor make, horse power and type of operation etc. The annual use of tractors in hours was a crucial factor in determining the cost per hour. Tractor operation involved a number of components of costs. Farmers were conscious of some but not all of them. The average

annual cost and cost per hour of operating a tractor in small farms is presented in table 4.9.

Table 4.9 Average cost of operation of Tractors on small farms in Punjab

Items	(Amount in Rs.)		
	Annual cost/ Tractor	Annual cost/Ha	Cost/hr
Fixed Cost			
Depreciation of tractor and allied implements	5872.85	4194.89	57.01
Interest an Investment @ 15% P.a.	9788.08	6991.48	95.02
Total fixed cost	15660.93	11186.37	152.03
Variable costs			
Diesel	5891.60	4208.28	57.20
Mobil Oil	750.00	535.71	7.28
Insurance Cost	507.00	362.14	4.92
Wages of driver	772.50	551.78	7.50
Repair and Replacement	5550.00	3964.28	53.88
Total variable cost	13471.1	9622.19	130.78
Total Cost	29132.03	20808.56	282.81
Hiring charges	10650.00	7607.14	186.84
Difference between ownership and hiring cost	18482.03	13201.42	95.97

The average fixed and variable costs were almost at par with each other and jointly accounted for Rs 29132.03/tractor/annum. The average investment of a tractor and its equipment at current market price was estimated at Rs 65253.84 with an expected life span of 10 years.

Thus the depreciation of machinery accounted for Rs 5872.85/annum/tractor. The other major item of fixed cost was the interest, which was at 15 percent per annum, the prevailing rate. These fixed costs amounted to Rs 15660.93/annum or Rs 11186.37/ha or Rs 152.03/hr of tractor use.

The cost of diesel was the most important among the variable cost items which amounted to Rs 5891.60/ annum or Rs 57.20/hr of use. Next in importance was the repair and replacement cost amounting to Rs 5550.00/annum. The wages of operator was assumed at Rs 60/day (for 8 hours of work). The imputed wage of driver during the year was Rs 772.50 (for small farmers) for operating the tractor for 103hrs. The total variable cost was Rs 13471.1/annum or Rs 9622.19/ha or Rs 130.78/hr of tractor use. Thus the total cost per hour was amounting to Rs 282.81 for small farmers.

Comparing the ownership cost of tractor per hour with the hiring rates per hour prevalent in the locality, it was found that hiring charges for tractors was lower by Rs 95.97 per hour than the ownership cost per hour. So it is economical for small farmers to hire a tractor than to own one.

4.4.2 Pattern of tractor use on semi-medium farms

Mostly the farmers use their tractors on own farms. Beside this, the tractor is also used for non farm operations i.e. commercial and social purposes to earn extra income. Utilization pattern of tractor on semi-medium farms is shown in table 4.10.

Table 4.10 Utilization pattern of tractors on Semi medium farms in Punjab

Type of use	Annual Use (hr)	Percent of total
On own farm	100.2	65.83
Commercial purpose	32.0	21.02
Social Work	20.0	13.15
Total	152.2	100.00

It shows that tractors were used about 65.83% of the time performing various farm operations i.e the tractor was use on own farms and 21.02 percent of tractor use was for commercial purpose and 13.15 percent for social activities.

A tractor use for various farm operations on own farm is presented in table 4.11.

Table 4.11 Tractor use on semi medium farms for different crops grown in Punjab

Crop	Average Area under the crop (ha)	Percent of total Cropped Area	Annual use (hr)	Percent of total use on own farm
Paddy	2.13	36.98	31.95	31.88
Wheat	2.27	39.41	48.24	48.14
Sugarcane	0.43	7.47	8.60	8.58
Summer fooder	0.40	6.94	3.50	3.50
Winter fooder	0.40	6.94	4.50	4.50
Vegetable	0.13	2.26	3.41	3.40
Total	5.76	100.00	100.2	100.00

It shows that maximum use of tractor was for wheat and paddy crops. On an average tractor worked for 100.2 hrs per year on own farm.

4.4.2.1 Cost of operation

In general, the farmers are ignorant of the costs of operating with an owned tractor. It includes a number of fixed costs depreciation of tractor and its allied implements and interest on capital. Similarly the variable costs like the cost of diesel, oil cost, insurance cost, wages of driver and repair & maintenance costs have to be considered. The average annual

cost of operating a tractor on semi-medium farms are presented in table 4.12.

Table 4.12 Average cost of operation of tractors on semi-medium farms in Punjab

Item	Annual cost/tractor	(Amount in Rs.)	
		Annual cost/ha	Cost/hr
Fixed cost			
Depreciation of tractor and allied implements	7661.37	2471.40	50.33
Interest on investment @ 15% P.a.	12768.95	4119.02	83.89
Total fixed cost	20430.22	6590.42	134.22
Variable cost			
Diesel	9794.07	3159.37	64.35
Mobil oil	1050.00	338.71	6.89
Insurance cost	507.00	163.54	3.33
Wages of driver	1141.50	368.23	7.50
Repair and replacement	7500.00	2419.35	49.27
Total variable cost	19992.57	6449.2	131.34
Total cost	40422.89	13039.62	265.56
Hiring charges	18852.5	6081.45	188.14
Difference between ownership and hiring cost	21570.39	6958.17	77.42

The average fixed and variable costs on semi-medium farms were jointly accounted for Rs 40422.89/tractor/ annum. The average investment of a tractor and its equipment at current market price was estimated at Rs 85126.38 with an expected life

span of 10 years. Thus the depreciation of tractor and its allied implements accounted for Rs 7661.37/annum/tractor. Interest on investment is the another major item in the fixed cost. The fixed cost amounted to Rs 12768.95/annum/tractor or Rs 4119.02/ha or Rs 83.89/hr of tractor use. The total fixed cost accounted for Rs 20430.22/annum/tractor or Rs 134.22/hr of tractor use.

The variable cost includes the cost of diesel, mobile oil, insurance cost, wages of driver, repair and replacement costs. So the total variable cost accounted for Rs 131.34/hr. The total fixed and variable cost jointly accounted for Rs 265.56/hr of tractor use.

By comparing the total cost per hour of own tractor with compared with the total cost per hour of hired tractor, It was found that the hiring cost per hour is less by Rs 77.42 as compared to own tractor per hour cost. So it has found that, it is economical for semi-medium farmers to hire a tractor than to own one.

4.4.3 Tractor utilization pattern on medium farms

The annual utilization of tractor in hours on the sample farm is presented in table 4.13. These hours cover their use on the farm and off farm for non farm purpose.

Table 4.13 Utilization pattern of tractors on medium farms

Type of use	Annual use (hr)	Percent of total
On own farm	262.89	79.09
Commercial purpose	38.50	11.58
Social work	31.00	9.33
Total	332.39	100.00

It is observed from table 4.13 that the maximum use of tractor hours on own farm was 262.89 hrs (79.09 percent). About 11.58 percent of tractor utilization was for commercial purpose, which is accounted that 9.33 percent of tractor utilization was for social purpose.

The farms operated by 35-50 hp tractors had an operational holding ranging from 4.0 to 10.0 hectare, the average for the sample was being 8.3 hectare. The entire operated area was irrigated. The cropping pattern of the sample respondents is presented in table 4.14.

Table 4.14 Tractor use on medium farms for different types of crops grown in Punjab

Crop	Average area under the crop (ha)	Percent total cropped area	Annual use (hr)	Percent of total use or own farm
Paddy	5.1	34.69	76.50	29.09
Wheat	5.9	40.14	125.38	47.69
Sugarcane	1.9	12.92	38.00	14.46
Winter oil seeds	0.4	2.72	2.50	0.96
Summer foeder	0.5	3.40	4.38	1.67
Winter foeder	0.5	3.40	5.63	2.14
Vegetable	0.4	2.73	10.50	3.99
Total	14.7	100.00	262.89	100.00

Paddy crop in kharif season and wheat crop in rabi season covered the major portion of the total cultivated area. These crops accounted for 29.09 percent and 47.69 percent of the total use of tractors on user's own farm respectively. The use of tractor for different activities is presented in table 4.14. On an average tractor worked for 262.89 hrs per year on the own farm.

4.4.3.1 Cost of operation

The annual use of tractor in hours was a crucial factor in determining the cost per hour. Tractor operations involved a number of components of cost. These costs of operating a tractor is presented in table 4.15.

Table 4.15 Average cost of operation of tractors on medium farms
(Amount in Rs.)

Items	Annual cost/ tractor	Annual cost/ ha	Cost/ hr
Fixed cost			
Depreciation of tractor, allied implements and shed	10748.13	1294.95	32.34
Interest on investment @ 15% p.a.	19288.54	2323.92	58.03
Total fixed cost	30036.67	3618.87	90.37
Variable cost			
Diesel	21389.29	2577.03	64.35
Mobil oil	1500.00	180.72	4.51
Insurance cost	507.00	61.08	1.52
Wages of driver	2492.93	300.35	7.50
Repair & replacement	11000.00	1325.30	33.09
Total variable cost	36889.22	4444.48	110.97
Total cost	66925.89	8063.35	201.34
Hiring charges	49475.00	5960.84	188.19
Difference between ownership and hiring cost	17450.89	2102.50	13.15

On medium farm the average fixed and variable cost were jointly accounted for Rs 66925.89/tractor/annum. The average investment of tractor and its equipments at current market price was estimated at Rs 101090.28 with life span of 10 years. Some of the medium farmers had their own sheds for shelter the tractor, so the cost of shed was also taken in consideration. The average cost of a tractor shed was estimated at Rs 27500 with life span of 15 years. After deducting the salvage value, the depreciation by straight line method was worked out. Thus, the depreciation of machinery and shed together accounted for Rs 10748.13/annum/tractor. The most important item of fixed cost was the interest on the value of tractor, trolley and cultivator, which was at 15 percent per annum at the prevailing rate. The average worth at the investment worked out to be Rs 19288.54/annum/tractor or Rs 58.03 cost/hr. Thus the fixed cost amounted to Rs 30036.67/annum or Rs 3618.87/ha or Rs 90.37/hr.

The cost of diesel and oil which is normally considered to be major cost accounted to be Rs 64.35/hr and Rs 4.51/hr on medium farms. The cost of insurance came out to be Rs 1.52/hr. The repair and replacement cost accounted to be Rs 11000.00/annum/tractor or Rs 33.09/hrs. The total cost which was calculated on medium farms amounted to be Rs 66925.89/annum or Rs 8063.35/ha or Rs 201.34/hr. Thus

the total cost per hour was amounting to be Rs 201.34 for medium farmers which is less as compared to small farmers because of more utilization of tractor on farms.

By comparing the total cost per hour of own tractor with the total cost per hour of hiring tractor i.e calculated on the basis of hiring rates prevalent in the locality, it was found that the total cost for hiring a tractor is lower by Rs 13.15 per hour than the total cost per hour of own tractor. So it is economical for medium farmer to hire a tractor than to own one. But owning a tractor may also helpful for the medium farmers, if they are able to find adequate work and earn more income.

4.4 Profitability of owning a tractor

The difference between the cost per hectare and cost per hour of purchasing and hiring a tractor for the three categories of farmers is as shown in table 4.16

Table 4.16 Diff. In ownership costs and hiring cost.

(Amount in Rs.)

Category	Total cost per hectare			Total Cost per hour		
	Ownership cost	Hiring cost	Diff.	ownership cost	Hiring cost	Diff.
Small	20808.56	7607.14	13201.42	282.81	186.84	95.97
Semi-medium	13039.62	6081.45	6058.17	265.56	188.14	77.42
Medium	8063.35	5960.84	2102.50	201.34	188.19	13.15

As the size of land holding increases, the difference in cost of ownership and hiring decreases and the profitability increases. Table 4.16 shows that small farmers who have purchased their own tractors bear a cost of Rs. 13201.42 per hectare (or Rs. 95.97 per hour) more than those farmers who hired the tractor from others. In semi-medium category the farmers who purchased the tractor bear a cost of Rs. 6058.17 per hectare (or Rs. 77.42 per hour) more than those who hired it. Similarly, medium farmers having their own tractor bear a cost of Rs. 2102.50 per hectare (or Rs. 13.15 per hour) more than the farmers who hired the tractors from others.

When tractor owners “were asked whether or not they found owning a tractor profitable”, the responses are as shown in table 4.17.

Table 4.17 Farmer’s view about tractor profitability

Category	High Loss		Moderate Loss		No loss No Profit		Moderate profitable		High profitable	
	Res.	%age	Res.	%age	Res.	%age	Res.	%age	Res.	%age
Small	0	-	1	6.66	4	26.67	8	53.33	2	13.34
Semi-medium	0	-	1	5.00	5	25.00	8	40.00	6	30.00
Medium Farmers	0	-	0	-	2	6.45	15	48.38	14	45.17
Total farmers	0	-	2	3.03	11	16.67	31	46.97	22	33.33

Of the respondents, 46.97 percent find ownership of a tractor “moderately profitable” and 33.33 percent find it “Highly

profitable". Therefore a total of 80.30 percent of the respondents find it "moderately profitable to Highly profitable". 16.67 percent respondents said ownership was a "No profit, No Loss" proposition. It is worth noting that of the 16.67 percent, 51.67 percent respondents were from semi-medium and small farmers category. Only 3 percent respondents find ownership "Moderate loss causing". All of them (100 percent) lie in the semi-medium and small farmer category. 93.55 percent of the "medium farmers", 70 percent of the "semi-medium" and 66.6 percent of the "small farmers" felt that ownership of tractor is moderately profitable to highly profitable. But the cost calculated in this study shows that tractor ownership is not profitable, specially for small, semi-medium and medium farmers because total cost per hour was almost at par with the average custom hiring rates prevailing in the state. There is thus a marked lack of awareness regarding the costs involved in owning a tractor and hiring it. This leads to the discrepancy in perceptions, where in more than 80 percent of farmers believe ownership to be profitable. This can also be attributed to the fact that farmers take tractor as status symbol and liberal loan policies of the banks enable even the small farmers to purchase tractors.

If the farmers calculated all costs such as depreciation, interest on investment, diesel oil, mobil oil, repair and maintenance cost, driver's wages etc. then they will be

able to take the right decision as to whether they should hire or purchase a tractor. Thus, there exists a need for the farmers to be better educated about the cost included and advantages of hiring tractors for increased profitability.

CHAPTER V

SUMMARY AND CONCLUSION

This chapter seeks to present the summary of the findings of this study and their implications. The Punjab state of India has witnessed rapid mechanization of agriculture during last five decades. The population of tractor is continuously increasing, so the present study was undertaken to find out the various factors that influence the decision making of farmers for purchasing a tractor and try to find out whether owning a tractor for small and medium farmers is profitable or not. For this study, sample size of 80 farmers comprising 24 small farmers (land holding 1-2ha), 24 semi-medium farmers (2-4 ha) and 32 medium farmers (4-10 ha), were surveyed to collect the primary data. For the selection of farmers a multistage, stratified random sampling techniques was used.

The information regarding the farm size, cropping pattern, availability and usage of tractor for various farm and non farm operations, purchase price of tractor and its allied equipments, repair and maintenance, fuel and oil cost, wages of operator, value of shed etc. were collected from the selected farmers.

Findings of the study are :

1. The farmers under study were from varied age groups. Majority of the farmers were in the age group between 36 to 55 years.

2. Majority of the farmers, about 81.25 percent, were educated. The percentage of illiterate farmers was highest (46.25 percent) in semi-medium category.

3. Majority of farmers (82.50 percent) have their own tractors. Of these, 8.75 percent of the farmers have purchased from their own resources only, while the remaining 73.75 percent purchased the tractors by taking loans from financial institutions and others. The remaining 17.50 percent of the farmers hired the tractors from others. The incidence of not owning a tractor was much greater in case of small farmers (37.5 percent)

4. Overall social participation of sample farmers was quite good. Most of the farmers were the members of one organization or more than one organization.

5. Four main reasons given by the farmers for buying a tractor were : Timeliness of operation, reduced labour availability during peak season, faster work and status symbol.

6. Farmers with small operational land holding (up to 2 ha) gave more weightage to resale value, horse power and maintenance cost, while deciding the purchase of new tractor. Medium (4-10

ha) and semi-medium (2-4ha) farmers gave more weightage to horse power and resale value.

7. The tractor, on an average, in Punjab state did not find adequate work for its use economically and was hardly covering the costs. The small farmers who have purchased their own tractor bear Rs 95.97 per hour more cost than the farmers who hired the tractor from others. In semi-medium and medium category farmers owning tractors also bear excess costs of Rs 77.42 per hour and Rs 13.15 per hour over hiring costs. Therefore the farmers need to be educated about the rationale of purchasing a tractor on the basis of thses analysis.

8. As was found that, most of the farmers purchased their tractors on loan and are not able to find adequate work, it means owning a tractor is unecnomical for small and medium farmers,so the institutional agencies should not encourage tractor loans to the small and medium farmers and in the areas where the intensity of tractor is already very high.

9. Custom-hiring also needs to be encourged instead of keeping the tractors idle due to social prestige.

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ANNEXURE-I

INTERVIEW SCHEDULE

1. **Name of the respondent** _____
Father's Name _____
Age _____
Village _____
Block _____ P.O. _____
District _____ Teh _____

2. **Education Level** _____

3. **Occupation**
a) Main _____
b) Subsidiary (Please specify) _____

4. **Operational Land Holding (Acres)**

S.No.	Particular	Area irrigated	Area unirrigated	Total
I	Area owned			
II	Area leased in			
III	Area leased out			
	Total			

5. **Social participation**

- a) Kissan club b) Cooperative Society
c) Panchayat d) Village Dev. Committee
e) Any other

6. **Mass media exposure**

	often	Sometime	Never
Radio prog. related to ag.			
TV prog. related to ag.			
Read Newspapers			
Visit kisan melas			
Ag. Information Magazine			

7. (A) Do you own any Tractor ?

- a) Yes b) No

(b) If Yes, Give

Name _____
 Horse power _____ Time of purchase _____

c) Whether the tractor was purchased new or old _____

- (I) At what price _____
 (ii) When did you purchase this tractor _____

8. If no, do you hire the tractor ?

- a) Yes b) No

9. How would you rate the following as source of opinion when making a purchase decision.

No.	Source	Mostly	Moderately	Less	Not at all
1.	Opinion Leaders				
2.	Dealers				
3.	Sales representatives				
4.	Ag. Officers				
5.	Relatives & Friends				

10. In your opinion, which type of adv. effect your purchasing decision

No.	Means of ADV.	Highly Effective	Moderately	Less	Not at all
1.	Spot Demonstrations				
2.	Wall paintings				
3.	Leaflets				
4.	Hoarding				
5.	Ad. On radio				
6	Ad. On TV				
7	Posters				

11. a) What factor's do you think makes tractor superior than the conventional methods of farming.

Timeliness of operator	
Convenient than feeding animals	
Better quality of ploughing	
Useful for many activities	
Reduced labour availability during peak season	
Labour & animal expensive	
Easy to operate	
Faster work	
Transportation purpose	
Status Symbol	
Additional land available due to reduced grassland for animals	
Any other	

11. B) Please rank the following factor's that effect your behaviour for purchasing a tractor

Easy availability	
Maintenance cost	
Resale value	
Horse power	
Spare parts and repair facility	
Fuel efficiency	
After Sale Service	
Low price	

12. Did you asked for any expert opinion or had calculated Economic of tractor use before purchase.

(I) Yes _____ (ii) No _____
Whom _____

13. (A) On an Avg. How many hr. does your tractor run in a year ?

(I) For Ag. Purpose _____
(ii) For Non Ag. Purpose _____
(iii) For commercial purpose _____
(iv) Total (I) + (ii) + (iii) _____

b) Periods in the year when the tractor is in peak use

a) _____ to _____ month
b) _____ to _____ month
For what purpose _____

14. How much is the area, which is sown under the following crops and the duration of use tractor for that crops (per acre's)

No.	Crop	Area under the crop (ha)	Annual use of tractor
I)	Paddy		
ii)	Wheat		
iii)	Sugarcane		
iv)	Cotton		
v)	Summer oil Seeds		
vi)	Winter oil seeds		
vii)	Summer fodder		
viii)	Winter fodder		
ix)	Vegetables		
X)	Other crops		

15. What are the hiring charges for diff. Field operations

No	Operation	Hiring charges (hr.)
(I)	Ploughing	
(ii)	Leveling	
(iii)	Sowing	
(iv)	Puddling	
v)	Threshing	
vi)	Transportation of Produce	
vii)	Paddy Harvesting	

16. Approximate consumption of diesel _____

17. Approximate repair and maintenance / year _____

18. Give your opinion, about the following

	Buying	Hiring
Advantages		
Disadvantages		

19. Have you any own shed

Yes/No

If Yes, What was the cost incurred? _____

20. Did you find the use of Tractor profitable or not ?

High loss Moderate loss No loss No Profit Moderately Profitable Highly Profitable

21. Credit/loan taken for purchasing a tractor (if any)

Yes/No

If Yes, How much
Amt. of one installment _____
No. of installments _____
Interest rate _____

ANNEXURE II

**List of Districts, blocks and villages, which were surveyed
under the study**

Districts	Block	Villages
Ludhiana	1. Pakhowal	Jodhan
		Sarabha
	2. Sidhwan Bet	Walipur
		Bharowal
Kapurthala	1. Kapurthala	Jalowal
		Madhupur
	2. Dhilwan	Khiranwali
		Surkhpur

Annexure III

The percentage of small, semi-medium and medium farmers in Punjab state are given below:

Category	Land holding (ha)	Percentage of farmers
Small	1-2	18.24
Semi-medium	2-4	25.85
Medium	4-10	23.40

(Source: Statistical Abstract of Punjab, 1999)

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VITA

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