Farm machinery services provided by selected cooperative societies

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Abstract: Agriculture mechanization plays a significant economic role by increasing agriculture production and reducing cost of cultivation. New technologies are available to the farmers for increasing productivity and overall returns. But this technology is out of reach of small and marginal farmers, who cannot afford purchase of these machines with their meager resources. Such farmers resort to custom hiring of machines form cooperatives or from large agencies providing such facilities. But the machines which have high demand also command higher rental values. This study was planned to gather information regarding nature of services provided by these agencies, the costs analysis with respect to the annual usage and to identify the machines that gave best Return on Investment (ROI). Seven custom hiring cooperative centres located in South Western region of Punjab were selected for the study. Each of these centres had a high powered tractor. Rotavator, laser land leveller, disc harrow and cotton drill were found to be the most common machines among all the centres, implying that these machines were in most demand by the farmers. The tractors had an average annual usage of 900 hours, and that for the tillage machinery such as rotavator, cultivator, disc harrow and laser leveller was close to 550 hours. Machinery such as the hydraulic trolley and water tank were also in great demand amounting to nearly 750 and 800 hours of annual use. Machines such as the generator, blower-fan, and the tanker were mostly used for non-agricultural operations. Most of the machines being used for agricultural operations had annual usage above 200 hours. The cost analysis showed that while for all the machines the break-even annual usage was exceeded, the hydraulic trolley and the bund former were used sufficiently. It was also found that the returns were maximum for the laser leveller and for the cultivator, while machines like the rotavator, the tractor, which had high ROI, were way behind the returns generated by the laser leveller. The study also showed that all the custom hiring centres were running in profit.

Keywords: farm mechanization, farm machinery services, break even analysis, farm machinery cost analysis, co-operative societies

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1 Introduction

India is a predominantly agricultural country, where major breakthrough in agricultural production has occurred through the agriculture mechanization. Farm mechanization implies the use of farm machinery in performing the farm operations speedily and efficiently thus relieving the farmer from burdens of physical work. Mechanization helps in timeliness in operation, provides the farmer more flexibility in his farming operations and facilities in the multiple cropping.

Punjab agriculture is known for the progressive and productive. Punjab is contributing 13% share in the Indian food grain. At present Punjab is producing 24% wheat and 14% rice of total produce in India (Anonymous, 2006). Mechanization in the Punjab agriculture has played a significant role in the rapid transformation of agriculture; still there is a large scope

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for increasing agriculture production of per unit area and time by increasing cropping intensity through optimum resource use. Cropping intensity is further increased by speedy and timely operations. This increased cropping intensity calls for the extensive mechanization to ensure the variety of field operations to be performed at optimum time. This is possible through the use of farm mechanization.

No doubt mechanization has contributed significantly in the development of agricultural economy of state; still most of farmers in view of the meager resources at their command can't go further for mechanization due to high prices of machines such as tractors, combine harvesters.

The small farmers could not avoid the use of machinery for a few selected operations. The time left between the harvesting of one crop and the sowing of the next crop was so short that only tractor ploughing could make it possible to prepare the seed-bed in time for a particular variety of crop to be grown. The threshing operation was given more importance because the whole seasons labour may be wasted if rains destroy the harvested (Kahlon, 1972).

To overcome such problem and at the same time to get the advantages of mechanization by the needy farmers for the costly machines and implements like rotavator, aero-blast sprayer and laser leveller, some of the cooperative societies have initiated a step toward providing the farm machinery services on rental as well as on custom hiring to the farmers. Custom hiring neither needs initial investment nor repair and maintenance cost from farmers. They have paid only custom hiring/rental charges and refundable security.

Various models were developed in order to select the optimum machinery and resources allocation to minimize cost and timeliness of agricultural operations. The model was developed for selection of optimum farm machinery and power source so that the operations could be completed on the time (Bector, 1997). This would avoid the losses in the yield due to late completion of the critical farm operations. Recia et al. (2001) developed a mixed integer programming model that consider optimal resource allocation and task planning for minimization of costs. The decision support system performs economic analysis of farm machinery operations on various crop types, field work, schedules of operations etc. The model suggested alternatives for buying or renting of resources and how these were to be used. Chahal and Malhi (2005) studied the societies of Ludhiana and Moga and found that the annual use of implements like disc-harrow, seed drill and bund former in the societies was 10 times more than that of farmers owned. Chaudhary (2006) studied that average total running cost of tractor by individual ownership was 574.69 Rupees per hour (Rs. h^{-1}) and whereas from cooperative societies cost was 39% lower than total cost per hour of tractor. Verma (1985) conducted a study on farm size and economic efficiency in Punjab. The study showed that the large farms gained much more in terms of economic efficiency as compared to the medium and small farms which only gained 43.04% and 17.02%. This was because of the reason that large farmers have better machinery but small farmers can't afford it. So there is good scope for custom hiring of machinery by small farmers. Ahuja (2006) revealed that 90% farmers of Punjab owning tractors had annual use even less than 400 hours out of which they use more for transportation and any loading or unloading of material. Thus mechanization will help in formation of cooperative societies, farmers club, custom hiring outlets, and farm machinery rentals for providing these services cheaper at farmer level. Mehra (2007) found out the status of farm machinery services under owning, private and co-operative societies of Punjab. The economics and availability of farm machinery services were studied by visual basic programming for these systems for the different farm operations and crop rotations for small, medium and large size farmers.

Some study is conducted in order to find the repair and maintenance cost of machinery like it was found that repair and maintenance cost decreased when the annual use increased by 1,000 h (Thakur, 1992). Bukhari et al. (1987) determined the effect of age of tractor, annual use, make and model and farm size on repair and maintenance cost per hour of farm tractors and it was found that the repair and maintenance cost varied with annual use and season's use was much more important than the age of

tractors. Singh (1996) reported that repair and maintenance cost was directly related with age and inversely related with annual use of tractor.

Most of researchers have voted for custom hiring rather than owning of farm machinery especially for small farmers due to high investment. So there is need to study the custom hiring trend to know the prospective of these services prevailing in Punjab. To gauge the status of functioning and viability of these services, a study was planned with the following objective:

• To study the status of farm machinery services provided by the cooperative societies;

• To perform the cost analysis of the farm machinery provided by the cooperative societies;

• To identify the farm machinery giving the best return on investment (ROI) based on cost analysis

2 Method and materials

This chapter deals with the methodology adopted to collect the information about custom hiring service of farm machinery provided by co-operative societies. It also includes the methodology which was used to calculate the Break Even Point of the all machinery used or owned by the co-operative societies. This information was collected and analysed in following stages:

2.1 Selection of co-operative societies

The selection of societies was based on the variety of machines that they had, covering all types of operations for various types of agricultural produce. For this, a plan was made for the surveying different co-operative societies of the South Western Punjab. To know the custom hiring status of the farm machinery, seven co-operative societies were selected from this area. Addresses of different co-operative societies providing the custom hiring of agricultural machinery were collected from the assistant registrar of cooperative societies, Government of Punjab, Abohar. As this area consists of farmers involved in production of cereals as well as horticultural crops, accordingly a pro forma (a form containing different details required for survey) was prepared for this area.

2.2 Development of questionnaire

A pro forma was developed to know the status of farm machinery service provided by the co-operative societies. Pro forma of farm machinery services contains the information about name and location of society, number and type of machines, their custom hiring charges, year of purchase, cost price, tractor availability, and number of member's etc. This pro forma was pretested and the data collected was reviewed and then it was modified for better analysis of data.

2.3 Collection of data and information

The data from each society was collected personally by visiting the society as per the pro forma. The information collected from the society was then recorded in the respective pro forma developed for this purpose.

2.4 Calculation of total cost of the farm machinery

The cost of operation of farm machinery is divided into two components (I) Fixed cost and (II) Variable cost, where fixed cost is independent of operational use while variable cost varies proportionally with the amount of use. The main components of the fixed and variable costs are given below

1) Annual fixed cost

(i) Deprecation

(ii) Interest on investment

(iii) Taxes, insurance

(iv) Housing / Shelter cost

2) Annual variable costs

(i) Fuel cost

(ii) Repair and maintenance cost

(iii) Lubricating oil cost

(iv)Operator and Labour cost

2.4.1 Calculation of annual fixed cost of the farm machinery

i) Depreciation

It was a measure of the amount by which value of the machine decreased with the passage of the time. According to the Kepner et al. (2005), the annual depreciation was calculated as follows:

$$D = \frac{(P - S)}{L}$$

where, D = Yearly depreciation; P = Purchase price of machine (Rs.) (Where Rs. stands for Indian Rupee); S = Salvage value or the selling price of the machine after its useful life (Rs.); (assumed to be the 10% of the purchase

price); L = Useful life of the machine between buying and selling (years or hours).

ii) Interest on investment

These are usually calculated on the yearly basis. According to the Kepner et al. (2005) the annual interest on the investment was calculated as follows:

$$I = (\frac{P+S}{2}) \times \frac{i}{100}$$

where, I = Rate of interest prevalent in the market, %; i =Annual interest rate (10% per annum for the agricultural machinery).

$$I = \frac{1.1P}{2} \times \frac{i}{100}$$

iii) Insurance and taxes

Some of the farm machinery such as tractors, combines etc. are taxed, insured against loss.

$$In = \frac{1.1P}{2} \times \frac{in}{100}$$

where, In = Rate of insurance and taxes, %; in = Annual insurance and taxes rate (2% per annum for the agricultural use).

iv) Shelter/housing cost

Shelter was essentially required against the weather changes. Shelter cost has been calculated at 1.5% of the average purchase price.

$$Sc = \frac{1.1P}{2} \times \frac{is}{100}$$

where, Sc = Hiring rate of the shelter, %; is = Hiring cost of the shelter (1.5% per annum for the agricultural use).

Therefore, Total fixed cost (TFC) = Depreciation + Interest on the investment + Insurance + Shelter charges

2.4.2 Calculation of the variable cost of the farm machinery

i) Fuel cost

The fuel cost depends upon specific fuel consumption, horse power of tractor and fuel price and calculated by following relationships (Singh, 1996)

Fuel cost (Rs. /h) = S.F.C. × Rated horse power × Fuel price (Rs. L^{-1})

where, S.F.C. = Specific fuel consumption.

For simplicity it was calculated as:

Fuel cost (Rs. h^{-1}) = Fuel price (Rs. L^{-1}) × Fuel consumption (L h^{-1})

ii) Repair and maintenance cost

According to the Kepner et al. (2005) the repair and maintenance estimated by taking a percentage of the purchase price. The repair and maintenance was a product of machine's cost price and repair and maintenance percentage factor (0.025) and expressed as follows:

RM= (2.5%) × Purchase price (Rs. per year)

where, RM = Repair and maintenance cost (Rs. per year)

iii) Lubrication oil cost

It can be determined depending upon the maintenance cost or depending upon the oil price or oil consumption.

Average lubrication cost= 1.5% of fuel cost (Rs. h^{-1})

iv) Operator and labour wages

The labour cost (Rs.) was the product of number of labour required for number of days for any operation and labour charges per person per day. It was given by following formula

Labour cost= Number of days×Labour charges (Rs. d^{-1})

Therefore, Total Variable cost (TVC) = Fuel cost + Repair and maintenance cost+ Lubrication Cost + Operator and labour wages

Total Cost of farm Machinery (TC) = Total Fixed Cost (TFC) + Total Variable Cost (TVC)

2.5 Analysis and compilation of data

This information was compiled as under:

2.5.1 Custom hiring services provided by the society

Data was collected from various co-operative societies and was compiled in order to get the information about types and number of machinery possessed by the cooperative society, their custom hiring charges, mode of custom hiring, problems faced by user/provider.

2.5.2 Break even point analysis

Break even point (BEP) is the point at which the total revenue is exactly equal to the total costs. At this point no profit is made and no losses are incurred. BEP can be expressed in terms of the sales i.e. it represents the number of units required to cover the costs. Sales above that number results in profit and sales below that number results in loss. Once this point is met, the profit is equal to the difference in the selling price and the variable cost. It was calculated in terms of the fixed costs, variable costs and hiring charges.

$$(BEP)_i = \frac{(\text{Fixed Cost})_i (\text{Rs. /year})}{[(\text{Hiring Cost})_i - (\text{Variable cost})_i \ (\text{Rs. /h})]}$$

where, i = Type of the implement like disc harrow, cultivator, seed drill etc.

i) Annual Use (h) of an implement

Total annual use (h) of an implement under different systems can be calculated by the total amount earned by a particular implement divided by the hiring charges of the implement or machine. It also included the number of that types of machinery varied from the society to society either due to soil type, crop rotation, type of implement .

For hire out categories

$$(TAUH)_i = \frac{\text{Total annual earned by the ith implement (Rs. /year)}}{(\text{Number of ith implements}) \times (\text{Hiring cost of the ith implement (Rs./h)})}$$

where, $(TAUH)_i$ = Total annual use (h) of i^{th} implement under hiring.

For owning categories

$$(TAUO)_i = \frac{\text{Area (ha)}}{(\text{Field Capacity})_i (\text{ha/h})}$$

where, $(TAUO)_i$ = Total annual use (h) of i^{th} implement under owning.

3 Results and discussion

A profit-loss analysis was done in order to calculate the break even point and to determine the economic feasibility of the custom hiring services. The selection of cooperative societies, collection of data and analysis of the collected data are discussed under this chapter. The results of the study have been reported and discussed as:

3.1 Custom hiring services provided by the society

To know the custom hiring status of the farm machinery seven co-operative societies were selected from South Western Punjab.

Pro forma of farm machinery services contains the information about name and location of society, number and type of machines, their custom hiring charges, year of purchase, cost price, tractor availability, and number of member's etc. After the pro forma was made the societies were surveyed for collection of the information required for the analysis. After collection of data, it was grouped into various categories like tillage machinery, plant sowing machinery etc.

3.1.1 Number of machinery available in the cooperative societies

During the survey work total seven societies are surveyed and the data regarding the machinery is taken. Then it is categorised into four groups and the number of implement in each group is noted as shown in Table 1.

Table 1 Number of machinery available in the societies as per their usage

S. No.	Name of society	Number of machinery				Total machinery
		Primary Tillage	Secondary Tillage	Sowing and Plant Protection	Other	
1	The Kera Khada Multipurpose Co-society Ltd.	3	1	3	0	7
2	The Khuian Sarwer Multipurpose Co-operative Society Ltd.	12	13	11	9	45
3	The Mauzgarh Co-operative Agricultural Service Society Ltd	1	3	4	1	9
4	The Danewala Satkoshi Multipurpose Co-operative Society Ltd.	6	8	4	1	19
5	The Kuller Khada Multipurpose Co-operative Society Ltd.	9	6	4	4	23
6	The Punjkoshi Multipurpose Co-operative Society Ltd	5	6	8	4	23
7	The Killia Walli Multipurpose Co-operative Society Ltd	3	4	7	2	16
	Total	39	41	41	21	142

From the Table 1, it is clear that the number of availability secondary tillage and sowing machinery was maximum. This means that the utilization of these implements was maximum. The primary tillage had second place and other implements are available in very less amount as compared to tillage implements. This also shows that the demand of tillage implements was quite high in this area (S-W Punjab). The maximum number of implements were possessed. The Khuian Sarwer Multipurpose Co-operative Society and the minimum number of implements were possessed by the Kera Khada Multipurpose Co-society.

3.1.2 Machinery which was available in the most of cooperative societies

There are a number of implements which are provided by the societies, but it was seen that some implements are

very common in most of the societies. The implements were commonly provided by cooperative societies like harrow, discs, weeder, cotton seed drill, laser leveller and rotavator etc. The list of machinery which was commonly available in most of the societies (i.e. >three societies possessed the same machinery out of seven societies) was made.

These implements were divided into four categories according to the operations for which these are used like tillage, sowing, others. There are 18 basic agricultural machinery and these were grouped into four types (Table 2).

Table 2 Categorization of common available agricultural machinery according to operation

Operation	Name of machinery	Annual Use (h/year)
Primary tillage machinery	Special purpose plough	132
	Plough	180
Secondary tillage machinery	Cultivator	550
	Rotavator	550
	Harrow	135
	Discs	520
	Laser leveller	532
	Land leveller	250
	Leveller	120
Sowing and plant protection machinery	Zero Till Wheat Drill	230
	Bacillus thuringiensis (BT) Cotton Seed-Drill	220
	Cotton Drill	200
	Wheat Drill	210
	Weeder	120
Other machinery	Water Tanker	800
	Trolley with Lift	750
	Bund former	60
	Tractor (New Holland)	900

Disc harrow and laser leveller and tractors are most common. Trolley and water tanker were the other machinery which were owned by the societies and had a great demand. BT cotton seed drill and wheat drill are extensively hired for the sowing operations. Mouldboard (MB) plough, rotavator and harrow, special purpose plough and cultivator are used for seed bed preparation also has a significant importance. More than 85% societies have above mentioned machinery. More than 75% societies have hydraulic trolleys which are being used by farmers for loading, unloading and transportation operations.

Besides the basic farm machinery some of the societies have provided with facilitating equipment like

- Generator
- Water tanker
- Trolley
- Fan blower

3.1.3 Hiring Charges

It was observed that there was a wide variation in respect of hiring charges being charged by different societies for particular type of machinery. However, hiring charges of agricultural machinery from the agricultural cooperative societies was at much lower rate. The variation of hiring rates of machinery also changes according to type size and demand of particular implement.

It was observed that mostly hiring charge varies from 25 to 50 Rs. per hour for most of the machinery. But hiring charge for the laser leveller and the tractor were quite high (Table 3).

Table 3 Variation in hiring charges in various cooperative societies

Name of the individual implement	Hiring Charges (Rs. h^{-1})
BT Cotton Seed-Drill	25-40
Weeder	25-40
Cotton Drill	25-30
Cultivator	20-40
Discs	30-40
Land leveller	25-40
Harrow	25-30
Bund Former	20-25
Laser leveller	500
Leveller	20-30
Tractor (New Holland)	150-250
Plough	25-40
Rotavator	70-80
Special purpose plough	30-50
Trolley with Lift	20-30
Water Tanker	25-30
Wheat Drill	25-40
Zero Till Wheat Drill	30-40

3.1.4 Annual Use of Farm Machinery

During the survey it was found that the disc harrow was extensively used by the societies and more than 60% societies have disc harrow of annual use of 520 h. Laser leveller and rotavators were also highly used by the farmers. Even in more than 70% of the society's annual use of the rotavator was 550 h and annual usage of tractor

was 900 h comes in more than 60% of societies. In the facilitating equipments demand of trolley was 750 h in more than 55% of societies and of water tanker was 800 h in more than 65% of societies.

From the Figure 1 it is clear that 67% of farm machinery have annual usage more than 200 h. The annual usage of trolley, water tanker, rotavator, cultivator, tractor, discs, and laser leveller is also high.

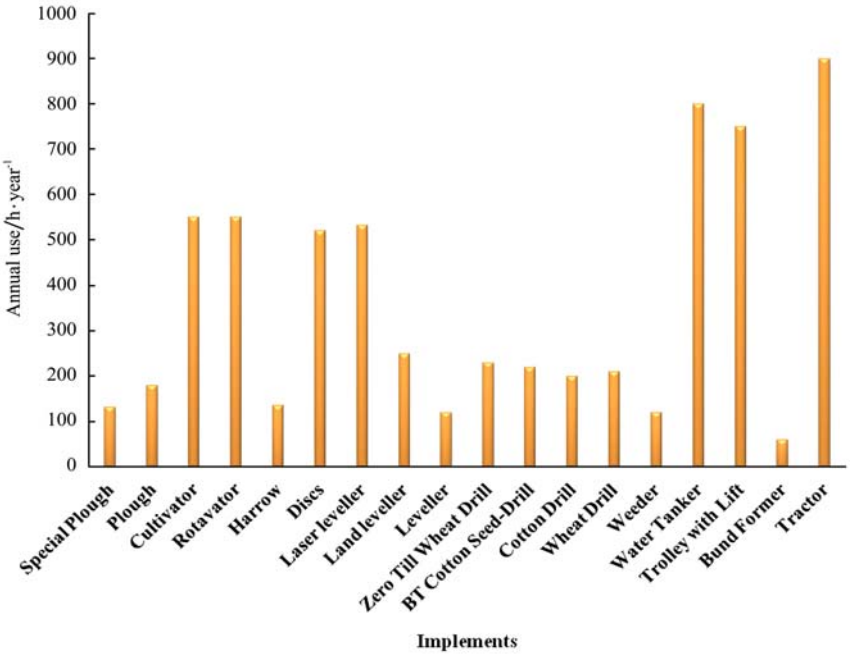

Figure 1 Annual use of farm machinery in cooperative societies

3.1.5 Transportation of machinery

It was noticed that normally transportation of machinery from society shed was done by the farmers themselves, but some of the societies also provided operator to the farmer along with machine, who in turn took the machine to the farmer's field. Normally for rotavator and laser leveller operators are provided by the societies.

3.1.6 Repair and Maintenance of machinery

It was observed that in case of break down/fault occurred in the implement or machine on the field, more than 50% cooperative societies owned the responsibility for major repair and maintenance/breakdown of the implement which normally occurred due to excessive usage, whereas, other minor repair and maintenance/ breakdown occurred due to the ignorance of farmer in the field then farmer had to pay charges or had to get it repaired. Number of societies surveyed only few of them had workshop facilities, whereas most of them approached local mechanic or workshop in nearby town for repair and maintenance.

3.1.7 Security Deposit

Societies took a security advance of 500 Rs. per implement from all the categories of farmers who hired machinery from them. This security was refunded after the deduction of charges. This security also depended upon the cost of implement or nature of work.

It was found that security for the hired machinery was taken from the farmers by 85% societies whereas 15% societies don't take any money as a security from the farmers.

3.2 Cost analysis of the farm machinery

Data was collected from the various societies and then it was tabulated. After collection of data, the whole data related to this machinery was analysed like purchase price of implement, numbers of hour of use per year and hiring charges etc. Break even analysis of all these machinery was done in order to know the Break Even Point. In this analysis total fixed cost, variable cost and repair and maintenance cost were calculated by using the equations as discussed earlier and then Break Even Point was calculated in terms of hours per year (Table 4) (i.e. how much time an implement will be used in order to have no profit and no loss and if these implements used above this point then they provide the profit by respective usage).

In this table, the positive values indicate the profit and the negative values indicate the loss from the implement for the given annual usage.

From the Table 4, it is clear that profit is maximum for cultivator and laser leveller whereas it is minimum for the land leveller. Also the implements like rotavator, cotton drill, wheat drill, discs, tractor, and leveller provides good profit to society.

There are also some implements like bund former, trolley which have negative values of profit per investment. This means that these implements cause loss on the initial investment.

Table 4 Break point analysis of the machinery

S. No.	Name of the individual implement	Purchase price (Rs.)	Hiring price (Rs./h.)	Annual use (h/year)	Break even point (h/year)	Net use of implement after BEP	Profit and loss (Rs./year)
1	BT Cotton drill	12300	30	220	96	124	3716
2	Weeder	10000	30	120	88	32	969
3	Discs	31500	30	520	241	279	8360
4	Laser leveller	320000	500	532	127	405	202417
5	Tractor	470000	250	900	404	496	123999
6	Rotavator	85000	80	550	230	320	25595
7	Harrow	9500	25	135	103	32	795
8	Plough	18000	30	180	166	14	430
9	Water Tanker	60000	25	800	605	195	4863
10	Special Plough	9800	30	132	83	49	1472
11	Trolley with Lift	103000	30	750	1024	-274	-8229
12	Zero Till Drill	21500	30	230	191	39	1166
13	Cotton Drill	10500	30	200	81	119	3557
14	Cultivator	8500	25	550	70	480	12006
15	Bund Former	7000	25	60	99	-39	-985
16	Land leveller	36000	40	250	244	6	231
17	Wheat Drill	13000	30	210	104	106	3186
18	Leveller	9000	30	120	77	43	1302

3.3 Determination of the economic feasibility of farm machinery

After calculating the BEP, it is observed that most of the implements have BEP more than their annual use i.e. net annual usage of machinery after the BEP is reached is positive (where net annual usage after BEP (h) = Annual use of machinery (h) - BEP of machinery (h)) and if the annual usage > BEP i.e. net annual usage is positive, implement provide profit and vice versa. The graph of annual use, BEP and net usage of machinery is shown in Figure 2.

This graph clearly shows that for the implements like laser leveller, tractor, rotavator, disc harrow, water tanker and weeder, the annual use of machinery comes more than the BEP. i.e. net annual usage of machinery is positive means these implements provide profit and the implements like trolley, bund former etc. causes the loss to the society because of less annual use than the BEP.

Now the amount of profit or loss can be calculated as:

Annual profit/loss (Rs. /year) = Net usage after BEP (h/year) × Hiring charges (Rs. /h)

From this data the graph of annual profit or loss is plotted as shown in Figure 3.

From Figure 3, it is observed that laser leveller, rotavator and tractor gives high amount of profit, so it is recommended to purchase these implements, whereas the trolley, zero till drill, plough and bund former creates the loss to the society, so these are not preferred to purchase from economic point of view.

On the basis of above analysis it was observed that to make a good profit one has to purchase at least laser leveller, tractor, rotavator, disc harrow, land leveller, cultivator and water tanker which provide a reasonable profit. Other machinery required machineries are BT cotton seed drill, weeder, special purpose plough, wheat drill and leveller which also provide a reliable profit. This means to start a new society for providing farm machinery services one has to purchase at least the

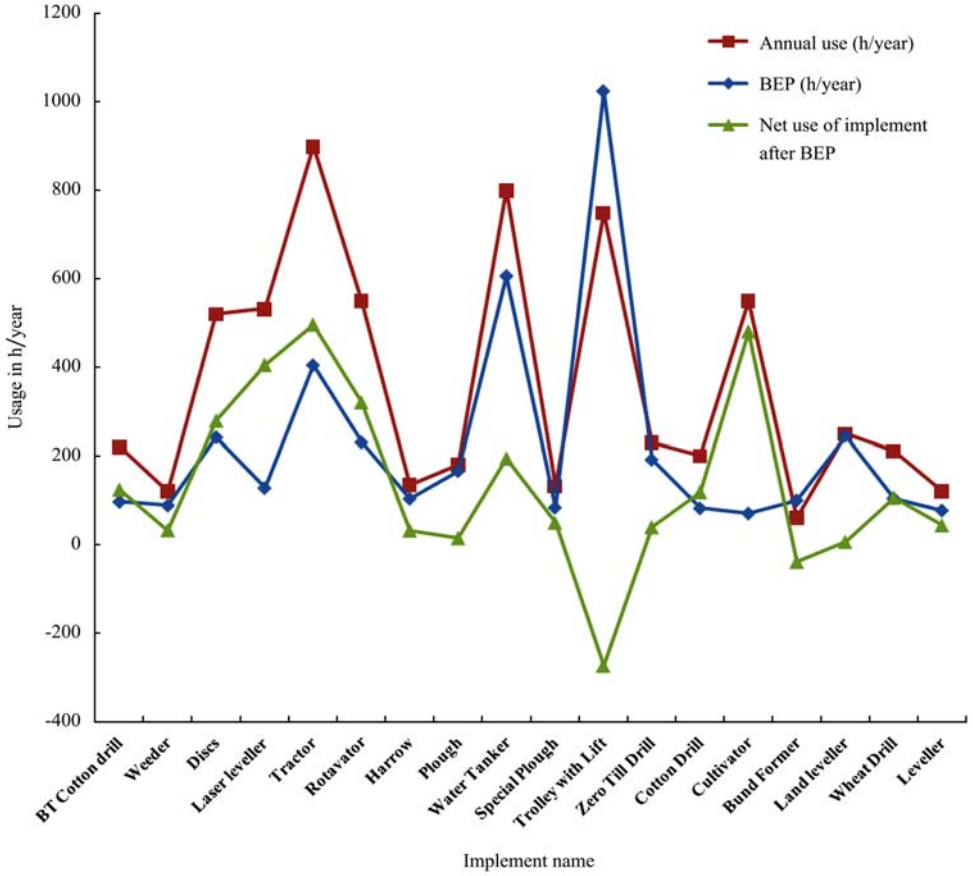

Figure 2 Graph of break even point and annual usage of machinery

implements which provides the high profit and at least Rs. 10,32,300 investment is required and for a complete set of machines which includes all the machinery excluding machinery that causes loss, minimum profitable investment Rs. 11,24,600 was required and if anyone wants to invest more money than it is preferred to buy multiple numbers of machinery like disc harrow, cultivator, rotavator, laser leveller and tractor etc. as per the amount available.

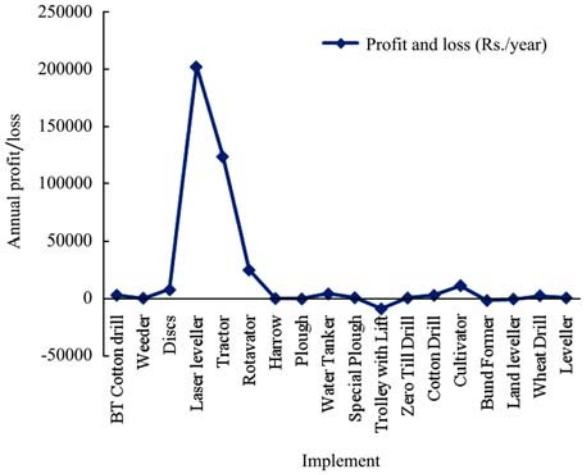

Figure 3 Graph of annual profit/loss of the various common machinery in cooperative societies

3.4 Identification of profit/loss making machines

The profit/loss that machine results in depends upon the annual use of the machine. Higher the annual usage lower will the operating cost, resulting in higher returns from the machine.

Table 5 List of machines in order of their profit/investment

S. No.	Machinery name	Purchase price (Rs.)	Annual Profit/ Investment (%)	BEP (h/year)
1	Cultivator	8500	1.41	70
2	Laser Leveller	320000	0.63	127
3	Cotton Drill	10500	0.34	81
4	BT Cotton drill	12300	0.30	96
5	Rotavator	85000	0.30	230
6	Discs	31500	0.27	241
7	Tractor	470000	0.26	404
8	Wheat Drill	13000	0.25	104
9	Special Purpose Plough	9800	0.15	83
10	Leveller	9000	0.14	77
11	Weeder	10000	0.10	88
12	Harrow	9500	0.08	103
13	Water Tanker	60000	0.08	605
14	Zero Till Drill	21500	0.05	191
15	Plough	18000	0.02	166
16	Land leveller	36000	0.01	244

From the Table 5, it is clear that the return on investment from a machine does not depend on its initial cost. The return from the lower priced cultivator is at 1.41, while that for laser leveller which is priced higher is at second with 0.63. Therefore depending on the entrepreneur wants to invest; the Table 5 gives the list of machinery, priority wise, that the society/entrepreneur should purchase.

For the machines which do not have much annual usage and are in the long run not profitable investment, it is better to take these machines from other societies.

4 Conclusions

The custom hiring is very useful method of having short term control of farm machinery particularly during the tillage operations, sowing and during their harvesting operations etc. Efforts are made through this study to document the information about the economic status of the custom hiring services of farm machinery through the cooperative societies. Seven cooperative societies of South Western Punjab were selected and from the study following conclusions are made:

1) Disc harrow, tractor, laser leveller, rotavator, BT cotton seed drill are available in more than 85% of societies.

2) Tractors which are available in societies are ranging from 50-60 hp.

3) Most of the hiring charges vary from 25-40 Rs. h^{-1} except that of laser leveller whose hiring charge is 500 Rs. h^{-1} and tractor hiring charge is 150-250 Rs. h^{-1} and rotavator hiring charge is 70-80 Rs. h^{-1}.

4) In more than 70% of the societies, annual use of the rotavator was 550 h. and annual usage of tractor was 900 h comes in more than 60% of societies and more than 60% societies have disc harrow have annual use 520 h.

5) In the facilitating equipments demand of trolley was 750 h in more than 55% of societies and of water tanker was 800 h in more than 60% of societies.

6) Although the use of the trolley is very high, its break even point is quite higher than that of annual usage. This is because of its high initial cost and low hiring price.

7) All the societies were having profit.

8) It was observed that profit per investment of cultivator and laser leveller is maximum whereas it is minimum for the land leveller. Also the implements like rotavator, cotton drill, wheat drill, discs, tractor, leveller provides good profit to society. There are also some implements like bund former, trolley which have negative values of profit per investment. This means that these implements cause loss on the initial investment.

9) Study suggested that in order to make profit one have to purchase at least laser leveller, tractor, rotavator, disc harrow, land leveller, cultivator and water tanker which provide a reasonable profit and minimum investment for these farm implements is Rs.10, 32, 300 and if anyone wants to invest more money, then it is preferred to buy multiple numbers of machinery like disc harrow, cultivator, rotavator, laser leveller and tractor etc. as per the amount available.

10) It was observed that the return on investment from a machine does not depend on its initial cost. The return from the lower priced cultivator is at 1.41, while that for laser leveller which is priced higher is at second with 0.63.

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