A Comparative Economics of Farm Machinery Ownership and Hiring for Farming

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Abstract

Farm mechanization helps to ensure timely field operations to increase productivity, reduce crop losses and improve the quality of grain or produce, increase use of land and other inputs more effectively and increase labour productivity by using labour saving and drudgery reducing devices. At present, in India, tractors are being used for tillage on about 22.78 per cent of the total land area and sowing about 21.30 per cent of total area. Custom hiring service (CHS) is a popular method of gaining short-term control of farm machinery among farmers who do not own them. Custom hiring gained importance mainly due to rise in the cropping intensity and drop in average landholdings. The productivity of major crops is higher on the tractor owning farms due to timely and sufficient availability of tractor services. Net farm income is higher on tractor owning farms but input costs are low on custom hiring farms. This may be due to the high fixed costs as well as repair and maintenance costs on tractor owning farms. The small and medium tractor hiring farms earned more net income. This shows that it is better for smaller farms to hire in tractor services rather to have their own tractor. On the other hand owning a tractor is economically beneficial for larger farmers.

Introduction

Farm mechanization saves time in completing different operations, which gives the crop more time to mature, allows the farmer to be more flexible in his farming operations and facilitates multi cropping. This transition from animal power to mechanical power has made agriculture capital intensive. However, it has played a key role in modernization of Indian agriculture due to its benefits of improved labour efficiency and productivity, efficient use of expensive farm inputs, reduction of human drudgery and timeliness of operations.

Custom hiring service (CHS) is a popular method of gaining short-term control of farm machinery. CHS may be available from a neighbor, a local dealer, or a business specializing in custom farming that performs all types of field operations. Custom hiring gained importance mainly due to rise in the cropping intensity and drop in average landholdings. In India, the proportion of marginal and small size landholding increased

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from 69.6 per cent in 1970-71 to 85 per cent in 2010-11.

It is a well known fact that farm mechanization enhances agricultural productivity but sometimes due to heavy fixed cost of farm machinery, net income of farmers gets reduced. The yield of crops is significantly higher on farms owning tractors and on farms custom hiring tractors. The small and medium tractor hiring farms earned more net income. This shows that it is better for smaller farms to hire tractor services rather to have their own tractor. On the other hand owning a tractor is economically beneficial for larger farmers (Singh *et al.,* 2013).

CHS would constitute a reliable tool for implementing specific farming practices and obtaining a reasonable income. To cope with the difficulties involved in securing a cheaper workforce and necessary operating capital convinced the farmers that a professional custom hire business would be useful for achieving sustainable agriculture and custom hire service is confirmed as a viable alternative to the direct ownership of agricultural machinery (Masayuki, 2009). With this background an attempt has been made in the present paper to assess the comparative costs and returns of tractor owned and tractor hiring farms.

Data and Methodology

The study was conducted purposively in Tungabhadra Project (TBP) Command area of Karnataka, as mechanization is relatively high in irrigated area and TBP is the largest command area of North-East Karnataka region. The numbers of tractors were more in the study area (20.58 Tractors/1000 ha) compared to the state of Karnataka (18.60 Tractors / 1000ha). Multistage sampling technique was adopted for selection of sample farmers from TBP command area. In the first stage, the top three taluks of TBP area namely Bellary and Hospet from Bellary district and Gangavati of Koppal district were selected based on the highest number of tractors. In the second stage, two villages were selected randomly from each selected taluk. In the third stage, 30 farmers were selected from each village with equal representation of large, medium, and small & marginal farmers. In all, 60 large, 60 medium and 60 small & marginal farmers were selected. Thus, the total sample size comprised of 180 farmers for the study. Both primary and secondary data were collected to fulfill the objectives of the study. Primary data was obtained from sample farmers while secondary data was obtained from reports of Joint Director of Agriculture and District Statistical Office of respective selected districts with regard to details of CHS and the operational modalities followed in implementation of CHS and other sources like Ministry of Agriculture, Govt. of India, statistical database like India Stat, etc. The study pertains to the year 2013-14.

The data collected were presented in tabular form to facilitate easy comparison. This technique of tabular presentation was employed to compile the general and socio-economic characteristics of sample farmers, extent of use of custom hiring services by small, medium and large farmers and also the cost structure, returns, profit and total benefits that the farmers received, etc. Simple statistics like averages, ratios and percentages were computed to interpret the results.

Accounting of Farm Machinery Cost

The cost of operation of farm machinery is divided into two components (1) Fixed cost and (2) Variable cost, where fixed cost is independent of operational use while variable cost varies proportionally with the amount of use.

Annual Fixed Cost

i) Depreciation

Depreciation expense accounts for the deterioration in the value of machinery because of age or technological obsolescence. Depreciation is usually estimated using a straight-line method for the purpose of estimating budget costs.

According to Kepner *et al.* (2005), the depreciation per hour can be calculated by the following expression:

$$D = \frac{P - S}{L \times H}$$

Where,

D = Depreciation (₹ /h)
P = Purchase price
S = Salvage value, 10 % of purchase price
L = Life of the machine in years
H = Number of working hours per year

ii) Interest on Investment

According to Kepner *et al.* (2005), interest per hour is calculated on an average investment by using the prevailing interest rate by the following formula:

$$I = \frac{P+S}{2} \times \frac{i}{H}$$

Where,

I = Annual interest charge (₹ /h)

i = Interest rate (%)

iii) Insurance and Taxes

Insurance charges and taxes together are taken @ 2% of the purchase. This is calculated for the tractor not for the tractor drawn implements.

$$\text{Insurance and taxes (Rs./h)} = \frac{2\% \text{ of } P}{H}$$

Where,

P = Purchase price

H = Number of working hours per year

iv) Shelter /housing cost

Shelter was essentially required against weather changes. Shelter cost has been calculated at 1% of the average purchase price.

$$\text{Shelter (Rs./h)} = \frac{1\% \text{ of } P}{H}$$

Where,

P = Purchase price

H = Number of working hours per year

Therefore, Total Fixed Cost (TFC) = Depreciation + Interest on the investment + Insurance and taxes + Shelter charges.

Operating cost

Operating costs generally include those costs that are incurred as a direct result of the machine being used. These costs vary as machine use varies.

i) Fuel cost

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

Fuel cost (₹ /h) = S.F.C. × Rated horse power × Fuel price (₹ /l)

where,

S.F.C. = Specific Fuel Consumption

For simplicity it was calculated as:

Fuel cost (₹ /h) = Fuel price (₹ /l) × Fuel consumption (l/h)

ii) Repair and Maintenance cost

The repair and maintenance was estimated by taking a percentage of the purchase price. The repair and maintenance was a product of the machine's cost price and repair and maintenance percentage factor (0.01) and expressed as follows:
RM = (1 %) × Purchase price (₹ /year)

where,

RM = Repair and maintenance cost (₹ /year)

iii) Lubrication cost

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

Average lubrication cost = 20% of fuel cost (₹ /h)

iv) Operator or Driver Wages

The cost of operator was calculated from the actual labour charges paid in rupees per day at the prevailing rates in the study area and generally number of hours worked taken as 8 hours.

$$\text{Driver charge} = \frac{\text{Wage rate for driver}}{\text{Number of hours worked}}$$

Therefore,

Total Variable cost (TVC) = Fuel cost + Repair and maintenance cost + Lubrication cost + Operator or driver wages.

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

Results and Discussion

The general characteristic features presented in Table 1 indicate that almost all farmers fall under the category of middle age group (44.31 years). Education being the source of knowledge is of prime importance for the development of the economy. Education as it enhances knowledge helps farmers in decision making regarding various farm business activities. With regard to educational status of sample farmers, literacy rate was considerably high in sample farmers (64.88 %). Thus, it can be concluded that the literacy levels of farmers had positive association with utilization of farm machinery on CHS basis. This emphasizes the fact that education helps in understanding and adopting new technologies in carrying out farm operations.

Landholding size is one of the crucial factors, which strongly influences decision making regarding the magnitude of production and cropping pattern etc. Similarly, the size of farm holding has a significant influence on mechanization of farm operations, since the farm size restricts mechanization in many cases. The average size of owned landholding was 1.37 ha for small farmers, 2.97 ha for medium farmers and 7.76 ha for large farmers. Owning tractor is economical for large farmers and it is to be noted that 61.67 per cent of large farmers and 11.67 per cent of medium farmers owned tractors.

Custom hiring in of tractor and farm implements was common among small (83.33%) and medium farmers (93.33%). This indicated that availability of CHS in the command area has helped the small and marginal farmers in adopting mechanization in farm operations.

CHS of farm machinery has tremendous impact on the whole of the economy because it normally leads to proper use of land resource, augments agricultural surpluses and higher farm income. In this direction an effort has been made to assess the cost incurred by the CHS providers in maintaining the machinery and implements and the charges paid by the farmers to avail the farm machinery and implements in cultivating the different crops.

Table 1. General characteristics of sample farmers

S. No.	Particulars	Small farmers (n=60)	Medium farmers (n=60)	Large farmers (n=60)	Overall (n=180)
1	Average age (Years)	43.45	43.48	45.70	44.31
2	Education (%)				
	i. Illiterate	40.33	38.00	27.00	35.11
	ii. Primary	23.00	22.67	27.00	24.22