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Study on status and implement wise tractor utilization pattern in pusa block, Bihar

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Abstract
Tractors play a crucial role within the mechanization of Indian agriculture. The farm power and machinery jointly represent the most important single item of expenditure constituting about 60% of the overall investment on a farm. Tractor industries play a very important role because the agriculture sector contains a major contribution to India's GDP. This study was concerned with a view to gathering information regarding status and tractor utilization pattern implement wise, at the farmers' level. The study was confined to the Pusa block of the Samastipur district of Bihar state. By personal interview employing a structured questionnaire, 34 respondents were selected from the 17 villages. the maximum intensity of tractors was in village Bishanpur Dimangra (8.46%) followed by Narayanpur Khairi (5.46 %), and Madhopur Khairi (4.46%). Among the available 30-35hp tractors, the maximum tractor 26.82% were owned by Marginal farmer followed by 14.63% Small farmer and 14.63% Semi medium farmer each. within the 36-40hp group of tractors, the maximum percent of owners were Semi medium farmer (21.95%) and followed Small farmer (9.75%). the foremost popular tractor power range was 30-35hp with (51.21%) followed by 36-40hp with (43.9%) and not popular greater than 40 hp tractor within the study area. Maximum use of cultivator found among different categories of farmers was marginal farmers which were (36.1.%) whereas the minimum use by medium farmers (16.6%). The study reveals that the tractor **is** principally used for seedbed preparation by all categories of farmers followed by transportation and threshing.

Keywords: Mechanization, tractor, machinery, cultivator, marginal farmer and small farmer

1. Introduction
Agriculture not only provides food to its population but also provides employment opportunities to about 60 per cent of the overall population of the study area. The population is expected day by day so, the largest challenge before the agricultural sector of the state is to satisfy the growing demand for food to feed the increasing population. To extend food production, the productivity of the land and the labour needs to be increased. Substantially, this will require higher energy input, modern agricultural technology and better management of crop production system.

With stagnating production and increasing demand, guaranteeing food security will become challenging our estimates suggest that India could face an acute food shortage of just about 50 million tons by 2020 (Directorate of economics and statistics, ministry of agriculture, 2014). The estimated food requirement in India and therefore the total production of major crops indicate that to stay pace with the current increment and consumption pattern, food requirement has been estimated to be 230 MT by 2025 and 241 MT by 2050 (FA0, 2005). Annual agricultural growth should be maintained at 6.7% to satisfy these demand projections (NAAS, 2009).

Tractorization has been recognized as the main driver of farm mechanization for mitigating drudgery and increasing the level of farming, so as to improve the life and work environment of farmers. The tractor production and sale in 2014-15 is 612994 and 626839 respectively (Agricultural research data book, 2015) which reflects that utilization of tractor is very high. Priority of tractor in farm mechanization due to its versatility like it can implemented in various farm operation like seed bed preparation, sowing, planting, weeding, spraying and dusting, harvesting, threshing etc.

Popularization of farm machine greatly depends upon the power source available in particular region and the awareness in farmers about their benefits of use. In absence of realistic data about the availability of tractors of different power, and the types of operation being used for different operation, it will be difficult to make sound planning for accelerating tractorization. The survey upon status of tractor and their utilization pattern of different matching implement used in selected area will give a feedback for proper implementation of this project at present as well as planning for giving pace to the process in future. Keeping this in view the present study was under taken with following objectives:

1. To evaluate the tractorization status in study area.
2. To determine the operations & implement wise tractor utilization in study area.

2. Materials and Methods

Bihar state consists of 38 districts with varied geographical areas. It has been divided into three agro-climatic zones based on the soil condition and cropping pattern. The various district falls under different zone. The current study was confined to Sakra block Muzaffarpur district situated in agro-climatic zone-I.

2.1 Methodology Adopted for the Study

2.1.1 Survey Questionnaire

At first, the data were collected on the premise of the objectives of the study. The performa was developed to produce necessary information regarding tractor, annual use of implements, size of tractors, farm size and operational hour for seedbed preparation, sowing, harvesting, threshing and transportation. Almost a day was used for preliminary data collection and one full day for secondary data collection and observing field operation by each tractor. The interviews were held with the owner, operator of the tractor and sometimes with tractor mechanics also. After that, the questionnaire was prepared for tractor utilization. The filling of the questionnaire also required persons involved in farming and mainly using tractors.

2.1.2 Sampling Procedure

The present study was confined to the Pusa block of the Samastipur district situated in the agro-climatic Zone-I of Bihar. The whole area was divided into 3 zones comprise of north, central & south zone. On the basis of location and high population from each zone 3 panchayats were selected. Data were collected from 17 villages randomly for the study. The details of the farmer surveyed by the questionnaire for getting the information about the details are presented in Table.

Table 2.1: Tractor availability in different farm size holdings

Category of farmers	Size of farm (ha)	Category wise tractor owners	No. of tractor	Percentage of tractors (%)
MRF	Below 1	13	13	31.70
SF	1-2	07	9	21.95
SMF	2-4	10	13	31.70
MF	4-10	06	6	14.63
LF	10 and above	0	-	0

2.2 Parameters Considered for the Study

2.2.1 Field Measurement

During the preliminary survey farmers were asked to provide information about primary tillage operation, as during the study period land preparation for the Rabi crops was going on than the program was worked out accordingly so that actual field data could be obtained Fuel consumption and Field capacity was noted at the time of tractor use.

2.2.2 Field Capacity

The area covered was measured with the help of measuring tape and time consumed and thus the field capacity was calculated.

2.2.3 Tillage Operation Data

The field capacity (ha/h) was obtained by dividing the total area covered at a particular time. Knowing the field capacity and the number of operations performed on different crops, the total period of use for each implement were determined. Thus, total working hour for tillage operation were calculated by summing them for different tillage implements and their number of operations.

2.2.4 Threshing Operation Data

Only those cases, where farmers were using tractors for the threshing operation has been taken and in order to obtain threshing hours, the capacity of thresher (in terms of output/h) was noted.

Thus, the threshing time was calculated by following formula;

$$\text{Hours of threshing} = \frac{\text{Total wheat production}}{\text{Outpur of thresher}}$$

This formula implied only when threshing was completed by tractor.

3. Results and Discussion

This deals with the presentation of data collected through the survey in tabular form to find out the overall status of tractorization and farm operations occurring in Pusa Block of Samastipur district. The represented data of 17 village with 34 samples, farmers for calculating the above mention parameters is presented in different tables.

3.1 Status of Tractorization

The data related to the status of tractorization in sample village of Pusa block of Samastipur district is presented in Table 3.1.

Table 3.1: Families having tractor village wise

S. No.	Name of Villages	Total Farm Family	Families having tractor	Percentage
1.	Harpur mahmada	1539	12	00.77 %
2.	Pusa mahamadpur	637	10	01.56 %
3.	Mahamadpur deopar	755	11	01.45 %

4.	Harpur pusa	2401	10	00.41 %
5.	Deghra	602	8	01.32 %
6.	Mahamadmadpur birauli	1127	6	00.53 %
7.	Birauli khurd	385	7	01.81 %
8.	Gopalpur	485	5	01.03 %
9.	Dharmagalpur bathua	886	10	01.12 %
10.	Bishanpur bathua	1127	6	00.53 %
11.	Dhobgama	942	3	00.31 %
12.	Malikorh	492	4	00.81 %
13.	Madhopur khairi	179	8	04.46 %
14.	Bishanpur dimangra	130	11	08.46 %
15.	Kubauli ram	1126	15	01.33 %
16.	Narayanpur khairi	128	7	05.46 %
17.	Akhtiyarpur Chandauli	2339	9	00.38 %

It also reveals that the maximum numbers of tractors are in village Kubauli Ram (1.33%) followed by village Harpur Mahmada (0.77%) and Mahamadpur Deopar. In the rest of the villages, Bishanpur Dimangra (8.46%), and Mahamadpur Deopar (1.45%), Harpur Pusa (0.41%) and, Pusa Mahamadpur (1.56%) have the same no. of tractor, Akhtiyarpur Chandauli have (0.38%) tractor. The variation in tractorization percentage in different villages of Pusa Block might be because of two reason. One may be the bad government subsidy programme and another is it connectivity with good.

3.1.1 Status of the tractor on the basis of make

Table 3.2 reveals that, in the study area, the maximum no. of the tractor belongs to Mahindra's Make (31.70%) followed by the Sonalika and Massey ferguson (12.19%) each. The popularity of the Mahindra tractor in the study area might be due to the comfortable use and efficient work and also spare parts were easily available in the near market.

Table 3.2: Status of the tractor on the basis of make

S. No	Make	No. of tractor	Percentage of tractors (%)
1.	Hmt	1	2.43
2.	Mahindra	13	31.70
3.	Tafe	0	0
4.	Swaraj	5	12.19
6.	Sonalika	7	17.07
7.	Escort	2	4.87
8.	Massy ferguson	5	12.19
9.	Eicher	3	7.31
10.	Balwan	4	9.75
11.	Power track	1	2.43

3.1.2 Status of different power range among different categories of farmers

Table 3.3 shows that the status of the tractor of different power ranges among different categories of farmers according to their capacity. Among the available 30-35hp tractors, the maximum tractor 26.82% were owned by MRF followed by 14.63% SF and 14.63% SMF each. In the 36-40hp group of tractors the maximum percent of owners were SMF (21.95%) and followed SF (9.75%).

It also reveals that there is a great demand of 30-35 hp range of tractor followed by 36-40 hp in the study area and not popular greater than 40 hp tractor. The variations in percentage owned by different categories of farmers might be their farm size and purchasing capacity.

Table 3.3: Status of different power range among different categories of farmers.

S. No	Tractor power range(hp)	Category of farmers (%)				
		MRF	SF	SMF	MF	LF
1.	30-35	11 (26.82)	6 (14.63)	6 (14.63)	0 (0)	0 (0)
2.	36-40	2 (4.87)	3 (7.31)	9 (21.95)	4 (9.75)	0 (0)
3.	Greater than 40	0 (0)	0 (0)	0 (0)	2 (4.87)	0 (0)

Note: Percentage are shown in parenthesis

3.1.3 Status of tractor drawn farm implements w.r.t. farmer categories

Status of tractor drawn implements for farming is presented in Table 3.4 shows largest number of tractors drawn implement was cultivator (36) followed by rotavator (34) and thresher (32). Maximum intensity of cultivator found among different categories of farmers was marginal farmers (36.1.%) and semi-medium farmers (27.7%) followed by small farmer (19.4%) and medium farmers (16.6%).

Table 3.4: Status of tractor drawn farm implements w.r.t. farmer categories

Tractor drawn implements	Total no. of implements	Category of farmers				
		MRF	SF	SMF	MF	LF
MB plough	3 (2.80)	0 (0)	0 (0)	1 (33.3)	2 (66.6)	0 (0)
Rotavator	34 (31.77)	11 (32.3)	7 (20.5)	10 (29.4)	6 (17.6)	0 (0)
Cultivator	36 (33.64)	13 (36.1)	7 (19.4)	10 (27.7)	6 (16.6)	0 (0)
Thresher	32 (29.90)	9 (28.1)	7 (21.8)	10 (31.2)	6 (0.18)	0 (0)
Disc harrow	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Land leveller	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Raised bed planter	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Other implements	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	**107**					

Table 3.4 also reveals that the use of all tractor drawn implements except cultivator, rotavator, thresher, and disc plough were not popular in the study area i.e. Pusa block that might be because of lack of information as well as small plot size.

3.2 Tractor utilization pattern

3.2.1 Tractor utilization pattern on the basis of land holding

The results of the survey on the operation-wise tractor utilization status in different categories of farmers are presented in Table-3.5. This table indicates that the maximum utilization of tractors in the seedbed preparation is practiced by the small farmers category (50.20%) followed by marginal farmers (49.81%), small medium farmers (49.80%) and medium farmers respectively. On the other hand, the use of tractors in threshing operation is mostly practiced by the MF (23.73%) followed by MRF, SF & SMF. The table reveals that all categories of farmers are using tractors almost equally for transportation. This table shows that the tractors are mostly used for seedbed preparation followed by transportation and threshing. Hence it may be inferred that all categories of farmers are still using the tractors mainly for seedbed preparation and transportation in the study area.

Table 3.5: Tractor utilization pattern on the basis of land holding

Categories of farmers	Farm operation	Av. own annual use (h)	Av. custom hiring (h)	Av. total annual use (h)	Percentage
MRF	seed bed and tillage	111	550	1327	49.81
	Threshing	5	211		16.27
	Transportation	10	440		33.91
SF	seed bed and tillage	179	467	1285	50.20
	Threshing	24	190	--	15.60
	Transportation	25	400		33.07
SMF	seed bed and tillage	187	459	1297	49.80
	Threshing	26	175	--	15.49
	Transportation	40	410		34.69
MF	seed bed and tillage	210	309	1205	43.07
	Threshing	11	275		23.73
	Transportation	100	300		33.19

3.2.2 Tractor utilization pattern on the basis of implement used

The tractor utilisation pattern on the basis of implement used in study area is presented in Table 3.6. It is obvious from this table that cultivator is mostly used (43.07%) for seed bed preparation followed by rotavator (38.83%). It infers that rotavator is becoming popular for seed preparation in the study area. It may be because of the fact that one pass of ploughing by rotavator is equivalent to 3-4 pass of cultivator. Also, primary and secondary tillage are carried out simultaneously by rotavator.

Table 3.6: Tractor utilization pattern on the basis of implement used

Operations	Implements	Average own Annual use	
		Hr	Percentage
Seed bed preparation	Cultivator	58.62	52.58
	Rotavator	52.86	47.41
	Total	111.48	

4. Summary and Conclusions

The present study was confined at Pusa Block District Samastipur of Bihar. It was possible to consult the entire owners of the tractor and implement and their use. A comprehensive survey Performa was thus prepared and information was gathered from these owners. The Performa contains information about agricultural machinery status, annual use of tractors, and capacity of the tractors, tractors' Make and farm size involved in operation. The information was collected regarding various operations such as tillage, sowing, harvesting, threshing and transportation. The data were also collected regarding tractor use on farmer's field, and in other work such as threshing, transporting. main conclusions were drawn from the study. The maximum intensity of tractors was in village Bishanpur Dimangra (8.46%), followed by Narayanpur Khairi (5.46 %) and Madhopur Khairi (4.46%). Among the available 30-35hp tractors, the maximum tractor 26.82% were owned by MRF followed by 14.63% SF and 14.63% SMF each. In the 36-40hp group of tractors the maximum percent of owners were SMF (21.95%) and followed SF (9.75%). The most popular tractor power range was 30-35hp with (51.21%) followed by 36-40hp with (43.9%) and not popular greater than 40 hp tractor in study area. The Maximum use of cultivator found among different categories of farmers was marginal farmers which were (36.1.%) whereas the minimum use by medium farmers (16.6%).Tractors were mainly used for seed bed preparation by all categories of farmers followed by transportation and threshing.

5. Reference

1. Agrawal B. Mechanization in India Agriculture and Analytical Study Based on the Punjab. Indian Journal of Agricultural Economics. 1983; 4(1):145-58.
2. Balasankari PK, Salokhe VM. A case study of tractor utilization by farmers, Coimbatore district, India. Agricultural Mechanization in Asia, Africa and Latin America. 1999; 30(3):14-18.
3. Battacharjee JP. Mechanisation of Agriculture in India - Its Economics. Indian Journal of Agricultural Economics. 1949; 4(1):121-44.
4. Gimenez, Milan. Farm machinery utilization in a row-crop producer region. Engenharia-Agricola. 2007; 27(1):210-219.
5. Gajja *et al*. Determinants of tractorisation in arid area of Western Rajasthan. Agricultural-Situation-in-India. 1985; 40(4):257-260.
6. Hunt DR. Selecting an economic power level for the big tractor. Trans. Of A.S.A.E. 1971; 15(3):414.
7. Kahlon AS, Sharma AC. Pattern of mechanization for 10-20 acre farms in Ludhiana district. Agricultural Situation in India. 1969; 23(2):1113-6.
8. Kruger IR, Logan RA. Farm study of tractor costs. Agricultural Engineering Conference. 1980; 4(3):51.
9. Mel'nik VI, Chigrin AG, Anikeev AI. Determining tractor requirement from land area. *Traktory-i Sel' skokhozyaistvennye, Mashiny*. 2001; 15(10):8-9.
10. Mittal JP, Saxena RP, Singh IJ. Mathematical expression for cost analysis of farm equipment. Indian Journal of Agricultural Economics. 1974; 29(1):51.
11. Mittal VK, Bhatia BS, Chauhan AM. Food security through farm mechanization. The Punjab Scene. Farm Power and Mchinery, ASAF, 1989, 95-88.
12. Morris WHM. When to buy a new tractor. Agricultural Engineering, 1965, 680.
13. Pandey GS. Break-even analysis of bullock vs tractor power in Haryana. Agricultural Situation in India. 1986; 3(41):143.
14. Patel AR. Farm Mechanization in India. Agrucultural Engg. Today, 1981, 12.
15. Sharma JL, Kahlon AS. An Analytical Study into Custom Hiring Services in Punjab. Agricultural Situation in India. 1975; 2(3):85.
16. Singh B. Economics of tractor cultivation – A case study. Indian Journal of Agril. Economics. 1968; 28(4):83.
17. Singh D, Burkardt TH, Holtman JB. Field Machinery Requirements as Influenced by crop rotation and tillage practices. Trans. of ASAE. 1979; 22(4):702.
18. Sinha AK, Ram RB. Tractor utilization in Bihar – A Case study. M.Tech. Thesis, unpublished, College of Agricultural Engineering, Rajendra Agricultural University, Pusa, Bihar, 1993.
19. Sisodia GS. Cropping pattern and productivity by partial farm mechanization. Journal of Agricultural Engg. 1976; 13(2):86.