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Research Article

UTILIZATION PATTERN OF POWER TILLER IN COIMBATORE DISTRICT OF TAMIL NADU

GOWTHAM B.*[1], SIVAKUMAR S.D.[2] AND MALARKODI[3]
[1]Department of Agricultural and Rural Management, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India
[2]Director (DABD), Directorate of Agribusiness Development, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India
[3]Directorate of Agribusiness Development, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India
*Corresponding Author: Email - gowthamabm20@gmail.com

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Abstract: The power tiller utilization pattern in Coimbatore district, Tamil Nadu was analyzed. Coimbatore District comprises of three revenue divisions *viz*., Coimbatore North, Coimbatore South and Pollachi. In each division 40 sample were farmers' who uses power tillers selected using snowball technique. Out of these 120 sample farmers 94 owned power tillers and 26 of them hired respondents. The average working hours of power tiller per day was six hours. Among the 120 farmers maximum share area cultivated was coconut (311.5 acre) and banana (267.95 acre). The maximum use of own power tiller in the study area was for transport of agriculture produce and input (61.37 percent), followed by tillage (13.77 percent) and rin basing (11.97 percent). The hired farmers used power tiller for intercultural operation with (53.98 percent) followed by ring basing (32.64 percent). The analyze time duration utilized for field operations by power tiller owned farmers was 17371 hours per year and farmers who hired power tiller used it for 628 hours respectively. The main reasons to purchase the power tiller was labour scarcity, simplification of work and word of mouth influence. The main reasons for hiring power tiller farmers due to high wage rate followed by farm size and lack of capital for buying power tiller.

Keywords: *Power tiller, Cropping and utilization pattern, Cost and maintenance, Problems, Duration of power tiller*

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Introduction

In India approximately 85 percent of the total land holdings are in small and marginal groups that need particular efforts to mechanize. The production costs of many crops are very high due to extensive labor participation in various farm operations. The availability of human power in agriculture also grew from around 0.043KW / ha in 1960-61 to around 0.077 KW / ha in 2014-15(NABARD). In 2050 half of the Indian population will be urban. It is projected that the proportion of farm workers in total labor force will decrease from 58.2 percent in 2001 to 25.7 percent by 2050 (World Bank). However, the rise in human power in agriculture is very slow as compared to the growth of farm machinery. Farm mechanization is the method of using agricultural machinery to mechanize various agricultural operations to improve productivity. The change over the year has been carried towards the use of mechanical and electrical power sources. Roughly 93 percent of farm power came from animate sources in 1960-61, but in 2014-15 is fell to around 10 percent. On the other hand, during the same time, mechanical and electrical power sources increased from 7 percent to about 90 percent.

At present these are two indigenous producers of power tillers in India *viz*., VST Tillers Tractors Limited (VST), Bangalore & Kerala Agricultural Machinery Corporation. The average production cost of the power tiller is Rs. 92,000. The average selling price of the power tillers is Rs. 165,000 (Ministry of Agriculture). In the year of 2017–2018 the total power tiller sales were 51,680. Demand for high-power power tiller category increased with high-capacity farm machines used for custom recruiting. The Department of Agriculture, Cooperation & Farmers Welfare, Mechanization and Technology Division launched Sub-Mission on Agricultural Mechanization (SMAM) implementation on 2014-2015. The scheme was implemented in all the states, to promote the usage of agriculture machinery and increase the ratio of farm power to cultivable unit area up to 2.5 kW/ha.

The farmers received power tiller 40-50 percent subsidy and remaining cost is to borne by farmers, and also supplies power tiller components under RKVY, NFSM, NHM & NMOOP various schemes. The total number of Custom Agricultural Machinery Centers' in India is 6,198, these are run by cooperative societies, self-help groups and private / rural entrepreneurs and they are the best option to allow farmers to easily access power tiller and increase farm productivity to support small and marginal farmers [1].

Japan was the first nation to use large-scale power tillers. The first common power tiller model was created in the year 1947. During 1950 to 1965 power tiller sales grew rapidly. In India, a power tiller was built in 1963 [2]. Power tillers are visualized as a suitable source of farm power for small and medium-sized farms (2-4 ha) and are mainly used in low-ground paddy fields for seedbed preparation, intercropping and earthing-up (more than 1.0 m row to row spacing) for horticulture and plantations. Mainly it is used in dry land, garden land and wet land and it is capable of performing operations from primary tillage to crop transportation with additional fittings which may include ploughing, harrowing, riding and furrowing, sowing, fertilizer application, water pumping, intercultural, plant protection, harvesting, threshing and finally transportation operations [3].

It contributes to increased output through timely action, better work, saves time and energy, reduces long-term production costs, reduces post-harvest losses, and increases crop production and farm income. By growing a second or multi-crop from the same property, crop intensity is increased and agricultural land is made more economically viable. For a period of five to six hours, power tiller operators engaged in working of the power tillers continuously. The estimated annual hours of operation for power tiller ranges from 853 to 888 hours. Therefore, there is a need to increase the country's degree of farm mechanization.

Materials and Methods

This study analyzed the utilization pattern and problems faced by the farmers using of power tiller. Coimbatore District comprises of three revenue divisions *viz*., Coimbatore North, Coimbatore South and Pollachi. In each division 40 sample were farmers' who uses power tillers selected using snowball technique. Out of these 120 sample farmers 94 owned power tillers and 26 of them hired respondents. The primary data collected from farmers in Coimbatore District using well-structured Interview schedule, the respondents were contacted directly by personal interview method and the details were collected. In this study, the sample interview schedule is made in accordance with the power tiller utilization of the respondent such as cropping pattern, usage for different field operations, operator comfort and reason for purchasing.

Cost, maintenance values and overall performance of the power tiller were considered as additional factors for analysis. Constraints faced by farmers were collected and especially their opinion and suggestion were noted separately. Finally, the socio-economic characteristics of the respondent including age, education, size of farm holding, farming experience, occupation *etc.* were collected. All these factors were analyzed using percentage analysis, Garret ranking and likert scale.

Garrett ranking

The sample respondents were asked to rank the reasons for the purchase of power tiller. The ranks were converted into percentage position by using formula,

Percent position = 100 (R_{ij} – 0.5) / N_j

R_{ij} = Rank given for the ith variable by j^{th} respondents

N_j = Number of variable ranked by j^{th} respondents

The percentage positions were then converted into scores by referring in Garrett conversion table. Mean scores were calculated for each reasons. The mean score for all the reasons were arranged in the descending order and the reasons with highest mean score was given 1st rank followed by other reasons.

Likert scaling scores

Performance level	Score
Highly satisfied	5
Satisfied	4
Neutral	3
Dissatisfied	2
Highly Dissatisfied	1

From the scores obtained for each attribute, the mean was calculated and interpreted to give the satisfaction level of farmers with respect to product.

The mean score is calculated by using the following formulae.

$$\text{Mean score} = \frac{\sum W_i X_i}{\sum X_i}$$

W_i- Weight of the variable.

X_i - Variable

Results and Discussion

i) General characters of sample farmers

The general characters of sample farmers such as age, education, occupation, annual income, farming experience, size of land holding, source of irrigation, irrigation structure was analyzed and presented in the [Table-1].

From the [Table-1] it could be inferred that majority of sample farmers have in the age group of 35 to 60 (55.83 percent) and most of the farmers completed primary school (35.83 percent). Subsequently, most of the farmers' primary occupation was farming (80.00 percent). Annual income majority of the sample farmers was about Rs.150000 - Rs.340000 (47.50 percent). Among the farmers 39.16 percent were medium farmers followed by small farmers of (26.66 percent). Also, 40.83 percent farmers had 10 to 20 years of experience in farming and 58.33 percent of the farmers were mainly dependent on bore well for irrigation in the farm and (59.19 percent) of the farmers adopted drip irrigation system.

Table-1 *General characters of sample farmers, (No of farmers=120)*

SN	Category	Owned (94)	Hired (26)	Total (120)
1	Age			
	a) <35	14 (14.89)	4 (15.38)	18 (15.00)
	b) 35 – 60	55 (58.51)	12 (46.15)	67 (55.83)
	c) >60	25 (26.59)	10 (38.46)	35 (29.15)
	Total	94 (100.00)	26 (100.00)	120 (100.00)
2	Education			
	a) Illiterate	25 (26.59)	9 (34.61)	34 (28.33)
	b) Primary	35 (37.23)	8 (30.76)	43 (35.83)
	c) Secondary	27 (28.72)	5 (19.23)	32 (26.66)
	d) Graduate	7 (7.44)	4 (15.38)	11 (9.16)
	Total	94 (100.00)	26 (100.00)	120 (100.00)
3	Occupation			
	a) Agriculture	77 (81.91)	19 (73.07)	96 (80.00)
	b) Allied activities	17 (18.09)	07 (26.92)	24 (20.00)
	Total	94 (100.00)	26 (100.00)	120 (100.00)
4	Annual Income			
	a) <150000	26 (27.65)	10 (38.46)	36 (30.00)
	b) 150000-340000	48 (51.06)	9 (34.61)	57 (47.50)
	c) 340000-1700000	20 (21.27)	7 (26.92)	27 (22.500
	Total	94 (100.00)	26 (100.00)	120 (100.00)
5	Farming experience			
	a) <10	28 (29.78)	9 (34.61)	37 (30.83)
	b) 10-20	42 (44.68)	7 (26.92)	49 (40.83)
	c)>20	24 (25.53)	10 (38.46)	34 (28.33)
	Total	94 (100.00)	26 (100.00)	120 (100.00)
6	Land Holding (Ha)			
	a) >1 Marginal	7 (7.44)	7 (26.92)	14 (11.66)
	b) 1-2 Small	25 (26.59)	7 (26.92)	32 (26.66)
	c) 2-4 Medium	39 (41.48)	9 (34.61)	47 (39.16)
	d) >4 Large	23 (24.46)	3 (11.53)	26 (21.66)
	Total	94 (100.00)	26 (100.00)	120 (100.00)
7	Source of irrigation			
	a) Open	16 (17.02)	5 (19.23)	21 (17.5)
	b) Bore well	56 (59.57)	14 (53.84)	70 (58.33)
	c) Both	22 (23.40)	7 (26.92)	29 (24.16)
	Total	94 (100.00)	26 (100.00)	120 (100.00)
8	Irrigation structure			
	a) Drip	55 (58.51)	16 (61.53)	71 (59.19)
	b) Sprinkler	10 (10.63)	2 (7.69)	12 (10.00)
	c) canals	29 (30.85)	8 (30.76)	37 (30.83)
	Total	94 (100.00)	26 (100.00)	120 (100.00)

ii) Machinery owned of the sample farmers

In the present study, the data on the number of sample farmers who owned farm machineries like tractor, sprayer, power tiller were analysed and presented in [Table-2]

Table-2 *Machinery owned of the sample farmers, No of farmers=120)*

SN	Farm Size	Tractor	Sprayer	Power tiller	Total
1	Marginal	0 (0.00)	4 (9.30)	07 (6.73)	11 (7.05)
2	Small	0 (0.00)	12 (27.90)	27 (25.96)	39 (25.00)
3	Medium	2 (22.22)	17 (39.53)	42 (40.38)	61 (39.10)
4	Large	7 (77.78)	10 (23.25)	28 (26.92)	45 (28.84)
	Overall	9 (100.00)	43 (100.00)	104 (100.00)	156 (100.00)

It was evident from [Table-2] that, in Coimbatore out of 120 sample farmers nine farmers owned (7.5 percent) tractors followed by 43 farmers (35.83 percent) owning sprayers and 104 sample farmers (86.66 percent) owned power tillers respectively.

iii) Cropping pattern of sample farmers

Cropping pattern of the sample farmers during the year of 2019-2020 is presented in [Table-3]. In Coimbatore District the power tiller owned farmers had the highest share of cultivated area coconut (39.24 percent), followed by banana (30.87 percent), simultaneously having of favorable soil type and climatic conditions results better farming but the labour scarcity and high labour wage level was one of the major problem which paves way to purchase and hiring power tiller. In Coimbatore, power tiller was used for various activities like making rinbasin and earthing up and other intercultural operations.

Table-5 Satisfaction level of farmers with respect to product, (No of farmer=94)

SN	Particular	Satisfaction level (performed level)					Weighted score	Rank
		HDS	DS	N	S	HS		
1	Cost saving	0	0	07(7.44)	24(25.53)	63(67.02)	4.59	1
2	Time saving	0	0	09(9.57)	33(35.10)	52(55.31)	4.45	2
3	Low maintenance cost	0	08(8.51)	42(44.8)	36(38.29)	08(8.51)	3.46	3
4	Easily available raw materials	17(18.05)	28(29.78)	29(30.85)	14(14.89)	06(6.38)	2.61	4
5	Easy handling	15 (15.95)	38(40.42)	21(22.34)	14(14.89)	06(6.38)	2.55	5
6	Service rendered by dealers	24(25.53)	31(32.97)	26(27.65)	13(13.82)	0	2.29	6

HS: Highly satisfied, S: Satisfied, N: Neutral, DS: Dissatisfied, HDS: Highly Dissatisfied

The hired power tiller farmers used mostly for cultivating banana (48.28 percent) followed by coconut (40.50 percent). Since, there was extensive cultivation of coconut, banana and vegetable crops throughout the study area, there is need of power tiller for various operations.

Table-3 *Cropping pattern of sample farmers, (No of farmer=120)*

SN	Crops	Owned (Acre)	Hired (Acre)	Total (Acre)
1	Coconut	255.5 (39.24)	56 (40.50)	311.5 (39.46)
2	Banana	201 (30.87)	66.75 (48.28)	267.75 (33.92)
3	Sugarcane	81.5 (12.51)	0	81.5 (10.32)
4	Paddy	57 (8.75)	0	57 (7.22)
5	Gourds	15.5 (2.38)	15.5 (11.21)	31 (3.92)
6	Millets	27 (4.14)	0	27 (3.42)
7	Others	13.5 (2.07)	0	13.5 (1.71)
	Overall	651 (100)	138.25 (100)	789.25 (100)

iv) Utilization pattern of power tiller respondents

From the [Table-4], it could be inferred that power tiller, were used for various operation. The power tillers owned used in mainly for transport (61.37 percent), followed by tillage (13.77 percent) and rin basing (11.97 percent). The hired farmers used it for intercultural operation (53.98 percent) followed used it by ring basin (32.64 percent). The analyze time duration utilized for field operations by power tiller owned farmers was 17371 hours per year and farmers who hired power tiller used it for 628 hours respectively.

Table-4 *Utilization pattern of power tiller respondents, (No of farmer=120)*

Purpose	Owned (Hours)	Hired (Hours)	Total (Hours)
Ring basin	2080 (11.97)	205 (32.64)	2285 (12.69)
Tillage	2393 (13.77)	84 (13.37)	2477 (13.76)
Intercultural operations	1402 (8.07)	339 (53.98)	1741 (9.67)
Puddling	376 (2.16)	0	376 (2.08)
Transport	10661 (61.37)	0	10661 (59.23)
Others	459 (2.64)	0	459 (2.55)
Overall	17371 (100.00)	628 (100.00)	17999 (100.00)

v) Satisfaction level of farmers with respect to product

The data given in the [Table-5] show the majority of the farmer with respect to product were highly satisfied with cost saving (63 percent) and satisfied with time saving (36 percent). In overall the farmers were satisfied with cost and time saving because of their timely operation, lack of capital for buying power tiller.

vi) Cost and Maintenance of power tiller respondents

In this study, 82.9 percent the cumulative rest time needed for the power tiller operator was up to one hour in an eight-hour day. Approximately, 67.07 percent of power tiller farmers indicate that it was easy to maintain the power tiller. Most of the farmers felt that training was required for the field operation and maintenance of the power tiller. The general procedure followed by respondents' for adjusting the gear oil and engine oil was only during the power tiller service period.

vii) Reasons for purchasing power tiller

Garrett ranking technique was used to analyze the main reasons to purchase the power tiller in Coimbatore District and the results are tabulated in the [Table-5]. Labour scarcity (65.60) was the major reason to purchased power tiller in Coimbatore district followed by work simplification (57.97). The easy handling ranked (34.51) the least because power tillers require more skill to operate.

Table-6 *Reasons for purchasing power tiller, (No of farmer= 94)*

SN	Category	Garret value	Rank
1	Labour scarcity (High wages level)	65.6	I
2	Work simplification	57.97	II
3	Neighbors influence	52.47	III
4	Price of the product	49.04	IV
5	Subsidy	41.38	V
6	Easy handling	34.51	VI

ix) Reasons for hired power tiller

The major reason behind taking hiring power tillers was high labour scarity (72.92), low farm size (less usage) (62.61) and high capital cost (62.15).

Table-7 Reasons for hiring power tiller, (No of farmer= 94)

SN	Category	Garret value	Rank
1	Labour scarcity (High wages level)	72.92	I
2	Less usage (Size of the farm)	62.61	II
3	High initial cost (Too expensive)	62.15	III
4	Work simplification	50.92	IV
5	Higher maintenance cost	43.61	V
6	Easy available of hiring	31.03	VI
7	Less hiring cost	28.73	VII

Conclusion

In this study, the majority of sample farmers were middle aged, with good experience in farming. Agriculture was their sole occupation. The average annual income of the sample farmers was about Rs. 150000 – Rs. 340000. The majority of the sample farmers were under the categories of small and medium category, hence their size of land holding would influence their willingness to purchase power tiller in this study. This study revealed that main reason for purchasing power tiller was labour scarcity formed by high wage level, work simplification and neighbors influence. Major reasons for hiring power tiller was high wage level followed by high capital to purchase the power tiller. The power tiller were used by the respondents for agricultural activity such as coconut rinbasin, intercultural operation for banana and sugarcane, coconut tillage operation, paddy puddling and transport of agriculture produce and input. The analyze time duration utilized for field operations by power tiller owned farmers was 17371 hours per year and farmers who hired power tiller used it for 628 hours respectively.

Application research: To analyze the utilization of power tiller in Coimbatore district

Research Category: Agricultural and Rural Management

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Study area / sample collection: Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India

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