

## Original Research Article

# Impact of Farm Mechanization on Income in Assam

### Abstract

The study was conducted in Central Brahmaputra Valley and Upper Brahmaputra Valley Zone of Assam. Primary data were collected with the help of specially design pretested schedule by interview method. Tabular, per cent analysis were done and results obtained from these analysis were summarized to examine the impact of farm mechanization ~~in~~ on income. In case of Tractor Ownership Farm, Tractor Hired Farm, Power Tiller Ownership Farm, Power Tiller Hired Farm and Bullock Operated Farm gross return per cropped hectare were Rs.62916.24, Rs. 61370.31, Rs.62408.87, Rs. 56783.89 and Rs.34425.58, respectively. Family labour income and net income also had inverse relationship with farm size in each categories of mechanized and Bullock Operated Farm and exception in case of under Group III under Tractor Hired Farm. Family labour income and net income relative proportion of each mechanized farm was higher over Bullock Operated Farm. Net return were observed to be Rs. 33898.17, Rs.377.76, Rs. 33606.45, Rs.27831.05 and Rs. (-)12075.51 in Tractor Ownership Farm, Tractor Hired Farm, Power Tiller Ownership Farm, Power Tiller Hired Farm and Bullock Operated Farms, respectively.

*Mechanized, non mechanized, Family Labour income, Net income*

### INTRODUCTION

Agriculture has changed significantly with advances in science and technology. Traditional agriculture was mostly dependent on human labor and draught animals with less fertilizer application, plant protection measures etc. where modern agricultural practices are mainly based on machines especially high-speed, powerful tractors and its implements with higher rate of input application. Farm mechanization is considered to one of the several pathways of agricultural development. In modern agricultural practices, mechanization of farm is needed from the view point of the profitability of agriculture by reducing the cost of cultivation. Agricultural mechanization has not only changed the characteristics of labor in agriculture but also influenced the workload involve in it. Farm mechanization is regarded as sine-qua-non to reduce the human drudgery and enhance the agricultural productivity. During the post-green revolution period, the impact of farm mechanization on agricultural production and productivity has been well recognized in India. So, it is obvious therefore, that agricultural mechanization is not merely a proposition of agricultural engineering, but perhaps mainly a problem in agricultural economics (Bhattacharya, 1965). Table 1.1 revealed time series information about cropping intensity, food grain production and farm power availability in India and it is observed that cropping intensity and farm power availability has a positive relationship and cropping intensity and

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per hectare farm power availability of farm power and food grain production were increasing while net sown area per tractor was decreasing during 2004-05 to 2014-15.

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## METHODOLOGY

The present study is an attempt to study the status of farm mechanization, effect of mechanization on human labour employment of the sample farms. The study was conducted in Upper Brahmaputra and Central Brahmaputra Valley Zone of Assam. The sampling design followed for the study was four stage random sampling design. Districts from the first stage unit, blocks were the second stage unit, villages were the third and the sample farmers were the fourth ultimate stage of units of sampling. For Central Brahmaputra Valley Zone, Nagoan district had been selected as Nagaon district is ahead of mechanization compared to other districts. Dibrugarh and Jorhat district represented the Upper Brahmaputra Valley Zone. In consultation with Agricultural Development Officer (ADO) and Agricultural Engineering Department, Government of Assam in the selected districts, the blocks having higher concentration of farm implements were selected. The sample household were classified into 5 ~~sub-groups~~ ~~sub-groups~~ viz., Tractor Ownership Farm (TOF), Tractor Hired Farm (THF), Power Tiller Ownership Farm (PTOF), Power Tiller Hired Farm (PTHF), Bullock Operated Farm (BOF). Most of the farmers in the sample were having less operational holding as most of the farmers of Assam is small and marginal. Only very few farmers were found to have land holding more than 3 hectares hence the stratification of groupings were made as follows:

- i) Group I (less than 1.00 ha)
- ii) Group II (1.00-2.00 ha) and
- iii) Group III (more than 2.00 ha)

Thus, a sample of 240 farmers comprising of 120 from Upper Brahmaputra Valley Zone and 120 from Central Brahmaputra Valley Zone had been taken for the study.

Primary data of 240 sample farms by personal interview method and with the help of specially designed pretested schedule were ~~used~~ ~~for~~ ~~used~~ ~~for~~ examining the effect of farm mechanization in ~~income~~ ~~income~~. All data collected from sample farms pertains to the year 2014-15. — Tabular with averages and ~~percentage~~ ~~percentage~~ were carried out to find out the effect of farm mechanization on income.

## Result & Discussion

Mechanization, along with other new technology has a tendency to shift upward in production by increasing output and decreasing costs which ultimately increase the income of the household. In this section therefore examine the impact of mechanization on income generation in the study area.

Aurangzeb *et al.* (2007) argued that the application of mechanization will boost up the overall productivity and production with the lowest cost of production. Cost and return analysis was done for different categories of mechanized and Bullock Operated Farm and presented in Table 1. Where family labour income and net income could be analyzed. Gross return per cropped hectare in Tractor Ownership Farm, Tractor Hired Farm, Power Tiller Ownership Farm, Power Tiller Hired Farm were found to be higher by 70.84, 66.65, 69.47 and 54.19 per cent than Bullock Operated Farm. Contrary to the gross return, total cost per cropped was higher in case of Bullock Operated Farm than other categories of mechanized farm. It was lowered by 40.64, 51.74, 41.10, 40.79 per cent in case of Tractor Ownership Farm, Tractor Hired Farm, Power Tiller Ownership Farm, Power Tiller Hired Farm, respectively over Bullock Operated Farm including family labour. Mahrouf and Rafeek (2002) reported that mechanization of paddy harvesting in Sri Lanka reduced the harvesting ~~cost~~ ~~by~~ ~~cost~~ by Rs.3800 per hectare, increased the net returns by Rs.7850 per ha and that the cost of production of paddy was reduced by 10-15 per cent and ultimately solved the problem of scarcity of labour during peak harvesting season. In the study area, total cost was declining with increase in the level of mechanization. This was mainly due to the reason of labour displacement where family and labour cost declined with increase in the level of mechanization. But on the other hand cost of manure and fertilizers and seeds were higher in various categories of mechanized farm over Bullock Operated Farm. This indicated that mechanized farm adopted improved varieties and other plant protection measures.

Gross return along with gross cost and farm income of different size group under various categories of mechanized and Bullock Operated Farm are presented in Table 2. From the table, within each category of mechanized and Bullock Operated Farm cost of different size group of different form of inputs such as material costs, human labour cost, all were found to be increase with decrease in farm size. Similarly, in case of gross return also seen inverse relationship with farm size while a little exception ~~in case~~ of Tractor Hired Farm where gross return per cropped hectare was decreasing with increase in farm size and in case of Tractor Hired ~~Farm under~~ ~~Farm under~~ Group III (-Rs. 60560.83) which was lowest within the groups.

It was observed that in case of Tractor Ownership Farm, Tractor Hired Farm, Power Tiller Ownership Farm, Power Tiller Hired Farm and Bullock Operated Farm, gross return per cropped hectare was Rs.62916.24, Rs. 61370.31, Rs.62408.87, Rs. 56783.89 and Rs.34425.58, respectively. Brief analysis of income of different categories of mechanized farm along with Bullock Operated Farm is apparent from Table. Family labour income was found to be Rs.34492.26, Rs.49737.51, Rs.37414.46, Rs.43812.74 and Rs. 25353.29 in Tractor Ownership Farm, Tractor Hired Farm, Power Tiller Ownership Farm, Power Tiller Hired Farm and Bullock Operated Farm, respectively and net return was observed to be Rs.33898.17, Rs.377.76, Rs.33606.45, Rs.27831.05 and Rs. (-)12075.51 in Tractor Ownership Farm, Tractor Hired Farm, Power Tiller Ownership Farm, Power Tiller Hired Farm and Bullock Operated Farm, respectively. Zhizhang ~~respectively~~, Zhizhang and Hanlin (2014) reported existence of co-integration relationship between farmers' income and total power of agricultural machinery from 1981-2011 in China.

Family labour income and net income also showed inverse relationship with farm size in each categories of mechanized and bullock operated farm and exception in the case of Group III under Tractor Hired Farm. Family labour income and net income relative proportion of each mechanized farm was higher over Bullock Operated Farm. This results indicated that mechanized farm had considerably higher return than Bullock Operated Farm. This result was in conformity with the result found by Balishter and others (1991) that impact of agricultural mechanization per hectare from mechanized farms having tube wells and tractors and partially mechanized farms having only tube well were 49 per cent and 29 per cent higher respectively than that from non-mechanized farms. Similarly, Rai and Bezbaruah (2002), Aurangzeb *et al.* (2007) had reported that, mechanization

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comparative cost advantage increased the marginal productivity of labour substantially. Again negative value of net return was due to imputed value of family labour as involvement of family labour higher in case of Bullock Operated Farm. Muhammad, Sivaswami and Jayan (1999) had also reported high wages and scarcity of manual labour in ploughing, transplanting, spraying, harvesting and threshing increased the cost of production in paddy cultivation in Kerala.

Further, comparative analysis of mechanized and Bullock Operated Farm were worked out and showed in Table 3. In case of mechanized farm cropping intensity was 160.40 whereas in case of Bullock Operated Farm was 126.36. In case of mechanized farm cropping intensity was 21.04 per cent more than Bullock Operated Farm. Again human labour employment were 70.90 and 147.90 man days for mechanized and Bullock Operated Farm respectively and thus labour employment was 52.06 per cent lesser than Bullock Operated Farm i.e. in case of mechanized farm labour displacement took place. Output and gross income was also higher in case of mechanized farm than Bullock Operated Farm at 37.06 and 39.65 per cent, respectively. Net income was found negative in case Bullock Operated Farm due to the inclusion of imputed value of family labour. In case of mechanized farm net income was 393 per cent higher than Bullock Operated Farm.

Thus, from the above discussion it was observed that there was positive impact of farm mechanization on productivity and income but negative impact on human labour employment. [Please bring Table 3 here.](#)

**Table 1. Farm Income (Rs./ha) per hectare under various categories of Mechanized and Bullock Operated Farm**

Sl. No.	Particulars	TOF	THF	PTOF	PTHF	BOF
1	Particulars					
2	a) Main product	57595.17 (167.30)	55813.81 (162.13)	56365.04 (163.73)	51787.75 (150.43)	34425.58 (100.00)
	b) By product	5321.07 (221.62)	5556.50 (231.43)	6043.83 (251.73)	4996.14 (208.09)	2400.94 (100.00)
	Total Gross Returns per cropped hectare	62916.24 (170.84)	61370.31 (166.65)	62408.87 (169.47)	56783.89 (154.19)	36826.52 (100.00)
	Cost A					
	a) Seeds	610.15 (141.99)	572.06 (133.13)	620.51 (144.40)	532.05 (123.82)	429.71 (100.00)
	b) Fertilizers, manures value of plant protection	411.22 (176.32)	356.84 (153.00)	515.69 (221.11)	301.22 (129.15)	233.23 (100.00)
	c) Depreciation on implements and machineries	6598.43 (343.10)	195.87 (10.18)	3654.48 (190.02)	112.59 (5.85)	1923.18 (100.00)
	d) Draft Power cost (Bullock labour+ Tractor /power tiller)	-	-	-	-	-
	e) Labour cost	15474.21 (428.54)	8345.99 (231.13)	16074.17 (445.16)	9378.84 (259.74)	3610.91 (100.00)
	f) Other cost (including oil & msc)	2500.70 (326.13)	-	1400.21 (182.61)	-	766.79 (100.00)
	g) Interest on working capital	1959.04 (46.13)	2124.06 (50.01)	2241.86 (52.79)	2619.38 (61.68)	4246.94 (100.00)
	h) Interest on fixed capital	859.23 (341.71)	26.89(10.69)	476.50 (189.50)	16.06 (6.39)	251.45 (100.00)

**Table 1. Contd...**

Sl. No.	Particulars	TOF	THF	PTOF	PTHF	BOF
i)	Value of land revenue.	11	11	11	11	11

	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
3 Cost C	29018.07	23598.55	28802.42	28952.84	48902.03
	(59.34)	(48.26)	(58.90)	(59.21)	(100.00)
4 Gross Income	62916.24	61370.31	62408.87	56783.89	36826.52
	(170.84)	(166.65)	(169.47)	(154.19)	(100.00)
5 Family Labour Income	34492.26	49737.51	37414.46	43812.74	25353.29
	(136.05)	(196.18)	(147.57)	(172.81)	(100.00)
6 Net Income	33898.17	37771.76	33606.45	27831.05	-12075.51
	(4597268.00)	(4984627.00)	(4568096.00)	(3990556.00)	(100.00)

Figures within parentheses indicate percentages expressed in terms of Bullock Operated Farm.

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**Table 2. Farm Income (Rs./ha) under various categories of Mechanized and Bullock Operated Farm across different farm sizes**

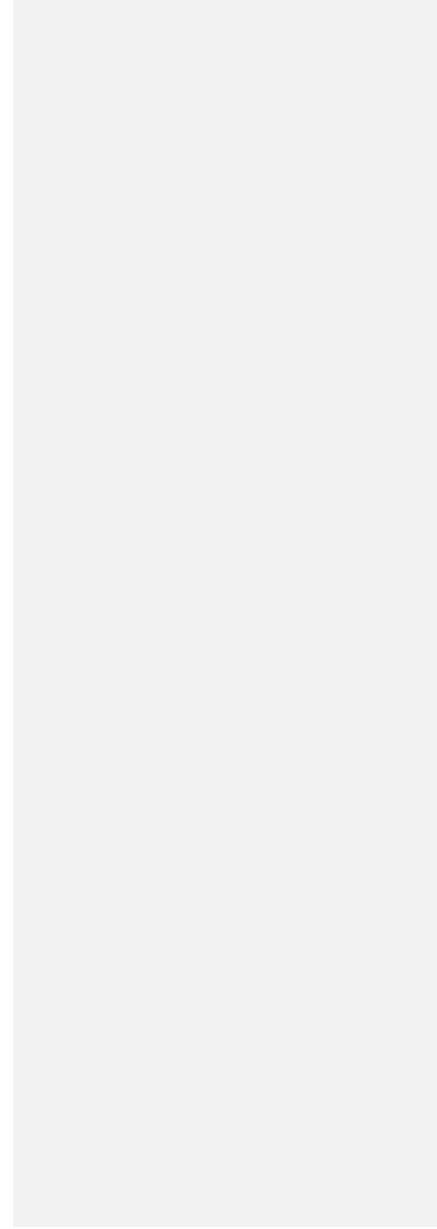
Sl. No.	Particulars	TOF	THF			PTOF		PTHF		BOF	
		Group III	Group I	Group II	Group III	Group II	Group III	Group I	Group II	Group I	Group II
1	Gross Returns per cropped hectare										
	a) Main product	57595.17	55857.22	55958.01	54320.49	56780.77	56048.30	51600.46	52061.48	33839.04	35989.67
	b) By product	5321.07	5201.39	6131.77	6240.34	6109.65	5993.69	4910.67	5121.05	2134.17	3112.31
2	Total Gross Returns per cropped hectare	62916.24	61058.61	62089.78	60560.83	62890.42	62041.99	56511.13	57182.53	35973.21	39101.98
	Cost A1										
	a) Seeds	610.15	545.75	615.17	619.53	623.21	618.45	528.38	537.42	404.07	498.09
	b) Fertilizers, manures value of plant protection	411.22	317.39	395.03	601.83	407.09	598.43	298.89	304.63	219.89	268.81
	c) Depreciation on implements and machineries	6598.43	189.24	203.50	229.41	3509.15	3765.21	109.37	117.29	1898.90	1987.91
	d) Draft Power cost(Bullock labour+ Tractor/power tiller)	-				-	-				
	e) Labour cost	15474.21	8230.20	8282.40	10219.6	15921.56	16190.45	9077.41	9819.40	3161.29	4809.90
	f) Other cost (including oil & misc.)	2500.70	-	-	-	1370.08	1423.16	-	-	750.13	811.23
	g) Interest on working capital	1959.04	2172.57	2058.81	1943.05	2228.28	2252.20	2669.58	2546.02	4154.98	4492.18

**Table 2.Contd...**

Sl. No.	Particulars	TOF	THF			PTOF		PTHF		BOF	
		Group III	Group I	Group II	Group III	Group II	Group III	Group I	Group II	Group I	Group II
	h)Interest on fixed capital	859.23	26.03	27.88	31.25	457.61	490.90	15.64	16.67	248.29	259.86
	i) Value of land revenue.	11	11	11	11	11	11	11	11	11	11
3	Cost C	29018.07	24124.68	22889.29	21645.17	28488.88	29041.30	29501.38	28151.13	47863.00	51672.78
4	Gross Income	62916.24	61058.61	62089.78	60560.83	62890.42	62041.99	56511.13	57182.53	35973.21	39101.98
5	Family Labour Income	34492.26	49566.33	50495.99	46905.16	38362.44	36692.19	43800.86	43830.10	25124.65	25963.00
6	Net Income	33898.17	36933.93	39200.49	38915.66	34401.54	33000.69	27009.75	29031.40	-11889.79	-12570.80

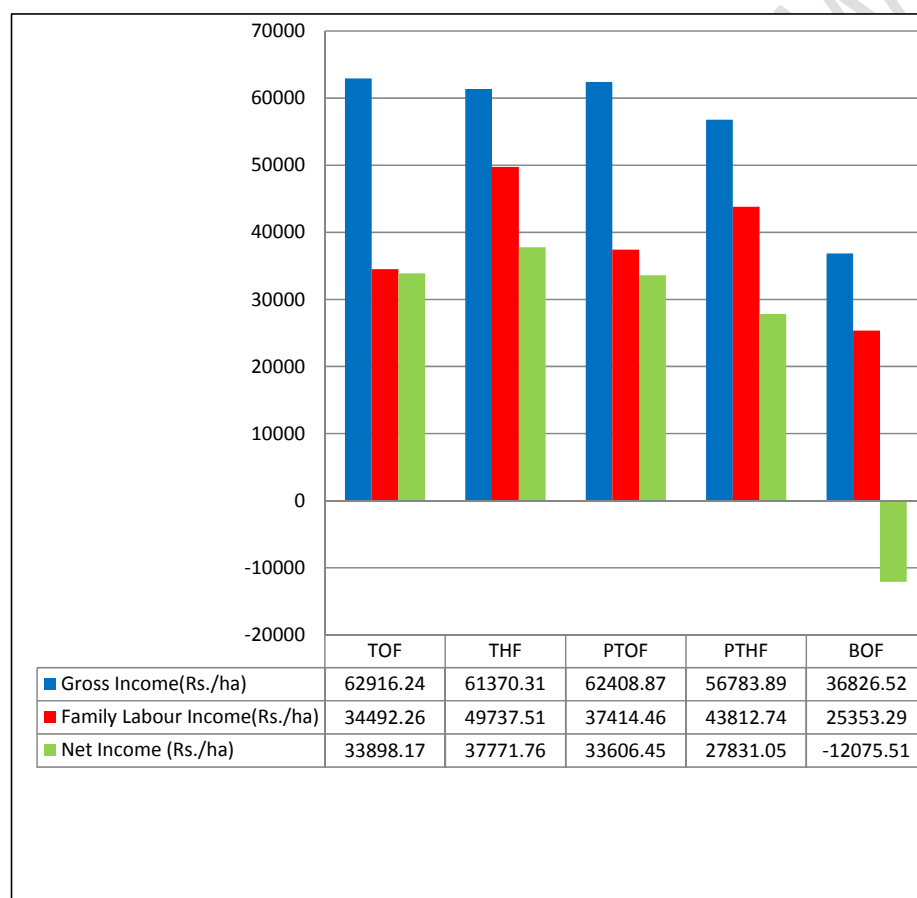


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**Table 3. Income statement of Mechanized and Bullock Operated Farm(Rs./ha)**

Categories of Farm	Gross Income	Family Labour Income	Net Income
Tractor Ownership Farm	62916.24	34492.26	33898.17
Tractor Hired Farm	61370.31	49737.51	37771.76
Power Tiller Ownership Farm	62408.87	37414.46	33606.45
Power Tiller Hired Farm	56783.89	43812.74	27831.05
Bullock Operated Farm	36826.52	25353.29	-12075.51



**FIG1: Comparative analysis of mechanized and Bullock Operated Farm**

No

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