International Journal of Agricultural Research

ISSN 1816-4897

Academic Journals Inc.

www.academicjournals.com

International Journal of Agricultural Research 5 (12): 1107-1115, 2010
ISSN 1816-4897

Determinants of Farm Mechanisation in Modern Agriculture: A Case Study of Burdwan Districts of West Bengal

Bidyut Kumar Ghosh
P.C. Mahalanabish School of Management,
Supreme Knowledge Foundation Group of Institutions, Mankundu,
Hooghly, West Bengal, India

Abstract: Mechanisation of agriculture is an important factor promoting to higher output of the agricultural farm and thereby increasing the profitability of the farming practices. The mechanisation of farm is determined by a set of inter-related factors such as size of farm, irrigation, access to institutional credit, government extension support services, experience of the farmers. At present in West Bengal, the prevalence of small and marginal farmers in the agricultural scenario prevents them from exploiting the maximum benefits of the modern agricultural implements. Based on a primary field survey in the Burdwan district of the state of West Bengal in India, the study tries to identify and analyse the effects of factors such as irrigation, access to institutional credit, government extension support services and experience of the farmers on the level of farm mechanisation. Using the logit regression model the study reveals that the factors such as irrigation, access to institutional credit, size of land holdings etc., are found to have positive significant bearing on the level of farm mechanisation. The study also reveals that younger generation are more opt for farm mechanisation than the old block, i.e., age-old customs act as hindrance to mechanise the farming practices.

Key words: Land reforms, growth rates mechanisation of farm, logit regression

INTRODUCTION

Farmers, whether in the developed or developing economies, mechanise farm operations when the biological sources of energy, e.g., human and animal labour become more costly than the mechanical sources. There is a secular tendency everywhere for the biological sources to become costlier than the mechanical sources. This is due, in part, to the increasing ease with which capital can be substituted for labour (rise in the elasticity of substitution) in agriculture and partly to the rise in the cost of human and animal labour relative to that of machines and fuel (Hanumantha Rao, 1972). Operation Barga, undoubtedly, has brought about significant changes both in agrarian structure and in agricultural productivity in West Bengal. Ceiling on agricultural land holdings and the distribution of ceiling surplus land to the landless have eventually led to the marginalization of operational land in the state. Consequently, as an immediate outcome, small farm size along with security of tenure through the distribution of pattas is found to be associated with higher productivity in agriculture (Sanyal *et al*., 1998). The trend growth rate, covering the period 1970-71 to 2004-05 and its decadal breakup clearly indicate that during 80's, the agriculture in West Bengal has experienced with a robust rate of growth for about 5.34% per annum (Ghosh, 2009). The decomposition of growth rates into area, yield and cropping pattern effect ascertains the fact that the period of high growth is coincided with the period of high yield growth rates

(Ghosh and Kuri, 2007). This fact is true especially in the 80's during which the land reforms measures is assumed to have exert significant impact on agricultural productivity in West Bengal. During 1980's the land reforms measures along with agricultural extension programmes in the form of greater utilization of HYV seeds, introduction of agricultural mechanization, technological improvement etc., have led to increase the yield growth rate and that have resulted in the higher growth of agricultural production in the state. However, the growth performance of West Bengal agriculture is found to experience a serious set-back in 1990's. There is a sharp deceleration trend in the growth rates of agricultural output.

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. A faring system cannot sustain with the traditional machinery. The mechanization of farm is also inductive to the diversification of the cropping pattern.

Further, as a result of globalization and liberalization, the mechanization of the farm becomes utmost necessary because to have a comparative cost advantage of the farming practices. With the implementation of the modern farming machinery, the cost of cultivation may be reduced to a substantial level. Mechanization of farm is expected to generate enormous development opportunities for the agricultural sector. It will increase the marginal productivity of labour substantially and have a higher return per unit of land and labour (Roy and Bezbaruah, 2002).

But the farm mechanisation requires more initial capital, improved technical know-hows and quality support services. Lack of access to these services may constrain small farmers to involve in farm mechanisation. This study based on the primary field survey data tries to analyse the determinants the farm mechanisation with reference to the agriculture of Burdwan district of West Bengal. The specific objectives of this study are to look into the:

- Status of the farm mechanisation among the sample farmers
- The factors that enable /or hinders the rural households to mechanize their farming practices

MATERIALS AND METHODS

The data were collected during the agricultural year 2005-06 on random sampling basis from the two sub-divisions (Purbasthali and Kalna) of the Burdwan district. These two sub-divisions are agriculturally developed areas of the district. The five villages selected for the field sample study are: Bareya, Dhamas, Majida, Ukhra and Naopara. A sample of 185 farmers comprising of 32 from Bareya, 31 from Majida, 27 from Naopara, 65 from Dhamas and 30 from Ukhra have been selected for the study.

The set of explanatory variables determining the level of farm mechanization and hence its impact on agricultural productivity is examined by applying a logit model analysis. Though, it is very difficult to measure the level of mechanization achieved by the farmers, we have used here an index based on the farmers' use and ownership pattern of modern implements such as tractors (hired or owned), threshers, sprayers, power tillers, etc. Farmers' responses to these parameters were codified into scores. The total scores on these codifications could very from 0 to 7 depending on the level of farm mechanization achieved by the respective farmers. Finally, if the score of a farmer exceeds 50% of the maximum achievable scores, we consider that farm to be mechanized and we assign a value 1 to that farm and 0, otherwise. Accordingly a logit analysis (Gujarati and Sangeetha, 2008) of farm mechanization by the sample farmers was taken out.

$$P = \frac{1}{1 + e^{-FM}}$$

where, P is probability that the household achieved farm mechanization

$$FM = C(1) + C(2) * AGEEXP + C(3) * EX + C(4) * IR + C(5) * LANDHOLDING + C(6) * PF + C(7) * BLOAN$$

where, AGEEXP is square of the age of the head of the household (proxy for experience), EX is level of contact with the extension agencies, IR is access to irrigation (irrigation intensity), Yes = 1, otherwise = 0, LANDHOLDING is farm size, PF is proportion of HYV and fertilizer intensive crops to gross cropped area and BLOAN is access to institutional credit Yes = 1, otherwise = 0

RESULTS AND DISCUSSION

The mechanisation of farming practices in the Indian context has been studied by Hanumantha Rao (1972), Brian (1972)and Prasad and Ojha (1987). Hanumantha Rao (1972) showed that mechanisation especially, the use of farm tractors, need not lead to unemployment in regions of expanding agricultural output because they are used in response to genuine shortage and high cost of draft power. Insofar as tractors save the resources allocated for maintaining of draft animals and enable an increase in output by raising cropping intensity and yield per acre. Hanumantha Rao (1972) also concluded that their use seems to be socially beneficial in the context of the shortage and high prices of agricultural commodities and the rise in the scale of operations through the rise in cropping intensity and yield per acre-made possible by tractorisation, can lead to a net rise in farm employment. Brian (1972) using an empirical study has shown that in the Indo-Gangetic plain while all farmers can increase their incomes with the HYVP package (theoretically) those with larger areas suitable for HYV wheat achieve a greater absolute increase than the farmers with small areas. HYVP allows the larger farmers to improve their performance, the productivity of their land, by investing their increased earnings in irrigation and other forms of mechanisation. That is, farmers with larger operational area have a competitive edge over the small farmers in respect of farm mechanistion. Prasad and Ojha (1987) have also confirmed a positive effect of) tractorisation on the cropping intensity, yield level of major crops and farm labour employment.

We first look into the agrarian characteristics of the surveyed villages regarding the land holding pattern, level of cropping pattern, sources of irrigation, fertilizer usage, level of mechanisation of farming practices, extent of government support services. All these factors are expected to exert significant impact on the development of the agricultural practices in any economic system.

Land Holding Pattern

The distribution of the sample farms according to the size of their operational holdings is shown in Table 1. From the Table 1, it has been found that out of 185 sample farmers, 136 farmers (73.51%) have operational holdings below 2.0 ha. Only 9 farmers have operational holdings greater than 5.0 ha, while 21 farmers (11.35 %) have operational holdings between 2.0 to 3.0 ha and only 10% farmers fall in the category of land holdings between 3.0 to 5.0 ha. The size class-size classification of agricultural holdings clearly reveals the dominance

Table 1: Distribution of sample farms according to size of operational holding

Size of operational holdings (ha)	No. of sample farms					
	Bareya	Majida	Naopara	Dhamas	Ukhra	Total
Below 0.5	1 (3.13)	13(43.33)	8 (29.63)	6 (9.23)	0 (00.00)	28 (15.14)
0.5 to 1.0	10 (31.25)	9 (30.00)	9 (33.33)	12 (18.46)	4 (13.33)	44 (23.78)
1.0 to 2.0	10 (31.25)	7 (23.33)	7 (25.93)	26 (40.00)	14 (46.67)	64 (34.59)
2.0 to 3.0	4(12.5)	1 (3.33)	1 (3.70)	11 (16.92)	4 (13.33)	21 (11.35)
3.0 to 5.0	6(18.75)	0 (00.00)	0 (00.00)	7 (10.77)	6 (20.00)	19 (10.27)
5.0 and above	2(6.25)	0 (00.00)	2 (7.41)	3 (4.62)	2 (6.67)	9 (4.86)
Total	32(100)	30 (100)	27 (100)	65 (100)	30 (100)	185 (100)

Source: Field survey, 2005-06. Values in brackets indicate percentages

Table 2: Area under different crops, their percentage share in gross cropped area and cropping intensity in the sample farms

Crop	Village area (ha)					
	Bareya	Majida	Naopara	Dhamas	Ukhra	Total
Aman rice	268.5 (32.54)	81.5 (30.59)	190.5 (43.00)	530.5 (33.83)	324.5 (39.12)	1395.5 (35.49)
Aus rice	10.0 (1.21)	3.0 (1.13)	0 (00.00)	0 (00.00)	0 (00.00)	13.0 (0.33)
Boro rice	200.0 (24.24)	33.5 (12.58)	108.5 (24.49)	455.5 (29.05)	280.0 (33.76)	1077.5 (27.40)
Total rice	478.5 (57.93)	118.0 (44.29)	299.0 (67.49)	986.0 (62.88)	604.5 (72.88)	2486.0 (63.22)
Potato	97.5 (11.82)	75.0 (28.15)	113.5 (25.62)	268.5 (17.12)	165.0 (19.89)	719.5 (18.30)
Mustard	42.25 (5.12)	21.2 (7.96)	19.0 (4.29)	68.5 (4.37)	44.0 (5.30)	194.95 (4.96)
Jute	145.25 (17.60)	26.5 (3.21)	0.0 (00.00)	178.5 (11.38)	16.00 (1.93)	366.25 (9.31)
Pulses	23.5 (2.85)	8.0 (3.00)	2.0 (0.45)	29.5 (1.88)	0 (00.00)	63.0 (1.60)
Vegetables	38.2 (4.63)	17.7 (6.64)	9.5 (2.14)	37.0 (2.36)	0 (00.00)	102.4 (2.60)
Combined net Cultivated area	501.5	166.5	244.0	916.5	504.0	2332.5
Combined gross Cultivated area	825.20	266.40	443.00	1568.00	829.50	3932.10
Cropping intensity (in %)	164.55	160.00	181.56	171.09	164.58	168.58

Source: Field survey, 2005-06. Values in brackets indicate percentages

of small and marginal farmers in agricultural operation of the study villages. This is the outcome of the 'successful land reform' in West Bengal. The average size of operational holdings of all sample farms together is 1.73 ha. The distribution of operational holdings according to the different size class is in conformity with the distribution of operation holdings of the district as a whole.

As elsewhere in the state, smallholders dominate the agricultural scenario in the Burdwan district. Over 70% of the holdings are small. Further segregation shows the dominance of sub-marginal and small farms in the region. Over 34% farms are sub-marginal and share 27.67% of the arable land. The marginal farms comprise 23.78% with a share of 10.95% in arable land. It is, thus, apprehended that for such tiny farms it would no longer be economically very easy to mechanize their farming practices to any considerable extent.

Cropping Pattern and Cropping Intensity

The cultivated area under different crops, cropping pattern and cropping intensity of the sample farms is shown in Table 2. The data shows that more than 60% of Gross Cropped Area of the sample farmers is under rice cultivation. The aus variety of rice is found to be very limited in this region. Next to rice the most important crops of the sample farmers are potato and jute. Jute cultivation is not found at all in Naopara village, where potato has replaced the jute cultivation. The cropping intensity of the sample farmers is estimated to be 168.58%.

Table 3: Irrigation facilities in the sample farms

Villages	Net cultivated area	Gross cultivated area	Combined net irrigated area	Percentage of net irrigated area in combined net cultivated area	Percentage of net irrigated area in combined gross cultivated area
Bareya	501.5	825.2	412.0	82.15	49.93
Majida	166.5	266.4	152.5	91.59	57.24
Naopara	244.0	443.0	224.0	91.80	50.56
Dhamas	916.5	1568.0	781.5	85.27	49.84
Ukhra	504.0	829.5	428.0	84.92	51.59
Total	2332.5	3932.1	1998.0	85.66	50.81

Source: Field Survey, 2005-06

Table 4: Crop-wise and village-wise chemical fertilizer consumption (kg ha^{-1}) by sample farms

	Crop						
Villages	Paddy	Potato	Mustard	Jute	Pulses	Vegetables	Total
Bareya	340.30	1404.92	661.63	169.78	525.00	1187.81	486.65
Majida	335.17	1194.50	465.55	138.02	180.00	604.070	753.70
Naopara	281.59	1419.61	236.46	00.000	162.00	7220.46	719.49
Dhamas	389.04	1613.58	446.19	142.25	176.95	1544.30	596.20
Ukhra	356.13	1184.36	468.00	137.25	000.00	00000.00	502.70

Source: Field Survey, 2005-06

Irrigation

The area is irrigated mostly by private shallow tube-well. There is also government operated mini-deep tube-well. The sample data shows Table 3 that 85% of the net cultivated area and 51% of the gross cultivated area are provided with irrigation facilities. The huge number of shallow tube-well in this region has been in operation for a long time period. This has been causing the groundwater level to fall drastically and this is a prime cause of concern for the sustainability of the region. Alternative sources of irrigation need to be found out to achieve the sustained agricultural development of the region. It is to be noted that the region is endowed with alternative source of river lift irrigation as the river *Ganga* flows through this region.

Fertilizer Usage

The adoption of chemical fertilizer was almost universal among the sample farmers. The crop wise consumption of chemical fertilizer by sample farmers during the reference year is shown in Table 4. The data reveals that the farmers use fertilizer at higher doses on crops such as potato, vegetables and mustard rather than on their main crop, that is, paddy.

Farm Mechanization

By and large, the farmers have adopted the mechanized ploughing and for this purpose they have relied mostly on the hired tractors. Though 33% of sample farmers have bullocks and ploughing, they mainly used the bullocks for transportation of the crops. Only 10% farmers have their own tractors and power tillers; 40% of the sample farmers have diesel pump-set and 24% farmers have their own electric pump-set for supplying irrigation to their land. The farmers of Ukhra village, in general, have no diesel or electric pump-set for irrigation. In this particular villages the irrigation is provided solely by government operated mini deep-tube well. In other cases the farmers mostly depend on privately owned shallow tube-well for irrigating their agricultural land. The comparatively minor implements of sprayer and thresher were most extensively used and also owned more frequently by the farmers (Table 5). Of the total 185 farmers, all of them used sprayer, 143 (77.30%) of them owned the implements, while 145 (78.38%) out of 185 farmers using thresher and 82 (44.32%) farmers owned it.

Table 5: Level of farm mechanization achieved by the sample farmers

Villages	Farmers having plough	Farmers having tractor	Farmers having power tiller	Farmers having diesel pump-set	Farmers having electric pump-set	Farmers having sprayer	Farmers having thresher
Bareya	16 (26.23)	2 (11.11)	4 (22.22)	12 (16.22)	7 (15.56)	27 (18.88)	16 (19.51)
Majida	4 (6.55)	1 (5.56)	1 (5.56)	8 (10.81)	2 (4.44)	16 (11.19)	7 (8.54)
Naopara	15 (24.59)	3 (16.67)	5 (27.78)	20 (27.02)	1 (2.22)	18 (12.59)	18 (21.95)
Dhamas	16 (26.23)	7 (38.89)	3 (16.67)	33 (44.59)	35 (77.78)	54 (37.76)	26 (31.71)
Ukhra	10 (16.39)	5 (27.78)	5 (27.78)	1 (1.35)	0 (0.00)	28 (19.58)	15 (18.29)
Total	61 (100)	18 (100)	18 (100)	74 (100)	45 (100)	143 (100)	82 (100)

Source: Field Survey, 2005-06. Values in brackets indicate percentages

Table 6: Level of contact of sample farmers with the extension agencies

	Villages					
Level of contact	Bareya	Majida	Naopara	Dhamas	Ukhra	Total
Very good	8 (24.24)	3 (10.00)	7 (25.93)	10 (15.38)	4 (13.33)	32 (17.30)
Good	2 (6.06)	7 (23.33)	7 (25.93)	12 (18.46)	1 (3.33)	29 (15.67)
Moderate	23 (69.69)	20 (66.66)	13 (48.15)	43 (66.15)	25 (83.33)	124 (67.03)
Poor	0 (00.00)	0 (0.0)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total	33 (100)	30 (100)	27 (100)	65 (100)	30 (100)	30 (100)

Source: Field Survey, 2005-06. Values in brackets indicate percentages

Government Support Services

To explore the role of government of extension programmes on agricultural productivity, questions were included in the questionnaire to record the influence of government extension agencies on the farming practices of the sample farmers. The sets of questions were related to the extent of farmers' contact with the extension agencies both at the village and block levels. The farmers' responses to these questions have been codified and awarded scores. On the basis of the score, the level of contact with extension agencies has been categorized into (1) very good, (2) good, (3) moderate and (4) poor. The distribution of sample farmers according to the level of contact with extension agencies is shown in Table 6. The results show that only 17% of the sample farmers had very good contact with the extension agencies and 16% of the sample farmers had good contact with them. The remaining farmers (67%) had moderate contact with the extension agencies. No farmers had been found having no contact with them. Most of the farmers knew the personnel but did not receive any direct benefit from the extension services of the government. The extension service of the government in the region is found to be inadequate.

Farm Mechanization and Agricultural Productivity: A Logit Regression Model

Farm mechanization is an essential component of agricultural development. The extent of farm mechanization in the region is found to be moderate. All most all farmers in the study areas adopted HYV seeds and fertilizer and also mechanized ploughing. Farmers are also familiar with the use of sprayer, thresher, etc. However, they are not trained well enough in respect of maximum efficient use of modern machinery. We carry out this analysis to identify the factors which determine the level of mechanization and its optimum utilization.

The logit model rather than the linear regression model has been used as the dependent variable, i.e., the index of farm mechanization is a binary dummy variable. The variable is denoted by FM and it takes the value 1 for farms that have adopted mechanization to a certain minimum level (50% of the maximum achievable scores) and 0 for those who have not done so. The maximum achievable scores is determined on the basis of the ownership and usage pattern of the modern agricultural equipments. More specifically, the ownership and usage of tractors, power-tillers, usage of threshers, sprayer, ownership and usage of diesel

Table 7: Logit Analysis of factors affecting the level of farm mechanization achieved by sample farmers

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-16.96327	3.695243	-4.590570	0.0000
C(2)	-1.099528	2.767121	-0.397354	0.6911
C(3)	-0.014684	0.110561	-0.132816	0.8943
C(4)	0.123723	0.0 31227	3.962041	0.0001
C(5)	0.254204	0.103551	2.454868	0.0141
C(6)	2.113176	2.328154	0.907662	0.3641
C(7)	0.860456	0.476282	1.806609	0.0708
Statistical analysis	Values	Statistical analysis		Values
McFadden R-squared	0.395182	Mean dependent var		0.237838
SD dependent var	0.426915	SE of regression		0.332024
Schwarz criterion	0.861102	Log likelihood		-61.38071
Hannan-Quinn criter.	0.788634	Restr. log likelihood		-101.4863
LR statistic	80.21125	Avg. log likelihood		-0.331788
Prob(LR statistic)	0.000000			

Source: Author's calculation based on field survey 2005-06. FM=C(1)+C(2)*AGEEXP+C(3)*EX+C(4)*IR+C(5)* LANDHOLDINGS+C(6)*PF+C(7)*BLOAN

and electric pump sets for irrigation purpose etc. are considered as the basis for determining scores of farm mechanisation. We assign 1 to those farmers who either own or use these agricultural implements and 0 to those farmers who does not own or use these implements. After putting these scores we consider those farmers as a mechanized one who score more than 50% of the maximum achievable score and assign 1 against that farm. On the other way we consider the remaining farmers as traditional farmers and assign 0 against that farm. The set of variables influencing the adoption of farm mechanization consists of experience of the farmers, level of contact with the extension agencies, extent of availability of irrigation, the size of landholdings of the farm, proportion of area under HYV and fertilizer intensive crops and access to the institutional credit by the farmers.

Obviously the level of contact with extension agencies is expected to have a positive impact on the dependent variable. Again since farm mechanization is of particular advantage for the cultivation of large plot, we expect greater adoption of mechanization among farms with larger holdings. Intensive agriculture utilizes mechanized agricultural practices. As irrigation intensity is a component of intensive agriculture, we have taken irrigation intensity as an explanatory variable to explain intensity of mechanization. Similarly, the access to credit is considered as an important explanatory variable of agricultural mechanization. The results of logit model are shown in the Table 7. The result shows that so far as the acceptance of the overall results is concerned it has been that the model fits moderately well as the value of Mc Fadden R^2 is 0.39 and the log liklihood ratio is -61.381. The significance (or absence of it) of explanatory variables has been found to be consistent on the basis of z-statistic.

Three explanatory variables viz., irrigation coverage, size of land holdings and the access to institutional credit out of six have been found significant. The coefficient of LANDHOLDING (operational holdings) is positive and highly significant confirming that the adoption of farm mechanization is more prevalent among the farms having relatively large in size. Small farmers find them in a disadvantageous position for adoption of mechanization. Also the coefficient of the variable BLOAN i.e., access to credit has been found to have a positive significant impact on farm mechanization. The larger farms being financially more sound as compared to smaller farms and for this they have easier access to modern agricultural implements. They have much more access to institutional credit as their assets base is stronger than the small farms and this enables them to buy or use modern costly inputs. As expected the coefficient of IR has been found to be positive and highly significant confirming a positive association between irrigation and adoption of farm mechanization.

Contrary to expectation, the coefficient of the EX is found to behave quite differently from our expected hypothesis. However, it is insignificant. The coefficient of PF has been found to be positive, though not significant. This implies that the coverage of area under HYV seeds and fertilizer intensive crops (viz., rice, potato, vegetables) needs more farm mechanization. Lastly, the negative value of the coefficient of AGEEXP shows that the younger generation of farmers favours the mechanization of farm much more compared to the old block.

Thus, the size of land holdings acts as a constraint for the farm mechanization in the study area. The small assets base of the small and marginal farmers prevents them from getting access to the institutional credit and this, in turn, reduces the possibility of optimum utilization of modern costly agricultural machinery and implements. In West Bengal this small and marginal farmers dominate the agricultural field as more than 70% of the farmers fall in this category. Also the optimal use of modern agricultural machinery and implement requires comparatively large size of land, which is very much scarce in West Bengal. The average size of land holding of the sample farmers is only 1.73 ha. The evidence shows that the farmers are not well trained to use the modern costly machineries efficiently. It seems that the modern agricultural implements and machinery have not been used efficiently. All these factors might cause the impact of farm mechanization on the agricultural productivity to be negative.

CONCLUSIONS

From the above discussion it is clear that the level of farm mechanisation is determined by a number of social, agricultural and economical factors. The study makes it clear that efforts are needed to strengthen these social, agricultural and economical factors for efficient use of modern agricultural machinery. Age-old customs, lack of support services through government extension agencies for providing knowledge and information of modern agriculture, lack of access to institutional credit stands as the main hindrance for getting the optimum benefits from the farm mechanization, especially for the small and marginal farmers group.

Land reforms measures in the state have resulted in the marginalization of operational holdings. This has led to increase agricultural productivity in the first phase of Operation Barga especially in 80s. However, at present the agriculture of the region has reached a situation where the land reform programmes not providing any further significant backup support to the small and marginal farmers for raising their productivity. The large number of small and marginal farmers which is the outcome of land reforms measures have very small assets base. These small assets base restrict them to make optimum use of the modern agricultural implements. Again the small asset base is also an indirect outcome of the land reforms measures taken by the government in the recent past. The study strongly confirms the positive effects of large land holding on the adoption of modern farming machinery. The proportion of HYV and fertilizer intensive crops to the gross cropped area has a positive effect of the mechanisation of farming practices in the area. And the younger generation rather than the old orthodox group of farmers are ready for the well-acceptance of the modern machinery in the agricultural practices. So, the situation demands reconstruction and development of innovative institutions like co-operatives, self-help groups for providing the better financial and support services to the small and marginal farmers for mechanisation of their farm so as to gain the maximum possible benefits of the modern technological development in the agricultural sector.

REFERENCES

Brian, L., 1972. Patterns of investment in farm machinery and equipment. Econ. Political Weekly, 7: A113-A124.

Ghosh, B.K. and P.K. Kuri, 2007. Agricultural growth in West Bengal from 1970-71 to 2003-04: A decomposition analysis. ICFAI J. Agric. Econ., 4: 30-46.

Ghosh, B.K., 2009. Growth and cropping pattern changes in west Bengal agriculture during 1970-71 to 2005-06. Ph.D. Thesis, Economics from the University of Burdwan, West Bengal.

Gujarati, D.N. and Sangeetha, 2008. Basic Econometrics. 4th Edn., Tata McGraw-Hill, New Delhi.

Hanumantha Rao, C.H., 1972. Farm mechanisation in a labour-abundant economy. Econ. Political Weekly, 7: 393-395.

Prasad, J. and T.P. Ojha, 1987. Impact of Agricultural Mechanization on Socio-Economic Conditions of Indian Farmers. UPLB., Philippines.

Roy, N. and M.P. Bezbaruah, 2002. Agricultural Growth and Regional Economic Development (S Study of Barak Valley). Mittal Publications, New Delhi.

Sanyal, M.K., P.K. Biswas and S. Bardhan, 1998. Institutional change and output growth in west Bengal agriculture: End of impasse. Econ. Political Weekly, 33: 2979-2986.