



PROGRAMMES AND TRENDS OF FARM MECHANIZATION IN WEST BENGAL, INDIA

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Abstract: *The present study intends to review on the mechanization programmes and trends of mechanization in West Bengal. It has been observed that farm mechanization in India in general and West Bengal in particular has not progressed as desired although presently India is the top producer of four wheeled tractors with growing exports to markets like USA. In West Bengal there are no major manufacturing centers for farm equipment. However, like any other States, there are plenty of roadside shops catering to the general maintenance of tractors/power tillers etc. Besides, there is a need to establish specialized centres for imparting training on post-harvest technologies for on-farm value addition. It has been observed that in case of cost of cultivation of major crops in West Bengal the operational costs are lower than value of production but total costs are higher, except in case of mustard. As such, it comes out that except for potato, costs of machinery has grown much faster than costs of bullock labour, human labour as well as value of production. This perceivably acts as a major constraint in the spread of mechanization of farming in the cultivation of crops like paddy, wheat and mustard. The study suggests that mechanization of selected operations must be promoted to enhance productivity and produce operational drudgery. The government should not, as a policy matter, discourage farm mechanization with a false pre-conceived notion of labour displacement. To encourage the use of farm machinery, a policy of insurance for users and credit facilities for farmers and entrepreneurs need to be introduced at low premium and interest rates.*

Key words: *Farm mechanization, programmes, trends, policies of farm mechanization*

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1. INTRODUCTION

The technological improvements in Indian agriculture since mid-sixties have brought about revolutionary increase in agricultural production. Interestingly, the growth rate of food grain production particularly in case of wheat and rice was much higher than the growth rate of population. The country was facing acute food shortages till eighties has now become not only self-sufficient but also a net exporter of food grains. This has been made possible due to evolution of high yielding crop varieties, increased use of chemical fertilizers, development of irrigation facilities and plant protection measures accompanied by effective price support programmes of farm products (Rao, 1972). The increased use of purchased inputs in agriculture necessitated to raise their use efficiencies through mechanization. The increase in the use of human and bullock labour and rising wage rates and cost of up-keep of bullock further made the case of farm mechanization still stronger (Agarwal, 1984; Kulkarni, 2005; Ghosh, 2010).

However, farm mechanization in India has not progressed as desired although presently India is the top producer of four wheeled tractors with growing exports to markets like USA (Rajdou *et al.*, 2012). In reality, Indian agriculture is far less mechanised than that of other South Asian countries viz., Bangladesh and Sri Lanka (Tewari, 2010). Similarly within India, the extent of mechanization is extremely varied and there are large regional disparities with Punjab and Haryana possessing the highest levels of mechanization while the eastern states like West Bengal, Bihar and Orissa possess lowest (Singh, 2004). However, both central and state governments have taken several measures through two Central Sector Schemes viz., 'Promotion and Strengthening of Agricultural Mechanization through Training', 'Testing and Demonstration and Post harvest Technology and Management' during 11th Five Year Plan. At the same time, mechanization is also promoted through other programmes viz., Macro Management of Agriculture (MMA), Rashtriya Krishi Vikas Yojana (RKVY), National Horticulture Mission (NHM) and National Food Security Mission (NFSM) etc. In view of the above phenomenon, the present study intends to review on the mechanization programmes and trends of mechanization in West Bengal. The specific objectives of the study are (1) to review the mechanization programmes in West Bengal; (2) to assess the trends of mechanization in West Bengal.



2. DATA BASE AND RESEARCH METHODOLOGY

The study has been conducted based on secondary data. The secondary data has been collected from various sources i.e. farm level data from the cost of cultivation studies, government publications, books, journals etc. Tabular analyses along with econometric analyses have been adopted to fulfil the various objectives of the study.

3. Results and Discussion

The traditional farm tools and implement mainly relied on use of animate power. Improved farm tools, implements and machinery, which use both animate and mechanical power were devised from time to time. The average size of farm holding being small, animate power is widely used in many parts of the country. Mechanical power is making its impact in Indian agriculture with steady increase in land and labour productivity. The traditional animal operated country plough although give low output and require higher number of field operations are still being used by majority of the farmers. Animal drawn cultivator and puddler have gained popularity over the years due to higher output and better quality of work. Improved implements such as M.B. plough, puddler, disc harrow, peg tooth harrow, spring tine harrow and patella harrow, being more efficient, have been adopted. Use of sowing/planting devices for line sowing have also increased over the years as it helped the farmers in better management of costly inputs of seed and fertilizers. The growth in the number of sprayers and dusters for plant protection has also been significant. The number of draught animals has shown decline during the past few decades as a consequence of farm mechanization and high cost of animal upkeep.

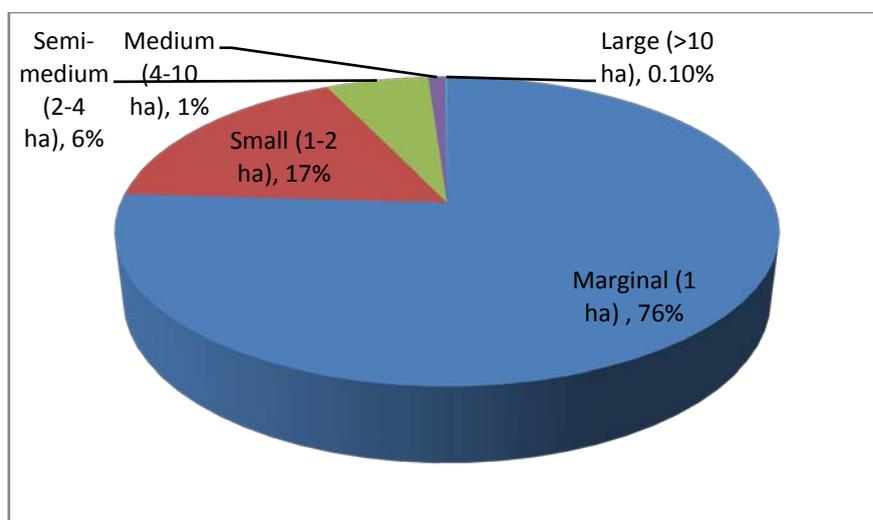


Figure 1: Status of land holdings in West Bengal



India has small as well as big farms. Mechanical power has replaced bullock power on Indian farms. The contribution of mechanical power and electrical power to the total power availability on the Indian farm has risen to 70 per cent from 30 per cent during the last two decades, viz. 1990s and 2000s. In hilly parts of the country and remote areas, most of the farm operations are still being performed manually or by animal drawn equipments and this will continue to be the case in future also. Hence, both small and large size machines would be needed. Average size of farm holdings has gradually reduced from 2.58 hectare to 1.57 hectare over the aforementioned period. Fragmentation will continue due to 'Laws of Inheritance' and 'Hindu Succession Act' where the father would divide the land amongst his sons. Labour shortage is being experienced at peak seasons due to the enactment of the National Rural Employment Guarantee Act and huge demand from the construction sector in cities; labour is available at a higher cost per hectare and this would increase the demand for mechanization. India is a growing economy and an increasing population can be supported by multiple cropping; hence, to perform the operations timely, high capacity machines in some places are required. Due to the high cost of agricultural machines, custom hiring/providing machines on rental basis are being promoted by the Government. Conservation Agriculture has emerged to encourage sustainable agricultural production. It refers to the system of raising crops without tilling the soil while retaining crop residues on the soil surface. There is minimum soil disturbance by adopting no-tillage solutions. The thrust areas of the Government include increase in the production and productivity of crops including horticultural crops, soya products, oilseeds and pulses. Increased participation of corporate through Corporate Farming has become very popular. Companies are entering into agreements with farmers through contract farming.

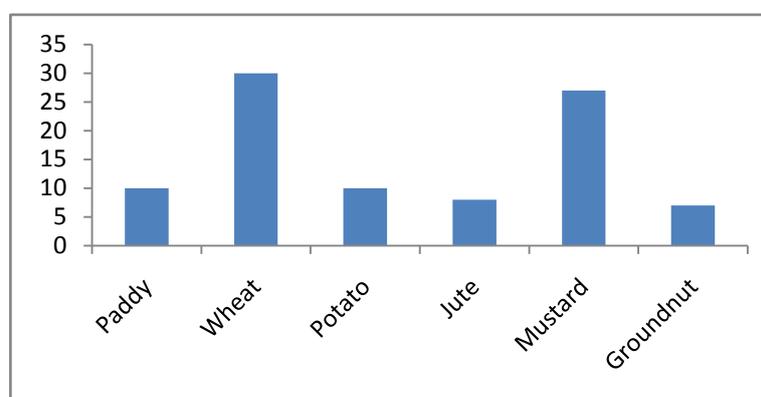


Figure 2: Mechanization index (%) of major crops in West Bengal



In fact in West Bengal, the picture of farm mechanization is not praiseworthy. Kolkata, Bankura, Bardhaman, Hooghly, and Midnapore are major markets for the sale/marketing of agro-equipment and grain in West Bengal. There are no major manufacturing centers for farm equipment in the State. Bardhaman has a few units manufacturing some farm equipment and most of the equipment is bought from other states. Infrastructural facilities available for sale/repair and maintenance of tractors and other machinery are not adequate in West Bengal. Most servicing facilities are extended through dealers of power tillers and tractors. The zone has the highest population and annual sale of power tillers. However, like any other states of India, there are plenty of roadside shops catering to the general maintenance of tractors/power tillers etc. West Bengal has three agricultural/allied sector universities and several other institutes including prestigious Indian Institute of Technology at Kharaghpur. The IIT has a Department of Agricultural and Food Engineering and a Rice Processing Centre, which are credited with numerous path-breaking useful agro-technologies to their credit. There are 9 Krishi Vigyan Kendras located at different districts viz., Midnapore; Kakdwip and Nimpith in South 24-Paraganas; Bankura; Jalpaiguri; Purulia; Kalimpong in Darjeeling; Bardhaman and Birbhum which impart trainings to farmers and other groups. Besides, there are several NGOs that serve for socio-economic upliftment of rural masses. However, to serve the large population of rural sector, these facilities are highly inadequate. There should be more training centres to provide hands-on training on the use of farm equipment, power tillers and tractors. Besides, there is a need to establish specialized centres for imparting training on post-harvest technologies for on-farm value addition. Establishment of a full-fledged Directorate of Agricultural Engineering at the state level may greatly help to achieve the above-mentioned activities. Most of the tools and implements being used by farmers in West Bengal are either manual or animal drawn. Since majority of farms are marginal (<1 ha), use of high capacity tools is not feasible. Use of tractors is suggested on custom-hiring basis. Power tillers are being adopted at a fast pace in the state. There are a number of small tools and implements, which need to be introduced for higher output and reduced drudgery.

In case of trend in population of farm machinery irrigation is one of the major energy-intensive operations. With the increase in gross irrigated area, the number of irrigation pumps has swelled from 20 thousand in 1950-51 to about 12.51 million in 2000-01. Electric



pumps are preferred than diesel engine operated pumps due to lower cost and higher energy-use efficiency. One of the major problems has been the lack of adequate and timely availability of electricity in rural areas due to which the diesel engines are kept as standby source of irrigation. The farmers are increasingly using power sprayers and dusters. Tractor is the basic machine on which most of the farm mechanization depends. Power tiller was introduced in the country in the sixties, but could not gain popularity like tractor due to its limitation in the field and on the road. The power tillers are being used presently in rice and sugarcane producing areas of Tamil Nadu, Andhra Pradesh, Kerala, Karnataka, West Bengal, Bihar and Maharashtra. Prime movers for irrigation are also used for operating threshing, chaff cutting, cane crushing equipment. Tractors are also used as stationary power source for such purpose. Use of power thresher, especially for wheat crop, became very popular in the seventies even among small farmers.

In case of status and trends of mechanization in West Bengal, it comes out that cost of machine during the period 2001-02 to 2009-10 accounted for about 3 per cent to 4 per cent of operational cost across crops like paddy, wheat, mustard and potato. In contrast, cost of bullock labour ranged between 12 to 15 per cent on an average, especially for paddy, wheat and mustard. As ratio to total cost, cost on account of machinery ranged between 2 to 4 per cent of total cost, where cost on account of bullock labour ranged between 8 to 10 per cent on an average over the period 2001-02 to 2009-10. Further, as ratio to value of production, cost of machine labour accounted for 2.5 to 3.5 per cent for paddy, wheat and mustard, while cost of bullock labour ranged between 9.5 to 11.5 per cent. On the whole, it comes out that costs of machine labour accounted for a small fraction (less than 5 per cent) each in case of operational cost, total cost or value of production. In sharp contrast, costs of bullock labour and especially human labour remain far higher.

Further, while comparing growth rates of costs of machine labour vis-a-vis bullock labour and human labour, we observed that for paddy, costs of machine labour grew much faster than that of bullock labour and human labour. This also holds in case of mustard and especially wheat, as cost of machine labour in case of wheat grew by more than 38 per cent over the period concerned. It is only in case of potato that we observe that cost of machine labour has actually declined over the period concerned.



It is interesting to note from tables-1 to 3 that the operational costs are lower than value of production but total costs are higher, except in case of mustard. Since these are average costs and returns in a sense, this in turn reflects the subsistence type of farming practiced in a highly marginalized economy like West Bengal.

Table 1: Share of machinery costs in operational costs (2001-02 to 2009-10)

Crop	Cost of Human Labour	Cost of Bullock Labour	Cost of machine labour	Operational cost	Cost of human labour as % of operational costs	Cost of bullock labour as % of operational costs	Cost of machine labour as % of operational costs
Paddy	11117.32	2376.03	853.68	19275.86	57.67	12.33	4.43
Wheat	7937.93	2522.60	692.51	18963.51	41.86	13.30	3.65
Mustard	6104.17	1837.12	502.74	12602.32	48.44	14.58	3.99
Potato	13428.47	1741.00	1980.82	50669.17	26.50	3.44	3.91

Source: Cost of Cultivation, MoA, DES, GoI

Table 2: Share of machinery costs in total costs (2001-02 to 2009-10)

Crop	Cost of Human Labour	Cost of Bullock Labour	Cost of machine labour	Total cost	Cost of human labour as % of total costs	Cost of bullock labour as % of total costs	Cost of machine labour as % of total costs
Paddy	11117.32	2376.03	853.68	27243.90	40.81	8.72	3.13
Wheat	7937.93	2522.60	692.51	26029.72	30.50	9.69	2.66
Mustard	6104.17	1837.12	502.74	18432.94	33.12	9.97	2.73
Potato	13428.47	1741.00	1980.82	67909.53	19.77	2.56	2.92

Source: Cost of Cultivation, MoA, DES, GoI

Table 3: Share of machinery costs in value of production (2001-02 to 2009-10)

Crop	Cost of Human Labour	Cost of Bullock Labour	Cost of machine labour	Value of Production	Cost of human labour as % of value of production	Cost of bullock labour as % of value of production	Cost of machine labour as % value of production
Paddy	11117.32	2376.03	853.68	25758.22	43.16	9.22	3.31
Wheat	7937.93	2522.60	692.51	22714.63	34.95	11.11	3.05
Mustard	6104.17	1837.12	502.74	19237.45	31.73	9.55	2.61
Potato	13428.47	1741.00	1980.82	63601.82	21.11	2.74	3.11

Source: Cost of Cultivation, MoA, DES, GoI



More importantly, it has been observed that cost of machinery grew faster than the growth in value of production over the period 1996-97 to 2009-10 (Tables-4 and 5). This holds true for paddy, mustard and especially wheat, where cost of machinery grew by 38.73 per cent as compared to 11.48 growth of value of production. However, in case of potato only, we observe that there has been a negative growth of -12.92 per cent in total machinery cost over the period, while there has been a positive growth in the value of output at 4.54 per cent per annum over the same period. As such, it comes out that except for potato, costs of machinery has grown much faster than costs of bullock labour, human labour as well as value of production. This perceivably acts as a major constraint in the spread of mechanization of farming in the cultivation of crops like paddy, wheat and mustard.

Table 4: Growth rate of costs (1996-97 to 2009-10)

Crop	Cost of human labour			Cost of bullock labour			Cost of machine labour		
	Qty	Price	Total cost	Qty	Price	Total cost	Qty	Price	Total cost
Paddy	0.23	5.70	5.97	-4.29	7.65	3.04	NA	NA	6.41
Wheat	3.58	14.43	18.53	-12.54	4.85	-8.30	NA	NA	38.73
Mustard	1.17	6.51	5.22	-1.72	6.30	3.25	NA	NA	8.49
Potato	-3.36	5.82	2.26	-5.33	8.08	2.31	NA	NA	-12.92

Source: Cost of Cultivation, MoA, DES, GoI

Table 5: Growth rate of production vis-a-vis costs (1996-97 to 2009-10)

Crop	Production			Cost of machinery		
	Yield	Price	Value of production	Qty	Price	Total machinery cost
Paddy	0.69	4.00	4.72	NA	NA	6.41
Wheat	3.55	7.66	11.48	NA	NA	38.73
Mustard	0.21	5.62	5.84	NA	NA	8.49
Potato	-0.96	5.55	4.54	NA	NA	-12.92

Source: Cost of Cultivation, MoA, DES, GoI

4. SUMMARY AND CONCLUSIONS

India is now a net exporter of food grains due to evolution of high yielding crop varieties, increased use of chemical fertilizers, development of irrigation facilities and plant protection measures accompanied by effective price support programmes of farm products. In fact, the increased use of purchased inputs in agriculture necessitated to raise their use efficiencies



though mechanization. The increase in the use of human and bullock labour and rising wage rates and cost of up-keep of bullock further made the case of farm mechanization still stronger. However, farm mechanization in India in general and West Bengal in particular has not progressed as desired although presently India is the top producer of four wheeled tractors with growing exports to markets like USA. In West Bengal there are no major manufacturing centers for farm equipment. However, like any other States, there are plenty of roadside shops catering to the general maintenance of tractors/power tillers etc. Besides, there is a need to establish specialized centres for imparting training on post-harvest technologies for on-farm value addition. Establishment of a full-fledged Directorate of Agricultural Engineering at the State level would greatly help to achieve the above-mentioned activities. Most of the tools and implements being used by farmers are either manual or animal drawn. Since majority of farms are marginal (< 1 ha), use of high capacity tools is not feasible. Use of tractors is suggested on custom-hiring basis. Power tillers are being adopted at a fast pace in the region. There are a number of small tools and implements, which need to be introduced for higher output and reduced drudgery.

It has been observed that in case of cost of cultivation of major crops in West Bengal the operational costs are lower than value of production but total costs are higher, except in case of mustard. Since these are average costs and returns in a sense, this in turn reflects the subsistence type of farming practiced in a highly marginalized economy like West Bengal. More importantly, it has been observed that cost of machinery grew faster than the growth in value of production over the period 1996-97 to 2009-10 in West Bengal. As such, it comes out that except for potato, costs of machinery has grown much faster than costs of bullock labour, human labour as well as value of production. This perceivably acts as a major constraint in the spread of mechanization of farming in the cultivation of crops like paddy, wheat and mustard.

In view of the above, the study suggests that mechanization of selected operations can be promoted to enhance productivity and produce operational drudgery. The government should not, as a policy matter, discourage farm mechanization with a false pre-conceived notion of labour displacement. A policy of insurance for users and credit facilities for farmers and entrepreneurs need to be introduced at low premium and interest rates in order to encourage the use of farm machinery. Policies are needed for accelerated



development of high quality processing industries with quality testing laboratories for horticultural products to derive maximum profits from this sector. A farm mechanization development council may be established at the state level to make provision necessary guidance and policy framework on various aspects of farm mechanization.

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