

Changes in labor pattern and agricultural mechanization

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Abstract

In countries like India, the main argument against the use of machine in agriculture is that it displaces labor. In Assam, agricultural mechanization has remained limited and selective. The number of labor to be engaged in the agriculture field is decreasing and the use of machines like tractor and power tiller etc. is giving direct and indirect employment to a large section of people as part-time labor. The farmers were found purchasing agricultural machines for both personal and rental business purposes. In Assam a lease market of agricultural machine has developed. The farmers have used machines considering the cost factors. In this paper an attempt has been made to observe the changes in labor market in connection to mechanization in agriculture.

Keywords: Displacement, Mechanization, Technological, Tractor, Transformation.

Introduction

The role of agriculture in the economic development was highlighted from the days of physiocrats in France. Francois Quesnay, the leader and central figure of the Physiocratic School made several interesting assumptions about the techniques of production in agriculture and industry and reached the general conclusions: (1) that the generation of an economic surplus was confined to agriculture and (2) that the size of surplus was determined by the technique of farming or the capital intensity of agriculture. He reached the fundamental conclusion that economic development in a country was not possible without agricultural growth, and that the industrial and the other sectors of the economy were wholly dependent on the agricultural sector since the demand for manufacture and service was depended on the size of the economic surplus which was wholly derived from agriculture. Adam Smith also found it possible to ignore the labor displacing effect of capital accumulation. For example, when the stock of corn input increases, the demand for labor increases at the same rate provided wages are constant. Adam Smith was quite explicit in his statement that capital and technology had far greater influence upon the rate of growth of an economy than the institutional factors. The classical economists thus explained growth process in terms of rate of technological progress and population growth. In their opinion, technological progress remains in lead for some times, but finally it peters out when the falling rate of profit prevents further accumulation of capital.

Technology implies factor combination or factor proportion. Therefore, use of new methods of production implies new combination of factors of production or a different way of using them in production. Mechanization of agriculture means the replacement of biological power (human or animal) for agricultural operations by machinery. The basic essential of mechanization consists in the use of power driven/ operated machines. The example is the tractor that ploughs. The driving force is the machine run with diesel/ petrol resting on wheel. The plough that prepares the ground for sowing is not to be worked by human labor or

bullock. Nor will the water be drawn from well by human effort or by animals. So is the case with other farm operations like sowing, harvesting, threshing, crushing etc. Industrial revolution that originated in England was in fact sparked off by the steam engine which provided the mechanical power to drive or operate, in place of human/animal power. Thus mechanization covers traction-work as well as stationary work- the two types of work into which all the agricultural operations can be categorized. The traction-work necessitates pulling and drawing efforts. Examples of this type of work are: ploughing; rolling; seedling; harvesting and hauling. Stationary work on the other hand needs power for operations on fixed situations. These include such activities as: lifting water for irrigation, threshing, and crushing sugarcane, grinding and mixing livestock feed, hauling paddy, etc. Some machines do one type of job only e.g., tube wells, but not the others. There are machines that do both the jobs. A combine harvester can perform the task of harvesting which is traction work. It can also do threshing, winnowing, bagging, etc., which are stationary jobs. Agricultural mechanization is thus the replacement of animal and human power by machinery, ploughing is to be done by tractors, sowing and putting of fertilizer by drill and reaping and threshing by combined harvest thresher and so on. The tractor will also be used in transporting crops to markets. The old fashioned wooden ploughs, bullock, sickles etc are to be eliminated and work is to be done by machinery. Thus the mechanization of agriculture stands for the use of machinery in all farming operations, ranging from ploughing to marketing of the product. In the western countries like the U.S.A., Canada and Australia where extensive mechanization of agriculture has taken place, agricultural productivity has been raised manifold. In the U.S.A where only 2% people depend in agriculture, agricultural production has been increased so much enabling the American farmers to send the surplus to the other countries.

It is almost true that full scale mechanization of agriculture cannot be adopted in a labor abundant country like India and at the same time it will be wrong to say that

there is absolutely no scope for mechanization of agriculture in these countries. Agricultural machines suitable for small size farms can be introduced. Mechanization is also necessary for reclamation of land, conservation of forest land or cultivation, ploughing of barren land, construction of wells in rocky areas etc. In view of the fact that the farm size is small in India but the farming population is very large it will be necessary to pursue a policy of limited mechanization so that the labor displacement effects can be minimized. The draft fifth plan also advised for selective mechanization.

The state of Assam is located in the far north east part of India and covers a geographical area of 78,523 sq. km which forms 2.4% of the country's total land area. The state is comprised of three physical divisions, namely, the Brahmaputra valley, Barak valley and the Hill ranges. The climate of Assam is very damp as it is freely open to the moisture-laden winds from the Bay of Bengal and lies beyond the influence of the dry air current, which flows down the Gangatic plain during the hot weather.

The survey indicates that the educated farmers have started use of machine in different stages of agriculture. The labor market has changed. The number of full time labor is decreasing and dependency on part time labor is increasing. As a rental market has developed the farmers have started using machine. Cost factor has influenced the farmers to go for mechanization. Therefore, the survey was conducted to analyze the labor market in connection to mechanization.

Objectives of the Study

(i) To study the changes in pattern of agricultural labor in Assam (ii) to analyze the relation between labor and use of machine in agriculture.

Review of Literature

Karl Marx (1959) did not consider improvement in production technique as an autonomous factor. He finds, technological progress is generally labor displacing. Schumpeter (1950) like Karl Marx believes in direct relationship between the capital accumulation and the method of production.

Tractorisation has both employment generation effects and labor displacing effects. Use of tractor displaces labor in the process of ploughing and transportation. It also facilitates multiple cropping by reducing time of land preparation and better ploughing raises yields per unit of land. These effects generate more employment opportunity in agriculture. Depending on the magnitudes of the labor displacing effects and employment effects, the net effect may go both the direction (Sen 1975). Kahlon (1976) in his study in Punjab found- family labor is more on the pure bullock farm, casual labor is hired more on pure tractor farm and permanent labor is employed more on the pure tractor with bullock farm.

Because of use of machine and increasing farm size, labour productivity could be increased. More use of machine causes farm capacity to move to non-farm sector employment for surplus agricultural labor (Bala and

Hussain, 1978). From the study in the Comilla district of Bangladesh Singh and Sarker (1978) found tractor used field were utilizing less labor, more particularly that of family labor as compared to traditionally tilled fields. Singh (1979) found tractor farm used more hired labor than the animal farm in central Mindanao, Philippines. However, the use of family labor and total labor was high in animal farm as compared to tractor farm.

NCAER (1980) found, in seven states in India, the tractor farm had 5.4% higher overall employment. But the study showed 35% higher in hired labor employment than bullock farm.

Ahmad (1983) reported from his study in Vehari district of Pakistan that the total hired labor input per cropped acre was less by 19.8% in tractor farm as compared to bullock farm. However the use of casual hired labor was higher by 80.5% in tractor farm than the bullock farm. NABARD (1985) studies about use of power tiller in the Hoogly District of west Bengal. The findings showed use of power tillers generated on an average an additional annual employment of 380 man days, out of which the share of hired labor was 112 man days.

In the study conducted in 1990 in Raipur District of Madhya Pradesh Dixit and Bharadwaj found hired labor employment per acre was higher in bullock operated farm. However, because of the introduction of combined harvester, the use of human labor was reduced significantly. In his study on income and employment of tractor and bullock operated farm in Chandausi block of Aligarh District in Uttar Pradesh, Sharma (1991) found human labor employment decreased by 19.17% in tractor operated farm as compared to bullock operated farm. However, the tractorisation, increased hired labor employment increased in agriculture.

Meier (2000) sums up “ the emphasis on agricultural development now is not only for its instrumental value in sustaining expansion elsewhere in non-agricultural sectors, but for its own absorption of labourers and its own increase of real income among the rural poverty groups of small farmers and landless labourers. The widely expressed view now is that root of the employment problem lies in the fact that modern economic activity is not being diffused to the countryside. An agricultural strategy that would improve the rural urban balance now requires the extension of planning, infrastructure, appropriate technology and complementary resources to the rural sector. If in earlier decades of development, agricultural development had instrumental value, in future decades it must have an intrinsic value of its own.” When many economists have opposed mechanization of agriculture on the fear of labor displacement effect, interestingly India has emerged as a leading tractors producing country in the world. In the states like Punjab and Haryana where mechanization has been introduced , the agricultural productivity have led to increase in income of farmers, a rise in wages of farm labor and enlargement of employment. Punjab employs 7 lakh laborers from adjoining states, out of which 3.5 lakh are employed on a

regular basis and the remaining during the main cropping seasons. Same is the case of Haryana (Datt 2007).

Research Methodology

A survey was conducted in five out of six agro climatic zones of Assam. From each zone one Agricultural Development Officer's (ADO) Circle was selected. The survey was conducted in the year 2005 and the data were updated in the year 2016. The hill valley zone was not included as the farming style followed in this zone is different from other zones. The data was collected through a two stage random sampling. The villages constituted the primary sample units. The farm households were considered as secondary units.

Thus five ADO circles namely Bongshor, Furkating, Bhurbandha, Dumunichowki and Silchar were selected. Bongshor is located in the Lower Brahmaputra Valley Zone. It is nearest to the state's capital Guwahati. In this circle large section of farmers grow vegetables along with paddy. Furkating circle falls in the Upper Brahmaputra Valley Zone which touches the boundary of state of Nagaland. Most of the farmers belongs to other Backward (OBC) category. Bhurbandha circle is in Central Brahmaputra Valley Zone which is regularly affected by flood. Dumunichowki circle belongs to the North bank Plains Zone. Assamese language speaking Muslim people dominates this circle. Silchar circle is located in the Barak Valley Zone. This circle is dominated by Bengali speaking Muslim people.

Thus five villages from each ADO circle were selected at first. The selection of the villages was random subject to condition that at least in one village there is infrastructure for use of machine. Then 10% of farm households of each selected villages were surveyed. Total 224 samples were collected in this way.

The software SPSS was used to analyze the data collected in the sample survey.

Results

1. The system of distribution and sale of farm inputs and implements is more or less uniform in the five circles.
2. The irrigation facilities available in five circles fall in the category of minor irrigation system.
3. Only few financial institutions are providing credit to the farmers for purchasing machine.
4. The system of extension service has got some changes in the recent past.
5. The extension workers can influence the farmers to a great extent to use the benefits of agricultural machines.
6. The farmers produce mainly paddy along with wheat, pulses, mustard, oilseeds, sugarcane and vegetables.
7. The part time hired labor accounts 88%. Against that full time hired laborers is only 1%. Again, the percentage of full time family labor is 6% and part time family laborer is only 5%.
8. The number of tenant farmers is decreasing as it is now easy to do farming by the use of machine in rental basis.

9. The production of Rabi crops and vegetables is also getting importance in Assam. Therefore it can be said that the mechanization of agriculture in the state will compensate the labor displacement effect by income effect.
10. In many areas there are no effective FMCs and sufficient number of SHGs. Majority of the farmers don't get regular services from the extension workers because of bigness of the 'eleka's.
11. The number of family labor is found less compared to hired labor among the samples. It indicates that dependency on part time hired labor is more which effects mechanization of agriculture in Assam positively.
12. Zone wise, the average employment per household in the five surveyed circles is 21.08. Each household is found generating employment to 2.3 persons.

Discussion

Labor Availability

The Table 1 gives the information about the labor availability in five circles. Either all or total 4722 laborers are found to be engaged in the agricultural activities in the surveyed circles. Out of these 4722 laborers 88% are part time hired labor. Full time hired laborers is only 1%. Again, the percentage of full time family labor is 6% and part time family laborer is only 5%.

Table 1: Availability of labor in five circles

Types of labor	Total	Percent
Full time Family Labor	303	6.42
Part time Family labor	228	4.83
Full time hired labor	36	0.76
Part time hired labor	4155	87.99
Total Employment	4722	100

Source: Field survey

Agricultural Mechanization and Labor Employment

From the Table-2 & 3, it is found that the number of family labor is less compared to hired labor among the samples. It indicates that dependency on part time hired labor is more which effects mechanization of agriculture in Assam positively. Out of 4722 labor 88% is found to be part time hired labor whereas only 6% is full time family labor. The dependency on part time labor is high (about 90%) in Bongshor, Furkating and Dumunichowki whereas it is near about 80% in Bhurbandha and Silchar. In these two circles the number of family labor is more. It is already mentioned that in Bongshor and Furkating circles use of machine in agriculture is more than the other circles. The available literatures also supports that the mechanized firms employ more casual and hired labor. Many families in the surveyed circles have done agriculture with the help of machine and part time hired labor. Many families used tractor and power tiller without having own agricultural land or having a small amount of land.

Labor Availability Pattern

To calculate the rate of employment generation in the surveyed circles, the following method has been applied. The following abbreviations are used to measure the changes in the surveyed circles.

Average Employment per Household

= Total Employment in each circle/Total records (circle wise)

Total Employment Generation in each zone

= Average employment per household x total no of households in the circle

FTE= Full Time Employment

PTE=Part Time Employment

TE= Total Employment

FTFL=Full Time Family Labor

PTFL=Part Time Family Labor

FTHL=Full Time Hired Labor

PTHL= Part Time Hired Labor

FTE=FTFL+FTHL

PTE=PTFL+PTHL

TE=FTE=PTE

ASW=Average size of worker

PPE=Per Person Employment

ASW=TE/ Total Sector Wise Sample Units

TE IN 5 circles=ASW X Total Farm Units in each circle

PPE= Total Employment in 5 circles/ Total Population in sample villages.

It is found (as shown in Table 4) that the average employment per household in the five surveyed circles (zone wise) is 21.08. In Bongshor, Furkating and Dumunichowki the rate is higher than the other two circles. The result shows that each household is generating employment to 2.3 persons. Employment generation effect is higher in Bongshor, Furkating and Dumunichowki circle.

As shown in the Table 5, as a whole in five circles hectare wise average employment is 16.03. The hectare wise average employment is higher in the circles- Bongshor, Furkating and Dumunichowki whereas it is lowest in Silchar circle. From the results it can be said that use of machines has not reduced the labor employment in agriculture in the state. Many families having non-farm activities as primary occupation have also started doing agriculture with the help of machines and part time labor. The use of machine is high in the cultivation of Rabi crops.

As found in the survey, the number of tenant farmer is decreasing because of use of tractor and power tiller. The wastage of agricultural land is also reduced. Mechanization facilitates multiple cropping by reducing land preparation time and raises yields per unit of land because of better ploughing of land. By the use of machine and employing part time labor it is becoming easy to run the agriculture.

Table 2: Circle wise family labor

Circle	Family labor (Full time)	in %	% in total	Family labor (part time)	in %	% in total
Bongshor	67	22.11	1.42	51	22.37	1.08
Furkating	51	16.83	1.08	37	16.23	0.78
Bhurbandha	44	14.52	0.93	76	33.33	1.61
Dumunichowki	91	30.03	1.96	33	14.47	0.70
Silchar	50	16.50	1.06	31	13.60	0.66
Total	303	100	6.42	228	100	4.83

Source: Own Survey

Table 3: Circle wise hired labor

Circle	Total No	In %	% of total employment	Hired Labor (full time)	In %	% of total
Bongshor	9	25.00	0.68	1196	28.78	90.40
Furkating	7	19.44	0.64	925	22.26	90.68
Bhurbandha	5	13.89	0.98	427	10.28	77.55
Dumunichowki	11	30.56	0.78	1263	30.39	90.34
Silchar	4	2.78	0.23	344	8.28	80.75
Total	36	100	0.76	4155	100	88.04

Source-Field study

Table 4: Zone wise employment generation in agriculture

Circle	Total Population	Total employ	% of the total	Average employment	Per person employment
Bongshor	59584	1323	28.01	24.96	2.8
Furkating	49025	1020	21.60	26.15	3.3
Bhurbandha	183687	552	11.69	12	1.3
Dumunichowki	83850	1398	29.61	26.38	3.2
Silchar	82563	426	9.02	12.90	1.3
Total	462124	4722	100	21.08	2.3

Source-Field Study

Table 5: Hectare wise employment generation in agriculture

Circle	Gross cropped area (in hectares)	Total employment
Bongshor	10943	165984 (15.17)
Furkating	10185	160665 (15.77)
Bhurbandha	22849	234996 (10.28)
Dumunichowki	15460	272426 (17.62)
Silchar	7348	104219 (14.18)
Total	66785	1070505 (16.03)

* Figures in the parenthesis indicate the average employment hectare wise

The production of Rabi crops and vegetables is also getting importance in Assam. The mechanization is expected to reduce the labor displacement effect by income effect. The task of educating the farmers about the benefits (as well as the negative effects also) of the use of machine in agriculture necessitates improvement of the extension services in the state. The farmers in the state are found unaware of the use of agricultural machines. Professionalism is found absent among the farmers. It would be necessary to strengthen the agricultural extension service to get the benefit of mechanization.

Some Recommendations

1. The electronic media-TV can give some visual and practical knowledge to the farmers.
2. The agriculture department can provide trainings for effective use of the machine and it will also help in reducing the cost of mechanization.
3. Farmers should be given easy finance to purchase agricultural machines or machinery.
4. The state Government should develop proper policy for timely distribution of machine to the farmers.
5. Considering the cost and risk factors emphasis should be given on ground water based well irrigation system than on major and medium irrigation project based on dams and rivers.

Conclusion

With the increase of educational level of the farmer and advancement of the farming technology the scenario of agriculture in the state of Assam in particular and India in general is expected to change. The educated farmers are found inclined towards use of machine in agriculture. The state Government is also taking policy to change the picture by technology mission. The present state Government has adopted a mega mission to supply tractors and power tillers to the villages. If proper policy of credit, distribution of machine, training of farmers and irrigation is followed in the state, the state may get a new facelift from traditional to modern farming. Of course there will be some negative

effects and the authorities concerned shall have to be cautious about those. As there is a change in the labor market and cost of farming is increasing naturally, the farmers shall have to go for use of modern machinery in agriculture. The emergence of lease market of services will also influence the farmers to use machine/machinery in agriculture.

Conflict of Interest: None.

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