Technological Change in Agriculture and Female workers: A refection from the Brahmaputra valley of Assam

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Abstract

Technological change can place in agriculture into two forms HYV technology which includes use of seed, fertilizer and irrigation and mechanical technology. Adoption of technology increases labour demand by helping intensified cultivation. In spite of being an agrarian state the use of machinery in Assam is not impressive as it limits to a few types of machines. Moreover the existing machineries are also not available equally for all activities. Mechanization is applied in a few activities like field preparation, threshing, irrigation etc which are predominantly participated by male agricultural workers which reflects a gender biases regarding use of machinery.

Keywords: Technological change, HYV technology, Intensified cultivation.

Introduction:

In an agrarian economy one of the important issues of agriculture is the technological change as it is one of the primary requisites for development of agriculture. Agricultural technology can be classified into two types- water seed fertilizer technology and mechanical technology. The adoption of HYV technology like application of irrigation, fertilizer, pesticides can increase labour demand. This is because adoption of modern technology in agriculture can change cropping pattern, increase yields, which in turn increase labour productivity. Similarly, mechanization refers the use of tractor, power tiller, harvesters and other machinery in the process of cultivation. Mechanization

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can affect labour demand depending on the operation mechanised (RakeshBasant, 1987). In the early stage technical development in agriculture, the difference in productivity between female and male agricultural workers is roughly proportional to the difference in physical strength of respective workers. With the development of various technologies in agriculture it becomes less dependent on muscular power and as a result of which labour productivity between the two sexes might be expected to narrow. Introduction of modern improved agricultural equipments reduce the need for male muscular strength. Male workers monopolize the use of new equipment and modern agricultural methods which leads to widen the productivity gap between male and female workers. Thus in the process of agricultural production, men's labour productivity tends to increase while women's remain more or less static (Easter Boserup, 1970).

During the initial stage of adoption of green revolution technology, as a result of using HYV seeds, assured water supply, chemical fertilizers etc., farm business income and labour absorption has increased. But during the second stage of green revolution, as a result of introducing machinery like threshers, tractors, total demand for labour stagnated and labour absorption per hectare under specific crops declined (Sheilla Bhalla, 1989). Uses of HYVs technology i.e. as the use of scientific seeds, fertilizer, manure increases, more labourers are required for intensive weeding and to take greater care and time for irrigation and water management. But at the same time HYV technology may have negative effects on female labour because there would be a tendency for the women to withdraw from manual work in the fields due to their family prestige consideration. So HYV technology would increase the female labour demand or not depend upon the net result of the two contradictory factors that is the positive labour requirement effects and the negative effect of a rise in income on female family labour (Bina Agarwal, 1984).

Objectives:

The main objective of the study is to find out to what extent mechanization is taking place in agriculture and also to examine whether it is equally available for both male and female workers.

Methodology:

The area selected for this study is the Brahmaputra valley of Assam. The Brahmaputra valley consists of four agro climatic zones i.e. lower Brahmaputra valley,

upper Brahmaputra valley, central Brahmaputra valley and north bank plain zone.One district is selected randomly from each agro climatic zone and the selected districts are Golaghat district, Morigaon district, Kokrajhar district and Dhemaji district. One sub district from each district is selected for intensive study. To collect primary data four villages from each sub district is selected where agriculture is the primary occupation is selected randomly.

Data collected from primary source is used for this study. To collect data from sample household, structured questionnaire is used.

Findings: Technological change in farming operation is one of the prerequisites for achieving higher productivity. In Assam technological development more specifically level of mechanization is not taking place impressively because in Assam power consumption for mechanization is 0.75 kw/ha which is still below national average of 1.5 kw/ha (S Mandal et al, 2014). Technological change in agriculture can take place in terms of both HYV technology and through mechanization. This study is conducted 329 households of four ample districts who practice cultivation in their own family farm. To examine overall technological change, at first attempt has been made to use of HYV technology in the sample districts which is shown in the table 1.1.

Table: 1.1
Use of HYV technology in the sample districts

District	Use of HYV seeds	Fertilizer	Irrigation
Golaghat	50 (24.75%)	72 (30.38%)	5 (4.20%)
Morigaon	102 (50.50%)	102 (43.04%)	98 (82.35%)
Dhemaji	20 (9.90%)	28 (11.81%)	0
Kokrajhar	30 (14.85%)	35 (14.77%)	16 (13.45%)
All	202 (100%)	237 (100%)	119 (100%)

Sources: Compiled from field survey

(Figures in the brackets represent the percentage of total)

The table 1.1 reflects that 202 sample households have used HYV technology.

Out of these 202 households, Morigaon district has the highest share i.e 50.5 percents HYV seeds are used in this district where as in the Dhemaji district this rate is only 30 percent. So far as application of fertilizer is concerned, it was found that 237 sample households have used fertilizer. Like as HYV seeds, Morigaon district has the highest share i.e. 43.04 percent regarding use of fertilizer. 119 sample households have irrigation facilities for cultivation. 82.35 percent irrigation was found in Morigaon district. No irrigation was found in Dhemaji district. For Golaghat and Kokrajhar districts ths ate is 4.20 percent and 13.45 percent respectively.

So far as impact of HYV technology is concerned, it was found that only 16.4 percent of the sample households have done cultivation more than one time in a year in the entire sample area. Following table gives a detail picture regarding percentage of households who practice cultivation one time and more than one time in the four sample districts.

Table: 1.2

Percentage of Households who practice mono cropping and double cropping

Districts	Mono cropping	Double cropping	Total
Golaghat	95 (100%)	0	95 (100%)
Morigaon	57 (53%)	52 (47%)	109 (100%)
Dhemaji	78 (100%)	0	78 (100%)
Kokrajhar	43 (92%)	4 (8%)	47 (100%)
All	255 (83.6%)	50 (16.4%)	329 (100%)

Source: Compiled from field survey

In Golaghat district, all sample households were found to engage in cultivation once in a year. Similarly in Dhemaji district also, all sample households cultivate only once in a year. But in this aspect, the scenario of Morigaon district is quite different. In Morigaon district, 53 percent sample households cultivate only once in a year and 47 percent households cultivate more than once in a year. In Kokrajhar district, only 8 percent sample households cultivate more than once in a year.

Thus coordination between use of HYV technology and crop cultivation was found to exist. Because among the sample districts, in Morigaon district use of HYV

seeds, fertilizer application and irrigation is the highest and at the same time in this district 47 percent of the sample households have done cultivation more than one time. So a positive effect of using HYV technology on intensive cultivation is found in this study.

Generally winter paddy i.e. Sali paddy and summer paddy i.e. bodo paddy was found to cultivate in study area. In Golaghat district all sample households were found to cultivate Sali rice. Similarly in Dhemaji district also all sample households cultivate only Sali paddy in the crop field. In Morigaon district, 47.7 percent sample households cultivate both Sali and bodo paddy and 48.6 percent sample households only cultivate bodo paddy and only 3.7 percent sample households cultivate Sali paddy. In kokrajhar district, 8 percent sample households cultivate both bodo and Sali paddy and 92 percent sample households only cultivate Sali paddy.

Application of machinery in the agriculture system is one of the important aspects to be concerned. During the field survey a poor picture regarding uses of machinery was found to exist. In most of the cases, machinery like tractors, powertilleretc are used in field preparation and threshing. But the activities like transplanting, weeding, harvesting etc are performed by using manpower. Moreover a majority of sample households do not use any kind of machinery in production. 76.6 percent of the sample households use machinery in crop cultivation where as 23.4 percent sample households do not use any kind of machinery in production. Following table 1.3 reveals the mechanization scenario among the four sample districts.

Table: 1.3

Percentage of Households Using Mechanization

Districts	Use of Machinery		Total
	Yes	No	
Golaghat	89 (93.7%)	6 (6.3%)	95 (100%)
Morigaon	109 (100%)		109 (100%)
Dhemaji	9 (11.5%)	68 (88.5%)	78 (100%)
Kokrajhar	45 (96%)	2 (4%)	47 (100%)
Total	252(76.6%)	77 (23.4%)	329(100%)

Source: Compiled from field survey

In Morigaon district all sample households have use machinery in production. Similarly in Golaghat district 93.7 percent households have used machinery in production and 6.3 percent sample households have not used machinery in cultivation process. In Kokrajhar district, 96 percent samples households are using machinery in production. So far as machinery use in cultivation process is concerned, performance of Dhemaji district is very poor where 88.5 percent sample households do not use machinery in production.

One of the important issue related to mechanization in agriculture is whether mechanization is equally available for all activities of agriculture. Major activities of crop cultivation are field preparation, transplanting, harvesting, transporting of inputs, application of manure and fertilizer, processing of farm produce, irrigation etc. But mechanization was not found to be equally available for all these activities and a clear picture is revealed from the following table.

Table: 1.4

Kind of Activities where Mechanization is Used

Activities	No of Households	Percentage of household
Field Preparation	254	77.20
Transplanting	0	0
Harvesting	0	0
Weeding	0	0
Transportation of crops from the field	19	2.73
Applying manure and fertilizer	37	11.24
Processing of farm produce	186	56.53
Irrigating crops	119	36.17

Source: Compiled from field survey

Among all the activities, machinery is intensely used in field preparation where 77.20 percent out of 329 sample households use machinery for performing this activity.

Similarly 56.53 percent sample households use machinery for processing of farm produce and 36.17 percent sample households use machinery for irrigating crops. Only 2.73 percent sample households use machinery for transporting crops from the field. But for activities like transplanting, harvesting, weeding etc. only manpower is used in all surveyed area. For these activities primarily female labourers are used. On the contrary mechanisation is done for those activities which are primarily done by male workers. So far as the type of machinery is concerned it is seen that machinery like tractor, powertiller, thresher, pumpset, trailer for carrying crops are used. Following table depicts types of machinery used in the study area.

Table: 1.5

Type, nature and use of machinery

Types of machinery	Nature of machinery		Use for activities
	Owned	Hired	
Tractor/powertiller	40	214	Field preparation, threshing
Pumpsets	19	100	Irrigation
Thresher	5	0	Threshing
Fertilizer spreader	7	30	Fertilizer application
Trailer	7	12	Carrying farm outputs

Source: Compiled from field survey

So far as types of machinery is concerned, it has been found that tractor, power tiller, thresher, fertilizer spreader, trailer etc. are used in perform various activities like field preparation, threshing, irrigation, fertilizer application and carrying farm outputs which is shown in the above table 1.5.

Thus from the above discussion it is clear that machinery equipments are not using equally in all activities. To connect the issues of mechanization and gender biases the researcher tries to find out participation of male and female in various activities in the entire cultivation process and the table 1.6 depicts a picture on it.

Table: 1.6

Participation of male and female in various activities

Type of works	Participated by	Percentage of households
Field preparation	Male	100
	Female	0
	Both male and female	0
Transplanting	Male	8.45
	Female	86.88
	Both male and female	4.66
Manure and fertilizer application	Male	100
	Female	0
	Both male and female	0
Irrigation	Male	100
	Female	0
	Both male and female	0
Harvesting	Male	8.45
	Female	82.79
	Both male and female	8.74
Threshing	Male	66.18
	Female	0.58
	Both male and female	33.24

Source: compiled from field survey

Maximum numbers of households are using machinery in field preparation but this activity is done 100 percent by male. Similarly another activity where machinery used is irrigation which is clear from the table . So far as male female participation is concerned, it is seen that 100 percent irrigation activity is done by male workers. For processing of farm outputs 56.53 percent households use machinery and at the same

time 66.18 percent households use only male workers, 0.58 households use only female workers and 33.24 households use both male and female worker for this activity. In case of transplanting 86.88 percent households use female agricultural workers and in harvesting 82.79 percent sample households use female agricultural workers and in all four sample districts all these works are done manually without using any machine power.

Conclusion:

Although technological change is one of the prerequisites for upliftment of agriculture a well as agricultural labourers, but the same is not to be impressive from the present study.In fact HYV technology is not adopted by all agricultural households. Like as HYV technology, mechanization is also not equally taking place in all activities. In fact mechanization is taking place in those activities which were previously performed by male workers. Majority of workers engaged in activities like transplanting, harvestingare female and these kinds of activities are primarily done by using manual power. In this way mechanization is not equally takes place in all agricultural activities. Thus from the analysis of using mechanization in different agricultural activities it is revealed that there is a gender bias regarding use of machinery in agriculture. One probable reason regarding low mechanization in female dominated activities is that wage differential between male and female workers and female workers are available at a lower wage rate for which people prefer to use female workers with a low wage instead of using high cost machinery.

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