International Journal of Scientific Research in Modern Science and Technology
ISSN: 2583 -7605 (Online)
© IJSRMST | Vol. 3 | Issue 5 | May 2024
Available online at: https://ijsrmst.com/
DOI: https://doi.org/10.59828/ijsrmst.v3i5.211

Mechanization in Agriculture: A Study of Kamrup District, Assam

Dr. Nabanita Baishya

Assistant Professor, Department of Economics, Dhing College, Dhing Nagaon

Email: nabanita.baishya@gmail.com

ABSTRACT

Mechanization of agriculture has contributed to the enhancement of agricultural production and productivity to a great extent in India. However, deployment of the process has been highly uneven in the country. States like Assam lagged far behind in this regard compared to Punjab and Haryana. Kamrup district is located in the west-central part of the state, ranging an area of 4345sq. Kilometres, boarded by Brahmaputra River. It is notable for its fertile and river system.(https://en.wikipedia.org). The economy of the district is basically agriculture based. Despite of the frequent occurrences of flood, diverse topography and agro-climatic condition of the region made it very conducive for cultivation of wide range of varieties of agricultural crops. The term "Mechanisation in Agriculture" covers in a broader sense, which includes tillage, harvesting, threshing along with irrigation, haulage of farm produce and farm requisites such as seed, manure and fertilizers. The main source of irrigation in the district are shallow tube wells, in terms of canals, tanks etc. However, no such study was done on mechanization of agriculture in the district. Therefore, the present study is taken up to fill this gap to some extent. The objective of the paper is to analyse the impact of mechanisation over agricultural productivity in the said area.

Keywords: *Mechanization, Productivity, Irrigation, harvesting, shallow tube wells, canals.*

Introduction and Background of the Study:

In mid 1960s, agriculture sector in India was in severe crisis. The productivity was already very low and there was no such scope for increasing the yield rate in absence of technological development in the farm sector. The situation was further worsened as the country experienced two severe droughts in the two successive years in 1965 and 1966. This results a severe food crisis in the country. To cope up with this crisis, New Agricultural Strategy was adopted, which combines HYV seeds, along with complementary inputs such as chemical fertilizers, pesticides, irrigation and farm mechanization. This new revolution was termed as 'Green Revolution.'

Historically, at the time of independence, Indian agriculture was almost in traditional form, without any kind of mechanisation. However, the process of agricultural mechanisation in India is underway for quite some time, especially after the Green Revolution in the mid 1960s.Indian farmers have started using agricultural machinery in farming operations, such as, electric motors and diesel engines for irrigation and threshing, tractors for ploughing, seeding etc., spray implements for spraying pesticides and harvesters for harvesting.

Mechanisation simply refers to the introduction of machines for carrying out farm operations. Mechanisation of agriculture means the use of power driven or operated machines for various farm jobs, which, otherwise, are being performed by human and animal power. The term "mechanisation in agriculture" includes not only tillage, harvesting, threshing operations, but also whole package of irrigation, seed, manure, pesticides etc. Mechanization in agriculture ensures reduction of both cost of labour and other inputs and helps in the utilization of potential available resources.(Soni, 1992).

Mechanisation of agriculture, thus, includes the use of machines like tractors, power tillers, harvesters, threshers, power driven pumps etc.Mechanisation is of two types. It may be partial or complete. When machines are used along with traditional implements, mechanisation is partial, which is the case of developing countries like India. When animal or human labour is completely removed by machinesin agriculture, it is termed as complete mechanization. In Western countries, particularly in some parts of North American continent and in Russia also, it is more or less complete mechanization. It has also been applies in Australia, Brazil, and Canada, where there is low pressure of population and scarcity of labour with high wages.(Shandilya and Prasad, 2006).

The process of mechanisation of agriculture in India can be divided into two phases- In the first phase; self-protection was the main motive force for the landowners, for mechanizing their farms. There is no such motive of increasing the productivity of agriculture with the help of mechanisation. There is absence of use of high-yielding varieties of seeds; fertilizers etc. Tractors was the main machine used which was generally used by large farmers. Tubewells too were installed by the large farmers. In the second phase, by the adoption of new seed-cum fertilizer technology, mechanisation of agriculture became more important. With the use of fertilizers, irrigation became inevitable. As a result, demand for tube wells and, therefore, for diesel and electricity driven pumping sets has increased. Multiple Cropping necessitated the use of tractors, mechanical threshers and harvesters, also appeared after the green revolution (Soni, 1992).

Adoption and use of improved farm implements and machinery has helped in increasing agricultural production and productivity by doing farm operations on time and optimum use of costly inputs. One way of enhancing agricultural production is to encourage the use of agricultural mechanisation technologies with its agro-processing industries. Despite the all-round developments in agricultural machinery and implements and the increasing use of Draft Animal Power(DAP) in the country, the agriculture in North-Eastern states of India is still carried out with old hand tool technology.(Basu et al,2006)

Mechanisation of agriculture has contributed to the enhancement of agricultural production and productivity to a great extent in India. However, deployment of the process has been highly uneven in the

country. The pace of mechanisation of agriculture was quite rapid mostly in states like Punjab, Haryana and Uttar Pradesh. On other hand, states like Assam lagged far behind in this regard. It was pointed out that in the year 1999; the number of tractors in Punjab was about 25% of the total number of tractors being used in India.

In Assam, mechanisation in agriculture was started with the use of tractors and power tillers in a limited scale. Initially, farmers are cultivating only one crop in a year. Withe the recent coverage of area under irrigation, mainly through shallow tubewells, farmers decided for multiple cropping. So area under double cropping in the state increases from 26% at the end of 8th plan to 50% by the end of 9th plan. Still the present status of mechanization in the state reflects the picture of inadequate availability of technical power. (www.agriassam.org).

Necessity and Objective of the Study

Kamrup district is one of the most prominent district of Assam in terms of agricultural production and productivity. Studying agricultural mechanisation in Kamrup district is crucial because it can help identify ways to significantly improve crop productivity, reduce labour drudgery, optimize resource utilization, and enhance the overall economic viability of agriculture in the region, considering the increasing population pressure on land and the need for efficient farming practices in the said area. Therefore, the objective of the paper is to analyse the impact of mechanisation over agricultural productivity in the said area.

Hypothesis

The hypothesis taken in the course of study is that agricultural mechanisation increases agricultural productivity in the said area.

Conceptual and Theoretical Framework of the study

Improvement in the techniques of cultivation is the most important measure for agricultural development. For sustaining agricultural development in the long run, technological improvements in farm sector are necessary. The technological improvements in the agricultural sector can be classified into two types- biological and mechanical. Biological improvements refer to those factors which raise the land fertility. Mechanical innovations usually refer to those of machinery in the production process.

There is remarkable importance of technological change in the context of growth and development of traditional agriculture according to Schultz. Schultz gave more importance on economic factors rather than cultural and institutional factors. He argues that the traditional agriculture set apart from modern agriculture only because of the use of technology and type of inputs. The growth and development in agriculture will possible only through the changes in technology only. (Schultz, 1964).

According to Hayami and Ruttan (1971), growth in agricultural output is essential to the development process in most societies and the contribution of agricultural growth to the development process is positively related to the role of productivity growth in the agricultural sector. They regard the new methods, materials and opportunities associated with technical advancement as a fundamental source of institutional change in modernizing societies. In their theory, technological change is considered as

endogenous factor to the development process rather than as an exogenous factor. According to them, there are multiple paths of technological development and these technologies can be developed by substituting relatively aboundant factors for relatively scarce factors in the economy.

Desai (2002) gives importance on technical change for agricultural development. According to him, agricultural development is possible by three options like, extensive farming, intensive agriculture and scientific knowledge based technical change. Extensive farming increases production and productivity by bringing uncultivated land under plough. Intensive farming implies by increasing the use of same inputs such as land, labour, irrigation, fertilizer etc. But scientific knowledge based technological change increases production at the same level of all inputs or at lower level of inputs. Scientific knowledge based technical change like the "Green Revolution" and the new dry farming technologies that are both seed and resource centered is a necessary condition for agricultural development because it averts a trap into Ricardo's Law of Diminishing Return to which agriculture is prone. It is also a sufficient condition because it increases output at reduced unit cost or prices in real terms which benefit the poor who spend large part of their budget on agricultural commodities. (Rao 1994, Joshi et. al. 2001).

From the beginning of the 19th century, science has made an increasing contribution to agricultural technology. A large amount of public and private sector investment has been made on agricultural research and development activities soundly based on scientific investigation. As a result, there has been massive increase in productivity in agricultural sector. However, the remarkable success of the new technology has also come from investment in infrastructural development, institutional development and above all, in extensive development of irrigation facilities. Again, agricultural research institutions and extension services have played an increasing role encouraging and expanding the innovations of agricultural technology. Thus, achieving a better agricultural system requires three inter-related actions- one, promoting adoption of new inputs and resources in which new technology is embodied, two, encouraging use of inputs and resources, and three, extending "knowledge" as an input on how to use both new and complementary inputs and resources.

Literature Review

Bezbaruah (1994) argues that mechanisation does not form a part of the technology package of the present strategy of agricultural development in India, but in a number of Indian states like Punjab, Haryana, Uttar-Pradesh etc., adoption of HYV seeds, fertilizers and water package has been found to be accompanied by mechanisation of various farm operations such as, ploughing, harvesting and processing.

Ross (1970) said that leadership; availability of technology, necessary farming inputs, available credit facilities, favourable price leadership, control of nature and communication process had a remarkable contribution towards agricultural mechanization process.

Technology is becoming available, but the mechanisation for transferring it to the illiterate and small users in an effective manner does not exist (Swaminathan, 1973).

Rao and Bhattacharya (2005) said that irrigation is essential for HYV seeds and fertilizers, which bring about green revolution in Indian agriculture. Due to availability of power in large parts of the country

for pumping water for irrigation, as much as 78% of the available potential of 81.4 million hectares from minor irrigation sources consisting of ground water, has already been exploited. Whereas, 75% of ground water still remains to be exploited due to unavailability of power for pumping.

Mamud (1978) had pointed out that there must be constant and close interaction between science and the rural environment in order to enable technology to assist the rural people to break away from the traditional methods of farming. The technologies should be applicable at the farm level and have to be simple and adaptable for all.

Basu and Ray (2006) remarks that Indian agriculture has undergone a great change, i.e., from manual and bullock farming to improved equipment and power farming and has resulted in increasing the cropping intensity. The new agricultural technology since the 3rd plan gave a boost to the agricultural sector. The number of wooden ploughs remained stagnant over the entire planning period (1961-71), but the use of iron ploughs has been doubled during the said period.

According to Shrivastva (1996), in the super forms of USA or Australia or some Latin American countries, use of tractors, harvesters, threshers etc. is made without a question ever being raised about its desirability. Even in the poor and labour abundant economies, machines are used, when the farmers find it advantageous. He also argued that mechanisation enables the transfer to area from simple crops to long period crops, usually commercial crops and cropping intensity also increases.

Database and Methodology

The study is carried out on the basis of primary data. The primary data is collected through multistage random sampling method. In Kamrup district, there are three agricultural sub divisions, namely, Guwahati, Rangia and Boko. Among three agricultural sub divisions, two agricultural sub divisions namely, Boko and Rangia are taken. From Boko agricultural sub division, one Agricultural Development Officers (ADO) circle Chaygaon is taken subject to the condition that there should be atleast some kind of mechanisation in the said area. Then from Chaygaon ADO circle, two villages, namely, Dagaon Katahi and Jalimura and from Rangia, sub division Kamalpur ADO Circle is taken on the condition that there should be some kind of mechanisation. From Kamalpur ADO Circle, two villages Agdola and Alekjari are taken. Then from each villages, 10% of farm households are selected as sample households at random. Total 135 households are selected as sample households.

Analytical tool:

For the analysis of the collected data, Cobb-Douglas Production Function is used.

The Cobb-Douglas production function formulated is as,

$$\text{Log } P = \beta_0 + \beta_1 \text{Log } Mc + \beta_2 \text{Log } I + \beta_3 \text{Log } F_Z + \beta_4 \text{Log } HY_V + \beta_5 \text{Log } C_I$$

Where, β_0 = constant

β_i = Elasticity of production with respect to various inputs, i, (i = 1,....5)

P = Productivity of mechanized farm

Mc = Cost of mechanizations (Physical capital)

I = cost of irrigation

Ps = cost of pesticides

Fz = cost of the consumption of fertilizer and pesticides

HY_v= cost of HYV seeds

C_I = Intensity of cultivation

Now, computing the data in the Cobb-Douglas equation, the results obtained as follows,

Log P = 1.384 *+0.487 Fz *+0.307 Ps *+0.132 HYv ***+0.063 Kp

(8.06) (15.33) (5.56) (1.28) (1.02)

R^2 =0.998, R^2 (adj)= 0.997, N=30

Note: * 0.01 level of significant, ** 0.05 level of significant, *** 0.05 level of significant

From the analysis, it is found that application of fertilizer and pesticides have more significant impact on the productivity of crops in terms of money. However, use of HYV seeds and mechanised variable which include irrigation and physical machineries like tractor, power tiller, weeder etc. have found to be less significant on the productivity of crops. This may be due to the reason that some of the farmers have go for traditional variety of seeds. In terms of profitability of use of fertilizers and pesticides on productivity, is found that each rupee spent on fertilizers results ` 0.48 increase in productivity. Likewise, each rupee spent on pesticides results ` 0.30 increase in productivity. However, compared to fertilizers and pesticides, application of HYV seeds and mechanization variable are found to be less profitable in terms of increase in productivity.

Again, to see the impact of single variable, ie, mechanised variable on productivity, the results found as follows,

Log P = -1.433 + 1.695 Mc *

(-0.727) (6.315)

R^2 =0.615 R^2(adj)= 0.599 N=30

Here, it is found that irrigation and application of physical machinery have significant impact on the productivity of crops, if we ignore the other variables like fertilizers and pesticides.

Findings:

Though, mechanisation has an important impact on the productivity of crop, yet, a few numbers of farm households are adopting the mechanised process of agriculture in the said area. Study shows a number of reasons for non- adoption of such technique and also go for some policy measures.

1. Mechanization is found to be less significant variable in case of increase in productivity of crops in the surveyed area. In the process of adoption of mechanization, small size of operational holding area is found to be a major constraint. When farmers have small size of holdings, they would not go for mechanization, as, it occurs higher operational expenditure per hectare of gross cropped area. Irrigation have also found to be insignificant variable in case of increase in productivity in the district. The district, as well as the State shows the poor irrigation infrastructure. Most of the people are economically backward, so they cannot afford to go for high cost intensive technique of mechanization.

2. There are still huge gaps in the coverage of extension agencies in the district. As a result, farmers cannot take the advantage of different subsidised government schemes for agricultural mechanization. Only a few numbers of farmers are aware of such schemes.

4. One interesting finding is that, rather than adoption of mechanized technique, application of chemical fertilizers and pesticides are found to be more profitable for farmers in terms of increase in productivity.

Conclusions:

Agriculture is the main occupation in the surveyed area. Mechanization plays an important role in changes in the productivity of crops. However, the intensity of cultivation in surveyed area is very low due to poor mechanization and inadequate irrigation facilities. The sample shows that the cost of machinery is very high which prevents its use by poor farmers. Here, Government extension agency can play an important role. Again, for improving the irrigation facility, since, the irrigation system of the district is based on Canals and Shallow Tube Wells, so, effective implementation should be taken to broaden the area under these two types of irrigation system. Application of mechanized technique in the said area is found to be difficult due to fragmented land holding. However, the analysis results that mechanisation enhances productivity in the district.

References:

[1]. Bezbaruah, M.P., (1994). "Technological Transformation of Agriculture." Mittal Publications-New Delhi.

[2]. Bilgrami, S.A.R., (2000). "An Introduction to Agricultural Economics." Himalaya Publishing House.

[3]. Choudhury, R. K., "Agriculture Sector- Intra Regional Disparity." in Yojana, Vol. 52, (December, 2008).

[4]. "Modernizing Agriculture." Report on the Intensive Agricultural District Programme (1960-68). Ministry of Food and Agriculture, Govt. of India, Vol. 1:PP.12-13.

[5]. Murthy, A.S. and S.N. Singh (1974). "Communication Behaviour of Farmers." New Heights, Delhi.

[6]. Narayana, D. L. (1978). "Entrepreneurship and Agricultural Development". Asian Studies Press, Bombay-AS-58.

[7]. Patel (1965). A Study of Small Farmers and their Problems as Related to Agriculture, M.Sc. Thesis (Unpublished), IARI, New Delhi.

[8]. Ross, V.S., (1970). "Factors Affecting Agricultural Development Review.IRRI, Los Banos, Philippines.

[9]. Roy, N. and M.P. Bezbaruah, (2002). "Agricultural Growth and Regional Economic Development-A Study of Barak Valley." Mittal Publication, New Delhi.

[10]. Sable Ram, "Impact of Technological Change on Marketable Surplus, in Jagadish Prasad (eds.), Encyclopedia of Agricultural Marketing, Vol. 2, Mittal Publication (1999).

[11]. https://Wikipedia.org .

Cite this Article:

Prashant B. Naik, Guneshwari Deepak Patil, "ARTIFICIAL INTELLIGENCE & ITS APPLICATIONS" *International Journal of Scientific Research in Modern Science and Technology (IJSRMST), ISSN: 2583-7605 (Online), Volume 3, Issue 5, pp. 18-24, May 2024.*

Journal URL: https://ijsrmst.com/

DOI: https://doi.org/10.59828/ijsrmst.v3i5.211