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Agricultural Efficiency at Farm Level: a study in Barak Valley Region of Assam

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Abstract

Agricultural progress is normally regarded as a pre-requisite of economic development. Agriculture – world – wide is a crucial determinant of the Livelihoods of farmers and rural communities. Agricultural growth – throughout history has been the pro-genitor of broad-based economic growth and development. It is well recognized that increase in agricultural production must proceed essentially through increased production of farm level efficiency. There is subsequent requirement to strengthen the resources wherewith the farmers can raise their production efficiency and consequently their total productivity. Given this backdrop, the present paper makes a holistic effort to analysis the performance of the farmers in Barak valley region of Assam, which very often been overlooked by the policy makers. Depending on the three districts of the valley, a sample of 500 primary level data was collected through a structured questionnaire. The collected data were analyzed through various statistical techniques such as mean, standard deviation, t-test, ANOVA and Correlation. Findings of the study revealed that there exists ways to improve Farmers level of efficiency with the existing level of inputs and the modern technology.

Introduction: Agriculture throughout the world is still single most important human activity. Despite all the advances of high technology, it is still the only reliable source of livelihood to the farmers and the rural communities. Agriculture is considered as the backbone of the Indian Economy as a large section of the population still depends upon it. Agricultural growth shall thus in the future also be a precondition for the alleviation and abolition of rural poverty and hunger in those countries that have not yet fully achieved their far-reaching growth. This is particularly so in India, where the records of rural poor including the land-less and those farming sub-marginal holdings-bare so large. Moreover, the tininess of many of the Indian farmers and the low income elasticity, together state that future agricultural growth shall need to broaden the horizons (Economy at a glance, 2011).

New analysis of India's agricultural growth gives grounds for concern – perhaps alarm. Agricultural productivity has yet again stagnated after the Green Revolution. Agricultural yields are currently languishing around the globe. But even here, what causes apprehension is that India's agricultural productivity is still lower than that of various other countries. India has 170 million hectares under food grain cultivation, producing 220 million tons of food grains in a year. Whereas China has only 60% of this arable land area, but it is able to produce twice the extent of food grains that India produces. This slackening in yield growth rate may result from numerous causes: from a

dwindling of inputs as farmers answer to falling prices or from non-increase in inputs where farmers have by now optimized their inputs allocations.

Thus we necessitate boosting agricultural productivity on the size and scale as we have achieved in industry and services. Such a significant development of agricultural productivity is possible only through the introduction of large scale irrigation, increased use of fertilizers and pesticides, multiple cropping, and widespread improvements in agricultural practices.

Necessity of the Study: Agriculture played an important role in the socio-economic development of the state of Assam as this sector is the major contributor to the economy of the state as well as providing livelihood to a significant proportion of the population in general and Barak Valley Region of Assam in particular. About 99% area of total land mass of the state is rural and almost 50% of the total land area is utilized for cultivation. on the other hand this sector continues to support more than 75% population of the state directly or indirectly providing employment of more than 53% of the labor force. However the economy of the valley continues to be principally agrarian in nature. About 70% of the people in the valley are depending on farming for their livelihood. Paddy is the major crop being cultivated in the valley. While due to poor agricultural productivity the income of the farmers of the valley is also very low. Owing to frequent flood and sometimes scarcity of water during pre and post monsoon period also affect the agricultural production. In addition, due to poor irrigation facilities, a high rate of productivity is difficult to expect in the valley. The new agricultural strategy, popularly known as the green revolution fails to make its charisma fully in the valley. Hence the question of efficiency in resource allocation in agriculture is significant and is widely apprehended that efficiency is at the heart of agricultural production. This is because the scope of agricultural production can be prolonged and sustained by farmers through efficient use of resources (Udoh 2000).

Data Description: The present study is based mainly on primary data. The required information meant for the study was collected from the primary source. The primary data on various aspects relating to the inputs of production of the sample farms were collected through the personal interview method using suitable designed pre-tested schedule/questionnaire for the year 2012-13. Theses sample households were selected from the six ADO circles located in the three districts of Barak Valley region of Assam. Three districts were purposively selected since it had varying socio-economic and geographical features. Multistage sampling procedure was applied here for selection of samples. At the first stage households were selected with purposive sampling technique where goal was to choose households who are engaged with paddy cultivation and also having their own agricultural land holdings (even taken for lease). A total of 500 sample households were selected for collecting the required information for the study.

This data set supplies information on various inputs like labor, bullock labor, fertilizer, pesticides, irrigation, machine and output of all the crops cultivated both in value and quantitative expressions. For our efficiency estimates we have taken several inputs namely land size, labor (human labor), fertilizer, pesticides, irrigation, tractor, bullock etc. which seemingly explain production of paddy very well. All these variables are measured in per bigha and only in case of labor; it is considered in per hectare. The time period is one year and the information is also provided for other items of farm expenditure as well for the same duration.

Methodological Framework:

Concept of Efficiency: In judging the performance of a production unit, one commonly examines whether or not the farm is efficient and/or productive. However, the terms efficiency and productivity are not synonymous. Efficiency is simply defined as the relationship between a set of

inputs and output (Eureval-C3E 2006). As such in agricultural yield, which is output per land area under cultivation, is widely used as a measure of how efficiently land is used in production. It thus refers to the degree of success with which a distinct device is used to achieve a definite purpose.

Efficiency is an important concept in agricultural economics when resources are constrained and opportunities of adopting better technologies are competitive (Gaddi *et al*., 2002). Efficiency studies assist in understanding the current performance and opportunities to enhance the production performance of the crops under consideration. Efficiency studies have showed that it is possible to raise the productivity of the crop even without actually raising the input application (Umesh and Bisalaiah, 1991). The corrective steps undertaken to alleviate the reasons for the low efficiency of the farmers will help in long-term to achieve higher productivity. Rane & Deorukhkar, (2007) stated efficiency as to get the maximum possible output from the given resources, however a farm generally means an area of land under single ownership and is devoted to agriculture and thus 'farm level efficiency' means the efficient utilization of production resources (land, labor, capital and many other inputs) to get sustainable output.

By the term productivity we mean the varying relationship between the agricultural output and the major inputs such as land, labor etc. This most commonly used term for representing agricultural productivity is the average yield per hectare of land. Dhar (2010), Kumbhakar & Lovell (2000) defined productivity as the ratio of the output that it produces to the inputs that it uses. A change in output can be caused not only by an alteration in efficiency but also by a change in the production technology and the atmosphere in which the production unit operates (Lovell 1993).

According to Fried et al. (2008), productivity of a farmer is defined as the ratio of its output to its inputs. However measures of productivity can again be divided into partial or total measures depending on the number of inputs under consideration. Agricultural efficiency is a key contributor to agricultural productivity enhance and an efficient allocation of resources in the economy. Studies in the agricultural efficiency literature have focused on determining if farmers have been using resources more efficiently by applying top technological practices from the existing hoard of knowledge.

Efficiency is thus an important foundation of productivity growth mainly in developing agricultural economies, where resources are insufficient and opportunities for developing and adopting better technologies have recently started falling. Such economies can benefit a great deal from inefficiency studies, which show that it is still possible to raise productivity by improving efficiency. It is generally understood that farmers in developing countries fail to exploit fully the potential and/or make allocative errors through the result that yields show wide variation, usually reflecting a parallel variation in the management capacities of the farmers.

Badal and Singh (2000) considered in their studies the resources used, productivity and efficiency in Maize production in Bihar. The primary data were collected commencing from 180 farmers from 112 villages of 3 districts of Bihar. The study concluded that resource use efficiency for different inputs assorted usually across the crops and there was possibility to reallocate the resources in order to achieve optimal allocation of inputs

Kalirajan (1984), examined how the efficient exercise of new technology affected production levels in a huge number of paddy farmers (based on 81Phillipine paddy farmers) and concluded that the new technology was not completely understood by the farmers. While in another study of Kalirajan and Shand (1985), a sample of 91 paddy farmers from the Coimbatore district in the Indian state of Tamil Nadu and found that the altitude of schooling as their understanding of current technology had a significant positive role on productivity.

Bravo-Ureta and Pinheiro (1997) examined the efficiency of individual farms in the Dominican Republic. The data for their study was collected from a sample of 60 farms from the Dajabon region. The output variable was the farm yield produced and the input variables were cultivated land, labor measured in worker-days, fertilizer, pesticides, the number of years of schooling of household head and age of household head. The results signify that farmers with more years of schooling exhibited higher levels of efficiency. In their study, older farmers were less likely to have contacts with extension agents and are less willing to adopt new practice and modern inputs. Furthermore, younger farmers were likely to have some formal education, and therefore might be more successful in gathering information and understanding new practices, which in turn would improve their level of efficiency.

Ashok Rudra (1980), found in his studies various types of relationship in explaining farm's efficiency that irrigation intensity was high in small farms but from mid-sixties it is positive in bigger farms. Intensity of cropping, intensity of labor inputs is also high on small farms than on the big farms. Total inputs application can be found negatively associated with farm size but all will depend on how the input values are imputed. However his study reveals that mainly in green revolution belt, the size of the various inputs used and the size of the farms was found to be positively associated.

The study of Battese and Coelli (1995) based on an analysis of inefficiencies in production of paddy crop by the farmers. The attempt has been made to examine farm-specific efficiency for paddy farmers in an Indian state of Haryana. The study also seeks to investigate the influence of farmers' specific variables on the technical inefficiency of paddy production. Testing a model for farm level efficiency on paddy farmers from an Indian village and showed on the other hand that older farmers are more inefficient than the younger ones. Many other studies even at international levels also reported similar consequences, indicating that older farmers are unwilling to have a higher level of efficiency.

Senthil Kumar et.al (2005) explained the efficiency in paddy cultivation. Various input factors for paddy cultivation have been considered and for an analysis, 90 farmers were surveyed from head, mid and tail reach of the Lower Bhavani Basin Project (LBP), Command Area of Tamil Nadu. The study suggests that there is still some scope left ahead for further use of various input factors for enhancing the productivity.

There is considerable agreement with the view that an efficient economic development strategy depends critically on the promotion of productivity and output growth in the agricultural sector. Empirical evidence suggests that small farms are desirable (Bravo-Ureta and Evenson 1994; Dorner 1975) in comparison to the larger ones. Consequently many researchers and policy makers have focused their interest on the impact that the adoption of new technologies has an important role on increasing farm level efficiency (Hayami and Ruttan 1985; Schultz 1964; Seligson 1982). However during the last decade, major technological gains curtailing from the green revolution seem to have been mainly exhausted across the developing world. This study suggests that attention to productivity gains arising from a more efficient use of existing technology is properly justified.

Empirical Result:

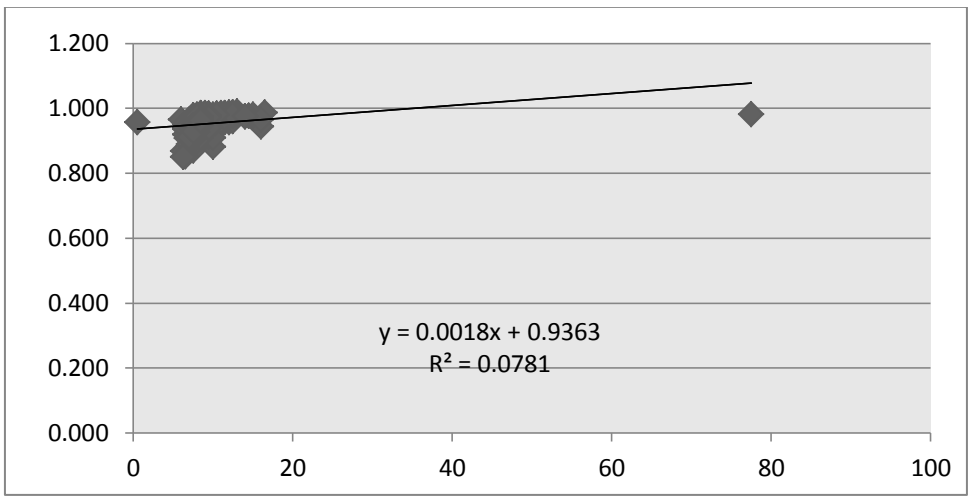
Coefficient of the Variables

Model	Unstandardized Coefficients		Standardized Coefficients	t values of	Sig.
	B	Std. Error	Beta	B	Std. Error
(Constant)	43.127	3.891		11.085	.000*
Labor	.178	.026	.302	2.876	.000*
fertilizer	.008	.014	.023	.534	.594***
pesticides	.001	.000	.110	2.649	.008*
irrigation	.145	.028	.209	3.098	.000*
Tractor	.524	.131	.162	2.989	.000*
Bullock	-.687	2.234	-.012	-.308	.759***

*Note: Dependent Variable: output, *1% level of significance, ***10% level of significance.*
Source: Authors own calculation

Result was found for farm level technical efficiency by using the frontier 4.1 version and placed in the table. From the table we can see that out of the six explanatory variables, namely labour, fertilizer, pesticides, irrigation, tractor and bullock four of the variables are found to be significant at 1% level having a positive relationship with the output. It shows that with an increase in the use of labour, pesticides, irrigation and tractor there will be more possibility of increasing the production level. Similarly, in the case of fertilizer and bullock, both of them are found to be significant at 10% level, however the variable bullock is showing a negative relationship with the output, This is because with the use of bullock the fertility of the soil cannot be generated properly as it is in comparison to modern technology, it is much easier and efficient to dig the paddy field with the help of modern technology and hence the soil fertility can also be increased. While in the case of fertilizer it is showing a positive effect on output, means if we increase the use of fertilizer by 1% then the production will increase by .008%.

Figure 1: Scattered Diagram of Farm Level Efficiency and Farm Size



In the above diagram the farm size is represented in the X axis and the farm level efficiency is represented in the Y axis. From the figure it is quite clear that there is a positive correspondence

between farm size and farm level efficiency. This can also be ensured by the positive slope coefficient of the trend equation. So from this we can conclude that with an increase in farm size there is a possibility to attain higher level of efficiency.

Conclusion and Suggestions: It is a well-known fact that development of agriculture is directly related to efficient use of resources. However this efficiency and productivity are mostly influenced by a number of factors. The study reveals that the level of productivity of farms is positively influenced by factors like labour, fertilizer, pesticides, irrigation, tractor and many other related factors. Thus it can be concluded that farm level efficiency could be increased by increased use of inputs like labour, fertilizer, pesticides, irrigation and tractor. However as allocative efficiency has not been found out in the study, so no comments can be made on the optimum level of input quantities. This study opens up windows for further research to analyze allocative efficiency of farms along with its determining factors.

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