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Factor influencing production of winter rice (Sali Rice) In the Nalbari District of Assam (India)

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Abstract
The present study was carried out in the Nalbari district of Assam to analyse production of rice. Both production and constraints related important factors were studied. The Nalbari district was selected purposively for the study as the district is a predominantly rice growing district and also from the points of convenience and acquaintance of the researcher. A Multistage Stratified Random Sampling technique was used to select the ultimate sample units i.e., the rice growing farmers from six selected villages of two development blocks, viz, Tihu and Borigog-Banbhag. In total 120 rice growers were selected randomly for the study. The Cobb-Douglass functional form was used to analyse the influence of various factors towards rice production. Also production constraints were identified and ranked. The FYM, irrigation and human labour affected the production process of autumn and winter rice but in summer rice, seed also affected the production along with FYM, irrigation and human labour. The study indicated that major thrust should be given on making availability of human labour particularly to large farmers, development of irrigation facility, in rural areas.

Keywords: Cobb-Douglass functional form, Multistage Stratified Random Sampling, human labour,

1. Introduction
At present, rice (*Oryza sativa*) occupies about two-third of the total cropped area in the state. Being the major contributor towards agricultural GDP, rice plays a significant role in the state economy. Further, its importance in the consumption basket the average monthly consumption per capita is about 13kg (Barah *et al*, 2009) [1] also speaks volumes on the rice orientation of the state. Another specialty is that rice is traditionally-grown throughout the year viz. winter, autumn and summer seasons, with winter (kharif) rice as the main crop. Rice is the major food crop in Assam as well as in the country. The crop accounts for nearly 41 percent of the total area under production (Barah *et al*, 2009) [1] in India and around 20 percent in total world rice contribution. As per Economic survey of Assam 2014-15 the paddy cultivation, during the year 2013-14 occupies 89.0 percent of the net cropped area and 60.0 percent of the gross cropped area in the state. Assam is one of the seven states of northeast India, which is located between 260/N and 5805'/N latitudes and 91007/E and 91047/E longitudes. Wide variation of physiographic features and climatic characteristics have resulted three distinct growing seasons of rice viz., *ahu* (Feb /March - June /July), *Sali* (June/July - Nov /December) and *boro* (Nov /December -May /June). Rice production in Assam plays an important role because rice is a staple food for Assam. So the production pattern and trend must be ascertained to identify the constraints associated with rice production. There are many threats related with rice production like continuous use of traditional varieties due to the non-availability of seeds, farmer's lack of awareness about high yielding varieties, Poor adoption of improved crop production technology etc. As per Economic Survey of Assam in 2014 rice production in Assam was 2101 kg/ha that was promising but the state need to produce more for exporting rice to improve the state economy.

2. Objective of the Study
Hence the present study has been conducted with the following objectives:
1) To Study the factors influencing production of Sali rice.
2) Constraints associated with production of Sali rice

3. Methodology
3.1 Factor influencing production of rice
The Cobb-Douglass functional form was used to analyse the influence of various factors towards rice Production. In 1928, Charles Cobb and Paul Douglas presented the view that production output is the result of the amount of labor and physical capital invested.

This analysis produced a calculation that is still in use today, largely because of its accuracy.

The Cobb-Douglas production function reflects the relationships between its inputs - namely physical capital and labor - and the amount of output produced. It's a means for calculating the impact of changes in the inputs, the relevant efficiencies, and the yields of a production activity. Here's the basic form of the Cobb-Douglas production function:

$$Q(L, K) = A * L^{\beta} * K^{\alpha}$$

Factors influencing the production of rice in the two development blocks Tihu and Borigog-banbhag have been sorted out and a regression analysis was done to draw inferences on data. All the values are written in monetary terms (rupees). The regression equation is given below.

$Y = a A^{b1} S^{b2} F^{b3} FY^{b4} P^{b5} I^{b6} T^{b7} B^{b8} H^{b9} u$

Where,

Y=the value (in Rs) of out put

a= Slope coefficient

bi= Slope coefficient of associate variables, where, i=1 to 9

A= Area (ha.)

S= Seed

F= Fertilizer

FY= Farm Yard Manure

P= Pesticide

I= Irrigation

T= Tractor hour

B= Bullock labour

H= Human labour

3.2 Constraints associated with production of rice

To find out the constraints associated with production and marketing of rice, perception of different stakeholders were listed and ranked. The ranks were arranged in descending order.

Formula is given below

Rank = X 100

Where,

X=No of respondence to a particular constraint

Y=Total no of respondents

4. Discussion and Results

4.1 Factor influencing total out put of winter rice (sali rice) cultivation

Variables	Coefficients	Standard Error	t Stat	P-value
Intercept	3.007368868	0.393251868	7.647436964	7.96553E-12
Seed	0.372689647	0.090123807	4.135307395	6.91403E-05
Fertilizer	0.337158225	0.068835675	4.898015845	3.31699E-06
FYM	0.118199282	0.056782934	2.081598697	0.039678594**
Pesticide	-0.003023586	0.053259868	-0.056770429	0.954830136
Irrigation	0.099792690	0.040676948	2.453298380	0.015710922**
Human labour	0.143095748	0.041524255	3.446076220	0.000804045*
Bullock labour	-0.032145163	0.065837907	-0.488247029	0.626338004
Tractor labour	-0.015087733	0.051601463	-0.292389637	0.770534556

Calculated F 8.600*

Multiple R 0.987

R^2 = 0.975

Adjusted R^2 0.973

*significant at 1% level of significance, ** significant at 5% level of significance

The Cobb Douglas production function model was found to be best fit since the F-ratio was highly significant (at 1% level of significance) in winter rice. The coefficient multiple determinations (R^2) was found to be 0.987 which indicates that the 98.7 % variation in the dependent variable was described by the explanatory variables included in the model. It was found that FYM and irrigation costs have significant (P value < 0.05) contribution to total output value of rice production in Nalbari district and human labour cost have highly significant value of (P value < 0.01) contribution to total output value of rice and also *A.N.Max* (2017) [3] Found in his study that NPK fertilizers (Nitrogen, Phosphorus, Potassium), organic fertilizers and labor had a direct effect on rice production. While seed and fertilizer, pesticide, bullock labour costs were not found to be significant factors to contribute for total gross output value. Other cost was found to be negatively contributing factor but insignificant.

4.2 Constraints associated with production of rice

For marginal farmer the study revealed that most important production constraints was size of cultivated land followed by insufficient capital. It was observed that 95.55 percent respondents were cultivating 0.4 to 0.90 ha land and 88.88 percent respondent had insufficient capital. Due to small land holdings, farmers were facing problems in acquiring agricultural machinery and loans where also Biniaz A *et al* (2014) [4] found in his study that In addition to land and capital, labor force is considered as one of the most important factors affecting the production of agricultural products, and plays a significant and effective role in all production processes of a product. In case of small farmer non availability of irrigation was mentioned as the 1st ranked constraint due to lake of govt. irrigation facility, uneven rain fall pattern and insufficient capital to hire or purchase farm equipment's, followed by non-adoption of pest control measure which was ranked 2nd due to lack of knowledge and availability of plant protection materials. Also most of the farmers were not aware of the infection of insect & pest. The study concluded that in case of medium farmers non availability of proper infrastructure for Irrigation was a major problem which was ranked 1st as it was mentioned by 80 percent of respondents followed by unavailability of labour in time such as during ploughing. These were due to lack of govt. irrigation facility to the farmers and high rent charges over borrowed agricultural machinery like irrigation pump. In case of large rice farmers non availability of hired labour in time was the major constraint which lead to unscheduled production process as their land holding was large hence they need more labour during the different stages of crop production. This constraint was mentioned by 90 percent respondents in the study 76 area and was ranked 1st most severe problem among the rice production related problems

followed by problems on irrigation which was ranked 2nd and mentioned by 80 percent respondents in the study area where *R.N. Moh et al* (2016) [5] found in his study that seed, fertilizer, pesticide and labor significantly positively affect rice production.

5. Conclusion

It was found that FYM and irrigation costs have significant contribution to total output value of rice production in Nalbari district and human labour cost have highly significant so if cow dung application to rice production process along with availability of human labour could be increased the yield of Sali rice in order to increase productivity, each worker must be able to produce more output. This is referred to as labor productivity growth. The only way for this to occur may be through an in increase in the capital utilized in the production process. The study highlighted that major thrust should be given on availability of human labour particularly to large farmers, development of irrigation, good road network for better transportation, dissemination of new technology, assured input supply and strong marketing support like storage infrastructure, processing facilities in rural areas. In chronically flood affected areas, special programmes should be taken up for summer rice cultivation in *rabi*seasons. Also production and supply of planting materials and other technological inputs may increase the efficiency of farmers. In view of the situation, it is necessary for the state government to make concerted effort to bring all the potential areas under rice cultivation to attain self-sufficiently in rice production.

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