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*Research note*

## ***ACCELERATED PROGRAMME FOR RICE PRODUCTION IN BANGLADESH AND ITS IMPACT ON OTHER CROPS***

**Fauzia Yasmin and W.M.H. Jaim**

### **ABSTRACT**

HYV Boro has displaced a number of major as well as minor crops. This study examines the magnitude and direction of changes in area of HYV Boro and its competitive crops in Bangladesh over the years (1973-74 to 1984-85). Considering the importance of the crops substituted by HYV Boro particularly the non-cereal crops; more emphasis in research and extension is needed to increase their productivities so that these can be grown profitably like that of HYV Boro.

### **1. INTRODUCTION**

Despite upward trend of foodgrain production in Bangladesh, she is loosing out in the race against growth of population. This has led to a continuous food deficit situation and Bangladesh has to import on the average 1.5 to 2.0 million tons of foodgrain every year.

To attain foodgrain self-sufficiency, the Government of Bangladesh has given special emphasis for increasing rice production through expansion of HYV Seed Fertilizer-Irrigation technologies. Among different types of rice, the largest expansion has taken place in the case of HYV Boro, mainly due to its higher productivity as well as less risky yield since the crop is relatively free from weather hazards. On the contrary, with the expansion of HYV Boro, some major crops, like Local Aus and Jute as well as some minor crops like different types of Pulses. Oil seeds and Spices have been partially displaced. Shift of acreage from local Aus to HYV Boro has contributed in increasing foodgrain production,

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but at the same time with the expansion of HYV Boro, productions of its competitive ( in terms of seasonal land use non-cereal crops ( including spices ) have been affected. Per capita availabilities of these non-cereal crops have decreased in recent years.

Further, as a result of shift of acreage of Jute to HYV Boro, production of Jute has been affected. Jute acreage has decreased from 2.22 million acres in 1972-73 to only 1.49 million acres in 1984-85. Decrease in acreage is one of the main reasons of reduction in its production from 1.6 million tons to only 0.82 million tons during this period. Again, imports of pulses, edible oil and spices have increased sharply in recent years as a result of deficit arising from growing population and inadequate production of these commodities. For example, import of spices has increased from 243241 kg. in 1979-80 to 785424 kg. in 1983-84 (GOB, 1985 ) for which an amount of Tk. 47 million was spent in 1983-84.

With the above background, the specific objective of this paper is to examine area trends and growth rates of HYV Boro and its competitive crops over the years (from 1973-74 to 1984-85). This will help to understand both magnitude and direction of changes in area of HYV Boro and its competitive crops.

Although studies relating to growth estimates for different crops and related issues are available ( i. e. Ahmed, 1977; Murshed, 1983; Wennergren, 1983 and Hussain, 1982 ), the interrelationships between growth of HYV Boro acreage and its competitive crops have not been examined. Further, growth estimates for some minor crops and spices by their different types (i. e. different types of pulses and spices ) are almost lacking. This study will make an effort to focus on these issues which have not got due attention so far.

## II. METHODOLOGY

The present study is entirely based on Secondary data. Time series data on area under HYV Boro and its competitive crops from 1973-74 to 1984-85 for the whole of Bangladesh were collected from published sources of Bangladesh Bureau of Statistics. For analytical purpose, competitive crops of HYV Boro have been classified into four groups as follows :

Group A : HYV Boro versus Local Boro, HYV Aus, Local Aus, HYV Wheat, Local Wheat and Jute.

Group B : HYV Boro versus Pulses ( i. e., Gram, 'Masur', 'Mung', 'Motor', 'Mashkalai' and 'Khesari').

Group C : HYV Boro versus Winter Til, Mustard ( including Rape ).

Group D : HYV Boro versus Spices ( i. e., Rabi Chillies, Onion, Garlic and Coriander Seeds ).

Both linear and exponential equations which are commonly used to explain trend movements and growth rates have been used in this study. The equations for linear trend line and exponential trend line in time series analysis of the forms :

$$Y_c = a + bt \dots \dots \dots (1) \text{ and}$$

$$Y_c = Ae^{bt} \dots \dots \dots (2)$$

respectively have been used in this study. Here b stands for trend coefficient in equation (1) and growth rate in equation (2). In both the equations t stands for time. After taking log in equation (2), we get :

$$\log Y_c = \log A + bt$$

Further, to examine relationship between areas under HYV boro and its competitive crops, product moment correlation coefficients were calculated.

### III. RESULTS AND DISCUSSION

The analyses showed ( Table 1 and Figures 1 to 7 ) that among the crops considered in this study acreages under HYV Boro, HYV Aus, HYV Wheat, 'Masur', 'Mung', 'Khesari', Onion, Garlic and Spices ( as a whole ) as well as Mustard had rising trend. Significant t-statistic for positive trend coefficients of HYV Boro, HYV Aus, HYV Wheat and Onion indicated that area of these crops increased significantly over the years. On the other hand, insignificant t-statistic of positive trend coefficients for 'Masur', 'Mung', 'Khesari', Spices ( as a whole ), Garlic and Mustard indicated that the areas under these crops did not increase significantly over the years ( Table 1 ). Per year increase in areas for these crops were found to be very low or negligible ( Table 1 ). On the other hand, per year highest significant increase in area was found for HYV Wheat ( 60.65 thousand hectares ) followed by HYV Boro ( 50.423 thousand hectares ) and HYV Aus ( 24.74 thousand hectares ) ( Table 1 ).



**Table 1. Linear and Exponential Trend Coefficients of Area Under HYV Boro and Its Competitive Crops Over the Year (1973-74 to 1984-85)**

Crops	Linear trend $Y_c = a + bt$			Exponential trend $Y_c = Ae^{bt}$				
	R <sup>2</sup>	a	Trend coefficient (b)	t	R <sup>2</sup>	a	b	Annual growth in percent
HYV Boro	.675	415	50.423	4.56**	.678	6.1687	.0323	6.23
Local Boro	.4767	489	-12.259	3.01*	.44	6.1933	-.0291	-2.91
HYV Aus	.76	230	24.74	5.65**	.61	5.41	.0786	7.86
Local Aus	.80	3032	-42.08	6.39**	.81	8.019	-.0152	-1.52
HYV Wheat	.908	-77	60.65	9.93**	.83	3.465	.2893	28.93
Local Wheat	.74	83	-6.77	5.37**	.84	4.500	-.1572	-15.72
Jute	.23	765	-15.31	1.73	.06	6.56	-.0114	-1.14
Pulses	.0688	304	-1.67	.86	.07	5.716	-.0059	-.59
Gram	.33	58	-.3916	2.23*	.34	4.05	-.0073	-.73
'Masur'	.12	70	.74	1.17	.14	4.237	.0109	1.09
'Mung'	.16	14	.2098	1.36	.18	2.589	.0170	1.70
'Motor'	.87	19	-.713	8.04**	.85	2.9688	-.0537	-5.37
'Mushkalai'	.73	56	-1.514	5.20**	.73	4.05	-.345	-3.45
'Khesari'	.0044	87	.0559	.067	.0009	4.46	.00093	.093
Spices	.0061	119	.105	.248	.0086	4.7799	.0011	.11
Rabi Chillies	.0004	71	-.0900	.07	.0018	4.2588	.000822	.08
Onion	.31	31	.1888	2.10***	.30	3.4378	.0058	.58
Garlic	.17	12	.059	1.44	.17	2.5007	.0048	.48
Coriander Seeds	.17	5	-.0559	1.42	.13	1.5925	-.0117	-1.17
Mustard	.01	193	.29	.35	.02	5.2607	.0017	.17
Winter 'Til'	.88	13	-.84	8.72**	.91	2.6009	-.0717	-7.17

\* Indicates significant at 5% level

\*\* Indicates significant at 1% level

\*\*\* Indicates significant at 10% level.



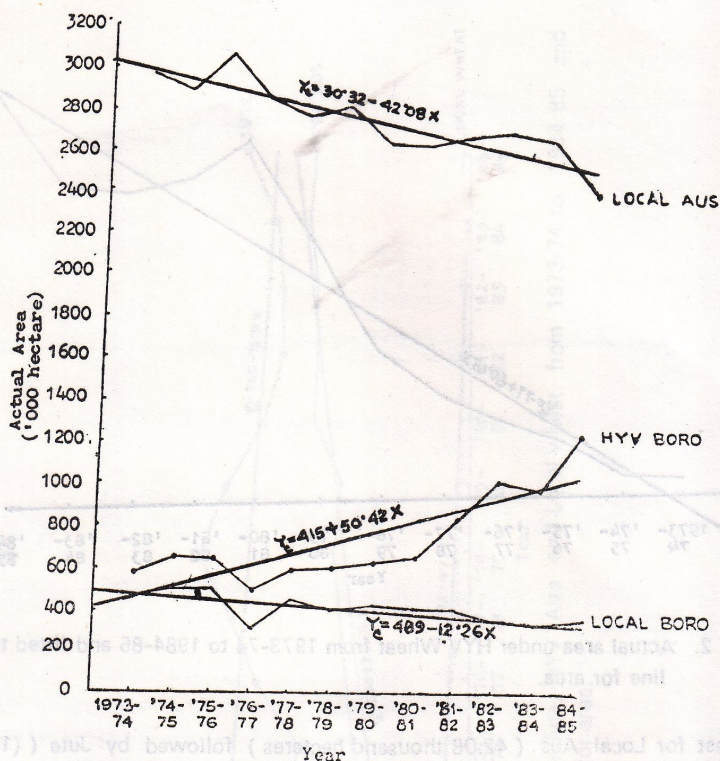
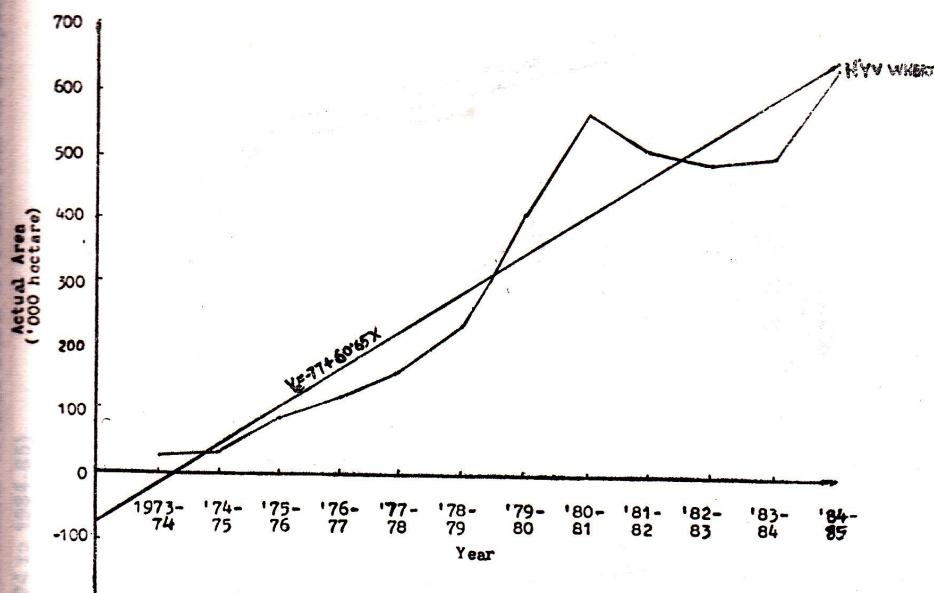


Figure 1, Actual area under Local Aus, HYV Boro, and Local Boro from 1973-74 to 1984-85 and fitted trend line for area.

The crops which showed declining area trend over the years were Local Boro, Local Aus, Local Wheat, Jute, Gram, 'Motor', 'Mashkalai', Pulses as a whole, 'Til', Chillies and coriander seeds. Significant t-statistic for negative trend coefficients indicated that among these crops, areas under Local Boro, Local Aus, Local Wheat, Gram, 'Motor', 'Khesari' and 'Til' decreased significantly. Again, insignificant t-statistics for negative trend coefficients of Jute, Pulses, Chillies and Coriander seeds indicated that the decreases in area for these crops were not statistically significant. Decrease in area per year was found to be the



Figur 2. Actual area under HYV Wheat from 1973-74 to 1984-85 and fitted trend line for area.

highest for Local Aus ( 42.08 thousand hectares ) followed by Jute ( 15.31 thousand hectares ), Local Boro ( 12.59 thousand hectares ) and Local Wheat ( 6.77 thousand hectares ). Per year decrease in areas of other crops ranged between only .0559 thousand hectares to 1.67 thousand hectares.

The analysis showed that among cereals; areas under both HYV rice and HYV wheat increased substantially by displacing local varieties. However, area under HYV Wheat showed a spectacular growth in area during the period under study. Annual growth in percent for wheat was 28.93 compared to 6.23 percent for HYV Boro and 7.86 percent for HYV Aus. Percentage growth rates during the period ( 1973-74 to 1984-85 ) for HYV Wheat and HYV Aus were found to be higher than HYV Boro because areas under HYV Wheat and HYV Aus were very low in the base year ( 1973-74 ) compared to HYV Boro. For example, in 1973-74, areas under HYV Wheat and HYV Aus were only 29 thousand hectares



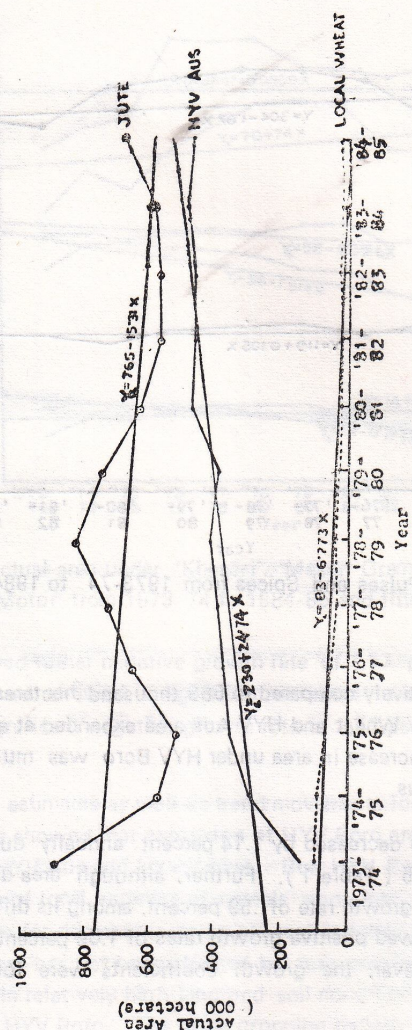


Figure 3. Actual area under Jute, HYV Aus and Local wheat from 1973-74 to 1984-85 and fitted trend line for area.



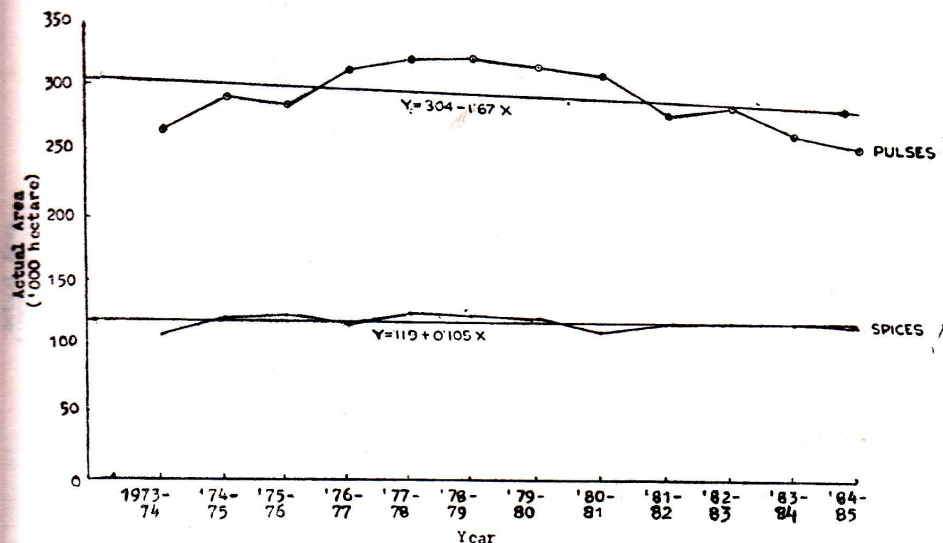


Figure 4. Actual area under Pulses and Spices from 1973-74 to 1984-85 and fitted trend line for area.

and 133 hectares respectively compared to 589 thousand hectares for HYV Boro. Therefore, although HYV Wheat and HYV Aus area expanded at a faster rate than HYV Boro, in the total increase in area under HYV Boro was much higher than HYV Wheat and HYV Aus.

Area under Jute has decreased by 1.14 percent annually during the period from 1973-74 to 1984-85 (Table 1). Further, although area under Pulses as a whole showed negative growth rate of .59 percent, among its different types only 'Masur' and 'Mung' showed positive growth rates of 1.09 percent and 1.70 percent respectively. However, the growth coefficients were found statistically insignificant.

Growth rate for spices as a whole was found to be negligible (only .11 percent per annum). Negligible rate of increase in areas (maximum being .58 percent per annum) was found for all types of spices except coriander seeds



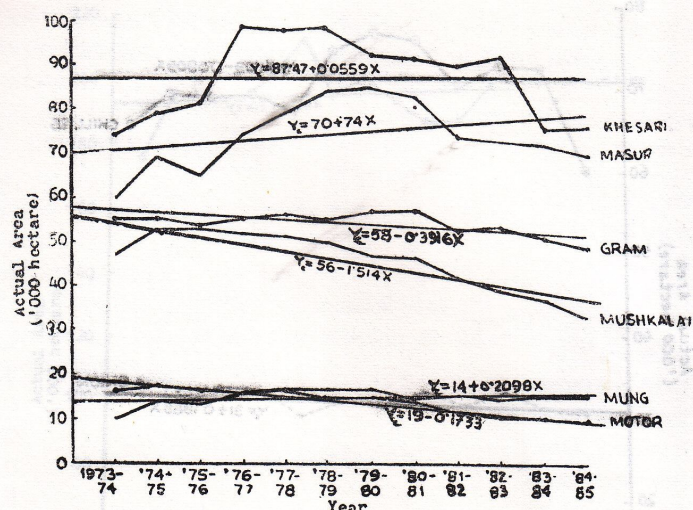


Figure 5. Actual area under 'Khesari', 'Masur', 'Gram', 'Mushkalai', 'Mung', and 'Motor' from 1973-74 to 1984-85 and fitted trend line for area.

which showed rather negative growth rate of 1.17 percent. Among oil seeds, while Mustard showed insignificant increase in area (only .17 percent per annum), significant negative growth rate of 7.17 percent was found in the case of Winter 'Til'.

Growth estimates as well as trend movements for area under HYV Boro and other cereals showed that expansion of HYV Boro area did not affect expansion of areas of HYV Aus and HYV Wheat. But, HYV Boro showed negative effect on the areas of local varieties of cereals and Jute. However, there might be other reasons for decrease in areas of local varieties of cereals and Jute. Acreage of HYV Wheat has not been affected because expansion of HYV Wheat area has taken place in relatively high land and soil condition of which is not so suitable for growing HYV Boro. The usual cropping pattern on such land is usually HYV Wheat followed by Jute, while in the case of HYV Boro, the usual cropping pattern is HYV Boro followed by Aman. Further, since wheat is harvested much earlier than HYV Boro, the farmers feel secure of growing HYV Wheat instead of

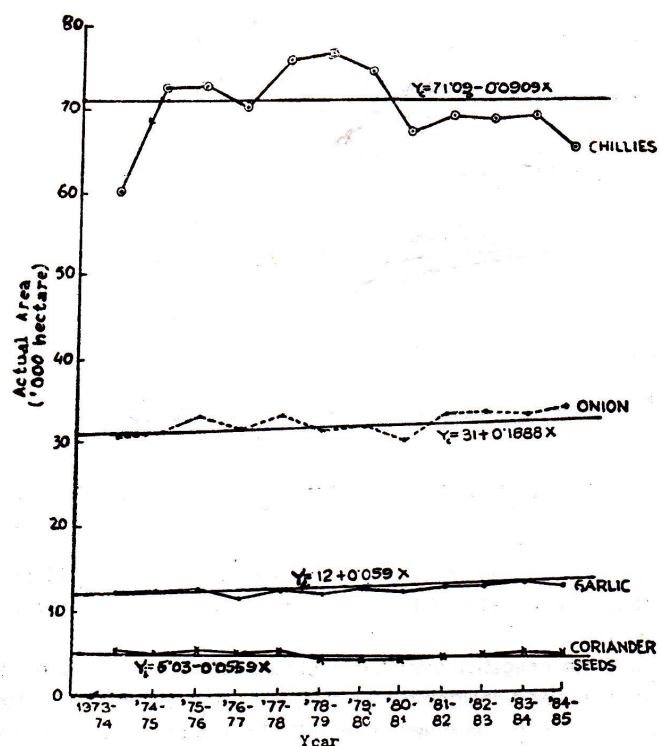


Figure 6. Actual area under Chillies, Onion, Garlic, and Coriander Seeds from 1973-74 to 1984-85 and fitted trend line for area.

HYV Boro in the area which is affected by early flood. Therefore, in most of the case, HYV Boro did not compete with HYV Wheat although the growing season of these two crops is overlapping. Again, HYV Aus, although partially competes with HYV Boro, expansion of HYV Aus has taken place mostly by substituting Local Aus and Jute. Therefore, expansion of HYV Boro also did not affect expansion of HYV Aus.

Further, the analysis showed that expansion of HYV Boro has negative effect on areas of Pulses, Spices and Oil seeds. This was further confirmed by



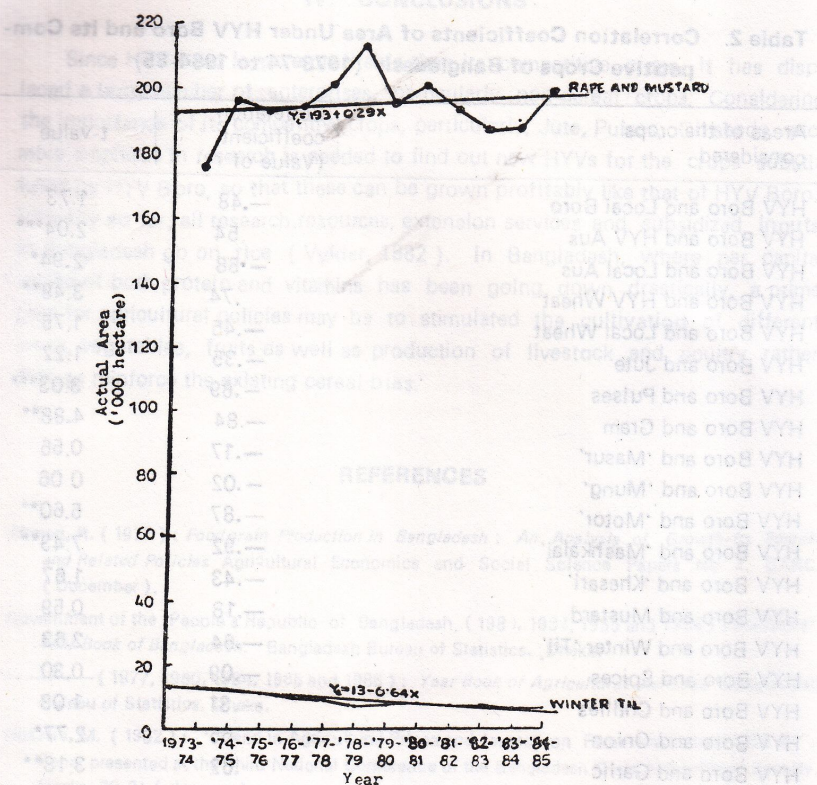


Figure 7. Actual area under Mustard and Winter 'Til' from 1973-74 to 1984-85 and fitted trend line for area.

estimated correlation coefficients of area under HYV Boro and its competitive crops which were considered for this study (Table 2).

The analysis showed that except areas under HYV Aus, HYV Wheat, Onion and Garlic; negative relationships existed between areas under HYV Boro and all other crops considered in this study. This indicated that with the exception of those four crops, the expansion of HYV Boro has affected production of all the



**Table 2. Correlation Coefficients of Area Under HYV Boro and Its Competitive Crops of Bangladesh (1973-74 to 1984-85)**

Areas of the crops considered	Correlation coefficient (Value of r)	t-value
HYV Boro and Local Boro	-.48	1.73
HYV Boro and HYV Aus	.54	2.04***
HYV Boro and Local Aus	-.68	2.94*
HYV Boro and HYV Wheat	.74	3.49**
HYV Boro and Local Wheat	-.45	1.75
HYV Boro and Jute	-.35	1.22
HYV Boro and Pulses	-.69	3.03***
HYV Boro and Gram	-.84	4.88**
HYV Boro and 'Masur'	-.17	0.55
HYV Boro and 'Mung'	-.02	0.06
HYV Boro and 'Motor'	-.87	5.60**
HYV Boro and 'Mashkalai'	-.92	7.43**
HYV Boro and 'Khesari'	-.43	1.67
HYV Boro and Mustard	-.18	0.59
HYV Boro and Winter 'Til'	-.64	2.63
HYV Boro and Spices	-.09	0.30
HYV Boro and Chillies	-.31	1.03
HYV Boro and Onion	.65	2.77*
HYV Boro and Garlic	.62	3.18**
HYV Boro and Coriander seeds	-.01	0.03

\* Significant at 5% level.

\*\* Significant at 1% level.

\*\*\* Significant at 10% level.

crops considered in this study. Further, the effect of HYV Boro area on its competitive crops was not in all cases statistically significant. One of the reasons for this is that the time period taken for this study is only 12 years. If the time period would be increased then it might happen that more coefficients would be significant.



#### IV. CONCLUSIONS

Since HYV Boro is more profitable than its competitive crops, it has displaced a large number of enterprises, particularly non-cereal crops. Considering the importance of its competitive crops, particularly, Jute, Pulses, Oil seeds, etc. more emphasis in research is needed to find out new HYVs for the crops substituted by HYV Boro, so that these can be grown profitably like that of HYV Boro. Virtually so far, all research resources, extension services and subsidized inputs in Bangladesh go on rice (Vyllder, 1982). In Bangladesh, where per capita intake of both protein and vitamins has been going down drastically, a prime goal for agricultural policies may be to stimulate the cultivation of different crops, vegetables, fruits as well as production of livestock and poultry rather than to reinforce the existing cereal bias.

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