CROP CUT STUDY
1989/90 BORO RICE YIELD ESTIMATION

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Summary

Boro Rice Production 1989/90

Estimate for 1989/90 Boro rice production in Bangladesh based on yield estimate by crop cuts and a preliminary survey area estimate is 7,196,000 MT. This constitutes a 23.4 percent production increase over the 1988/89 production estimate of Bangladesh Bureau of Statistics (BBS). This production estimate is based on a 19.14 percent yield increase over 1988/89 and a 3.58 percent area increase. Average national yield estimate is 1,152.82 kg of clean rice per acre (that is 1,728.36 kg of paddy per acre). The 1989/90 acreage estimate for Boro rice is 6,242,000 acres, from a survey by Farm Level Fertilizer Use Study (FLFUS). This survey was carried out to estimate changes in acreage of Boro rice from 1988/89 to 1989/90 from the FLFUS sample farmers' response. The 3.58 percent area increase was applied to the BBS acreage estimate for 1988/89 Boro rice to estimate the 1989/90 Boro rice acreage of 6,242,000 acres. USAID/Dhaka has projected Boro rice area in the crop year 1989/90 will be in the neighborhood of 6.0 to 6.2 million acres. The FLFUS area estimate is very similar to the USAID estimate.

The crop cut experiment for estimating the 1989/90 Boro paddy yield was conducted during May - July, 1990. Total number of cuts was 1,689 covering 50 locations in 20 regions. Overall

national average yield based on these crop cuts is 1,728 harvest kg of paddy per acre. This is equivalent to 1,153 kg of clean rice, and is 19.1 percent higher than the 1988/89 yield estimate made by the BBS and 17.5 percent higher than the estimate from the FLFUS carried out by IFDC which covered 41 locations. These 41 locations were included in the crop cut sample for 1989/90 Boro paddy yield estimation study.

Weather conditions during the growing season were generally favorable for Boro paddy production. During the early Boro season there was some shortfall of rain. Distribution of rainfall improved significantly as the season progressed. Most HYV was planted late and did not incur any significant damage. However, some local varieties were damaged and recorded yield reduction. Nationwide average yield of local varieties was lower by 10.2 percent than the previous year, compared to 17.6 percent increase in the HYV. At harvest time there was an excess rainfall in some areas which damaged the crop in a limited number of locations.

Aside from the favorable weather conditions as an important factor contributing to good yield of 1989/90 Boro paddy, other production conditions faced by farmers also improved and contributed to the good harvest. Compared to the previous year, fertilizer prices paid by farmers declined substantially, coverage of HYV seeds further improved and more Boro paddy areas were under irrigation.

Yield increase during 1989/90 over 1988/89 is observed in all divisions, except Khulna. In Khulna Division yields are the highest among the four divisions in both years but there was no yield increase in 1989/90 over 1988/89. This may be due to a large increase in Boro paddy areas in the Khulna Division and additional areas being marginal paddy areas. The phenomenon should be further researched. The largest yield increase was observed in Rajshahi Division.

The 1989/90 Boro rice yield in non-remote locations was 9.2 percent more than in remote locations. This is mainly due to the differences in the diffusion rates of HYV seeds and irrigation. The yield difference of HYV in irrigated areas in non-remote and remote locations is only 2.1 percent.

Comparing the 1988/89 yields from the 41 locations of the FLFUS with 1989/90 yield estimates of the crop cuts from the same 41 locations, the overall average yield increase was 17.5 percent, which is the same when the comparison was made with the estimate from the 50 locations for 1989/90. The yield increase of HYV in remote locations was 26.6 percent, compared to 12.3 percent in non-remote locations. In 1988/89, the HYV average yield in remote locations was 83 percent of the non-remote locations, and in the 1988/89 crop it was 93 percent. This yield increase in HYV in remote locations was achieved without any improvement in irrigation rate (Table 5). Obviously falling fertilizer prices and improved availability increased fertilizer use and also induced the spread of HYV to larger areas.

Based on the average yield obtained, an estimate for the 1989/90 Boro rice production in Bangladesh is 7,195,000 MT, which is 23.4 percent increase over the last year production. An important point to be observed is that the major part of this increase is contributed by the significant increase in yield. This contrasts with recent trend where increased production came almost entirely from increased area under Boro crop.

Because of this year's large Boro rice production, current farm-level paddy price is depressed to the 1986 level in nominal terms and lower than the GOB announced procurement price. The incentive created by policy reform on irrigation operation and fertilizer marketing, which successfully increased 1988/89 and 1989/90 Boro rice production will be affected adversely by this year's low output price In view of the fact that Boro rice is the source of sustaining and increasing the total rice production in Bangladesh, likely negative impact of such price situation should receive due consideration of the policy makers to adopt appropriate price policies to provide incentive to the farmers to increase Boro rice production.

I. Introduction

1. Background

Precision in estimates of crop area and production is a pre-requisite for realistic planning for agricultural development, and effective and fair policy formulation. Crop production statistics in Bangladesh have been a subject of criticism as doubts have been expressed by many on accuracy and representativeness of the crop production estimation.

USAID/Dhaka has been concerned with realistic crop production estimates particularly for major cereals to better understand the foodgrain production situation in the country. USAID/Dhaka , therefore, requested IFDC/Dhaka to undertake a pilot project at the ongoing project locations of Farm Level Fertilizer Use Study (FLFUS) project to estimate yields of following crops:

1. Boro rice, 1989-90 (56 locations)
2. Wheat, 1990 (47 locations of ongoing project)
3. Transplanted Aman rice 1990 (56 locations)
4. Broadcast Aman rice (56 locations).

This report deals with the 1990 Boro rice crop cut results.

2. Crop Cut Experiment

Sample farmers of this experiment are the sample farmers of the ongoing FLFUS and randomly selected farmers from 9 additional locations. Out of 56 locations of total sample, there was no Boro rice grown in 6 locations. Thus, this study covers 50 locations. A map of locations of sample Upazilas is presented in Appendix I.

Number of Plots for Crop Cut

Twenty percent of all plots of the selected crops were included in the crop cut experiments in all 50 study locations.

Method of Selection of Plots

Plots for crop cut experiments were randomly selected from each of the 50 study locations. It was expected that the sample plots for crop cut would represent the level of technology in use, namely, crop variety, irrigation and fertilizer use.

Crop Cut Methods

Different methods of crop cut have been in practice at the agricultural research institutes and the BBS for estimating crop yields. The BBS earlier practiced a method of random crop cut in a rectangular area of 33' x 16.5' for crop cut of rice crop. BBS, however, have changed the method and now adopted a random cut of a circular area.

The circular cut method has been regarded as an improvement over square or rectangular cuts and relatively more convenient in operation without losing efficiency and precision of the yield estimates. In this survey random cut of a circular area of 9.28m^2 (100 sqft) method was used. The procedure and the method of circular crop cut are presented in Appendices II - IV.

Recording

Crop cut was done on the same day when the sample farmer harvested his crop on the sample plot. A simple one page data sheet was designed to record yield from crop cut plot together with other information to facilitate analysis of yield data (Sample data sheet in Appendix - V).

Data Processing and Analysis

Crop cut data obtained from 50 locations were computer-processed and analyzed at IFDC/Dhaka.

II. Findings of the Study

1. Yield

Yield estimates made from the 1989/90 Boro paddy crop cuts are presented in Table 1. Overall national average yield estimate is 1,728.36 kg per acre which is equivalent to 1,152 82 kg of rice. This estimate is based on total of 1,689 crop cuts covering 50 locations. Six out of the total of 56 locations in the sample had no rice cultivation during the 1989/90 Boro season. For the 1988/89 Boro rice, the average yield estimate from the FLFUS was 1470.38 kg of paddy per acre (980.74 kg of rice). Out of the total of 50 locations in the 1989/90 sample 41 locations were common with the FLFUS. The estimate of 1989/90 average yield from the crop cuts shows an increase in yield over the FLFUS estimate of 1988/89 by 17.5 percent.

A perusal of the table shows that most sample locations had higher yield than last year's overall average yield, and locations which had lower yield than last year's average are the ones traditionally considered low Boro rice yield areas, except some in Mymensingh Region where disruption of water supply damaged this year's crop.

Yields of non-remote and remote locations are compared in Table 2 for local and HY varieties separately for irrigated and non-irrigated crop. Overall average yield in non-remote locations is 9.2 percent higher than in remote locations. This difference seems to be due largely to differences in diffusion rates of HYV seeds and irrigation in these two areas. For irrigated crop of

HYV yield in remote locations is only 2.1 percent less than the yield in non-remote locations. But the percentage of non-irrigated crop in remote locations was 10.3 percent compared to only 0.4 percent in non-remote locations, and the proportion of local varieties in remote locations was 10.6 percent compared to only 1.8 percent in non-remote locations.

Overall national average yield of local varieties is 51.8 percent of the HYV yield. But in remote locations it is only 43.3 percent. As shown later, the 1989/90 yield of local varieties is 10.2 percent less than the 1988/89 FLFUS estimate, which is most likely due to the damage caused by the early season rain shortage.

2. Variation in Yield

Table 1 shows estimates of average locational yields, the range of yield for each location and the estimated co-efficient of variation, all measured from the 1989/90 Boro paddy crop cuts (50 locations). Yield varied from a minimum of 157 kg to a maximum 3,411 kg per acre. The estimates of the overall sample mean yield of 1,728.36 kg and a standard deviation of 551.11 kg indicate that two thirds of this year's crop yields should be within the range of 1,177 and 2,279 kg per acre. The co-efficient of variation estimates show that relative variation is larger in remote locations than in non-remote locations.

Sample distributions of yields are presented in Table 3 for each of the four divisions, for non-remote and remote locations and for the overall sample. In Chittagong Division, 72 percent of the total cuts had yields only between 1,000 to 2,000 kg per acre reflecting low average yield in this division. On the other hand, in Khulna Division, which has the highest average yield

among the four divisions (Table 4), 63 percent cuts had yields between 1,500 to 2,500 kg per acre. In Dhaka Division, yields are more spread out, and in Rajshahi Division the distribution of yields is centered more toward the mean yield.

The distribution of yields in non-remote locations is almost symmetrical, but in remote locations it is skewed toward the lower yield levels. That is, in remote areas, relatively large percentage of farmers have lower than the average yield. In remote locations, 43 percent crop cuts show yields less than 1,500 kg per acre compared to 28 percent in non-remote locations. In the highest category of yield (larger than 2,500 kg per acre), there are proportionately more crop cuts in remote locations than in non-remote locations.

3. Comparison of 1988/89 and 1989/90 Yields

In Table 4, 1989/90 Boro rice yield estimates are compared with the 1988/89 yield estimates from FLFUS and BBS. The comparison is made by division and for the country as a whole. The table also allows an examination of the differences in regional weights if any. For the FLFUS and the BBS samples crop areas are the weights but for the 1989/90 crop cut experiment weights are the number of crop cuts.

In comparing two sets of 1988/89 estimates, the overall average of yields of FLFUS is 1.3 percent larger than the BBS estimate. The FLFUS yield estimates in Chittagong and Rajshahi Divisions are lower and those of Dhaka and Khulna Divisions are higher than BBS estimates. The largest difference in yields in two data sets is seen in Khulna Division where FLFUS estimate is 15.6 percent higher than the BBS estimate. Yet, however, the divisional ranking in terms of the average yields is the same from these two sets of data.

Somewhat higher overall average yield in the FLFUS data than the BBS data seems to be due to, at least in part, differences in diffusion rates of HYV seeds in these two sample areas. Using FLFUS yields of HYV and local varieties and the BBS diffusion rate, the overall average yield for the FLFUS sample becomes 971 kg per acre which is only 0.7 percent higher than the BBS estimate. Thus, it seems that the FLFUS sample represents a slightly higher rates of HYV diffusion and irrigation than that of BBS[1]. In comparing the 1989/90 crop cut yield with the 1988/89, FLFUS data are used.

The 1989/90 overall national average Boro rice yield estimate is 17.5 percent higher than 1988/89. Yield increase is observed in all divisions except Khulna, where yields were almost the same in two years Yields in Khulna were also the highest among four divisions in both years. Rajshahi Division had the largest yield increase.

Good weather conditions during the 1989/90 Boro season were an important factor in yield increase, even though early during the season there was some shortfall of rain. Afterwards, however, the distribution of rainfall improved significantly. HYV crop which was planted late and was not damaged much. However, some local varieties were damaged by this early season rain shortage. In some areas later during the harvest time there was an excess of rainfall which damaged the crop to some extent. In some cropland areas of Sylhet and Chittagong Regions near the hills, plants got washed away by heavy rain and flash flood and in some areas plants with almost matured grain were submerged in water and impossible to be harvested.

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1 The 1988/89 irrigation rate of the FLFUS is 93.04 percent. The latest available data of BBS shows 86.38 percent for the 1987/88 Boro rice.

By and large weather conditions were favorable and other production conditions faced by farmers were also improved and contributed significantly to the good harvest. From 1988/89 to 1989/90, the simple average prices of fertilizer paid by farmers during November - April declined 7.25 percent for urea, 3.34 percent for TSP and 3.83 percent for MP. Fertilizer sales during the Boro season of 1989/90 (November to April) were 17.2 higher than the corresponding Boro season of 1988/89[1]. Table 5 compares the diffusion rates of HYV seeds and irrigation rates for 1988/89 and 1989/90 Boro rice crop This comparison reveals overall improvement in these rates, except the HYV diffusion rate in Rajshahi Division.

The sample for 1989/90 Boro paddy crop cuts has 9 additional locations to the 1988/89 FLFUS sample. In comparing these two crop years, therefore, data from these 9 locations were excluded. However, the estimate for overall average yield from the 41-location sample was almost the same as that of 50-location sample, 1,727.90 kg and 1,728.36, respectively, and there are some minor differences in yield of HYV. Thus for a comparison of the two crop years, the overall picture is very similar whether one uses the results from the 41-location sample or the 50-location sample. Since there are some differences in results of two samples for non-remote and remote locations for comparison of these two groups, the results of 41-location sample are used.

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1 Various issues of IFDC, Farmer's Survey Report.

There was a 13.3 percent overall yield increase in non-remote locations in 1989/90 from the previous year. Compared to this, the overall yield increase in remote locations was 24.2 percent. This large yield increase in remote locations was achieved even under the conditions of only slight increase in diffusion rate of HYV seeds and a slight declined in irrigation rate in the area. The increase in the yield only of HYV in remote locations was even more, 26.6 percent compared to 12.3 percent in non-remote locations. Thus, the yield of HYV in remote locations which was 17.3 percent less than the non-remote locations in the 1988/89 crop was only 6.9 percent less in the 1989/90 crop. This gap seems to be being abridged with the help of cheaper and better availability of fertilizer in remote locations due to policy changes promoting competitive marketing. But, there appears to be some constraints in the expansion of irrigation in remote locations.

In comparing crop cut weights to the BBS weights the representation of Chittagong Division to the overall sample is more and that of Dhaka Division is less and the representation of two other divisions are fairly close to the BBS sample. The calculation of yield by using divisionwide yield estimates from the crop cuts sample with the BBS weights gives 1,166 kg of rice per acre, which is 1.1 percent higher than the crop cuts yield estimate.

III. Boro Rice Production for 1989/90

The official data for acreage estimate for 1989/90 Boro rice is not available at present. However, there are two preliminary data sources to use. First, USAID/Dhaka had developed a projection that Boro rice area in the crop year 1989/90 would be in the neighborhood of 6.0 to 6.2 million acres. Second, the FLFUS conducted a special survey to ascertain changes in acreage of Boro rice and wheat from 1988/89 to 1989/90. This survey was carried out for the entire FLFUS sample farmers, over 2,000 in 49 locations. The estimates indicate an increase in the acreage under Boro rice cultivation of 1989/90 by 3.58 percent over the acreage of 1988/89 among the sample farmers. Using this estimate of increase in crop area from 1988/89 and the total acreage estimate of 1988/89 Boro rice by BBS, an estimate for the area under Boro rice in 1989/90 is 6,242,000 acres. This gives an estimate for the 1989/90 Boro rice production of 7,196,000 MT, which is 23.4 percent increase over the previous year.

During the 1980s the Boro rice production increased dramatically from 2.6 million MT in 1980/81 to 5.8 million MT in 1988/89. The increase from the 1986/87 to the 1987/88 was 18 percent and from the 1987/88 to the 1988/89 23 percent. The production increases in the 1980s were mainly due to the expansion of acreage and the increases in the diffusion rate of HYV seeds. In spite of declining trends in yields of local and HYV varieties, the yearly average yields remained rather constant throughout years with some yearly variations, which was possible by steadily increased share of acreage under HYV. Meanwhile, the acreage

under Boro rice increased from 2.0 million acres in 1980/81 to over 6 million acres in 1988/89. From 1987/88 to 1988/89 alone 1.2 million acres were added to Boro rice cultivation. The expansion of acreage was only possible by the introduction of irrigation facilities[1].

IV. Impact of 1989/90 Boro Rice Production

A large increase in paddy production would normally be expected to have a depressing effect on its price immediately after the harvest, unless farmers had incentives to hold back sale in expectation of future price increase or efforts were made to keep a portion of the crop off the market by public price support programs. Table 6 presents data on monthly paddy prices received by farmers since January, 1986. The table also presents data on yearly percentage changes in Boro rice production (from the previous year) since 1986 as well as percent changes in Boro paddy prices from the pre-harvest (March - April) period to post-harvest (May - June) period. During April, 1990, farm-level Boro paddy price was Tk. 322 per 50 harvest kg, but immediately after the bumper harvest of 1989/90 Boro crop started flowing into the market the price came down to Tk. 231 per 50 kg in the following month. Even during June the price has remained depressed.

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[1] In the 1980s, 80-86 percent of total area under Boro rice was irrigated (BBS estimates).

Most of this area increase under boro paddy has been a shift of crop areas from other boro season crops due to improved relative profitability of boro paddy.

The 1988/89 Boro rice output was 23.3 percent more than the previous year, and the June, 1989 price had fallen by Tk. 108 per 50 kg compared to the April, 1989 price. Table 6 establishes two points: First that there is a clear correlation between relative increase in Boro rice production from the previous year and the relative decline of paddy price from the pre-harvest months to the post-harvest months. That is, larger the increase in production from the previous year greater the fall in post-harvest price. Secondly, the post-harvest prices of Boro paddy in 1990 fell to a level lower than the last three years, and in nominal terms came down to the level of 1986 prices. In November, 1989, the GOB announced procurement price for 1989/90 Boro paddy as Tk. 590 per quintal, that is Tk. 295 per 50 kg. But the post-harvest paddy prices received by farmers during May - June, 1990 were about 20 percent less than the government announced procurement price. In 1988 and 1989, the procurement prices were almost same to the lowest monthly farm-level price in the post-harvest period.

Since a large decline in farm-level price is expected to have adverse effect on their income it could have negative impact on irrigation investment and subsequent planting and yields. Recent policy changes helped to increase areas under irrigation and Boro paddy production. Increase in Boro paddy acreage from 1986/87 to 1988/89 was about 2 million acres, which is one third of the 1988/89 acreage under Boro paddy. The privatization policies on fertilizer marketing have brought down fertilizer prices to

farmers and increased fertilizer consumption. The price of urea in June, 1990 is 10 percent less than that in June, 1988 and 7 percent less than in June, 1989. The depressed output price will reduce the incentive created by these policy reforms.

Boro crop has become a major paddy crop as its share in the total paddy production has been increasing steadily, from 25 percent in 1980/81 - 1982-83 (average) to 31 percent in 1986/87 - 1988/89 (average). Data below compare the total actual rice production in Bangladesh for the period of 1983/84 - 1988/89 with corresponding yearly figures assuming Boro rice production was at the level of 1980/81 - 1982/83 average.

(1000 MT)

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89
Total Rice production (actual)	14,509	14,623	15,401	15,407	15,414	15,544
Rice production with Boro production at 1980/81 - 1982/83 average level*	14,268	13,823	14,839	14,506	13,792	12,822

* In this hypothetical case, a constant amount of 3,109,000 MT (the three year average of Boro rice production during 1980/81 - 1982/83) is used to replace the actual yearly Boro rice production.

These figures show that if there was no overtime increase in Boro rice production, rice production in Bangladesh could actually have been declining. Thus, the importance of Boro rice to sustain and increase rice production in Bangladesh is obvious.

Table 1. Yield of Boro Paddy, 1989/90 by Location

Division	Region	Location	No. of cuts	Estimated yield (Kg/acre)	Coefficient of variation (%)	Maximum yield (Kg/acre)	Minimum yield (Kg/acre)
Chittagong	Chittagong	Ramu	71	1510 85	23 2	2479 26	808 65
		Ukhiya	37	1959 35	9 7	2341 79	1482 78
		Boalkhali	172	1552 57	23 5	2786 10	659.06
		Lohagara	107	1542 22	25 7	2813 98	804.99
		Fatikchari	8	1260 98	23 7	1629 58	785 82
	Noakhali	Chagalnaiya	45	1538 69	17 6	2219 82	1070 27
	Comilla	Choddogram	20	2133 79	21 4	2705 08	858 65
		Homna	24	1494 36	41 7	2500 69	156 82
		Nasirnagar	2	1368 66	2 0	1395 66	1341 65
		B Baria	89	1843 50	20 5	2907 63	988 13
	Sylhet	Jamalganj	69	851 91	30 9	1254 53	412 08
		Kulaura	7	883 17	24 0	1313 55	579 35
Dhaka	Dhaka	Joydevpur	10	1225 01	15 4	1486 38	794 53
		Gazaria	35	2437 26	13 0	2920 70	1579 81
		Lauhajang	11	3000 90	3 1	3130.65	2814 41
	Jamalpur	Sherpur	16	1148 62	21 9	1626 97	740 52
		Jhenaigati	10	1577 57	17 5	1899 65	740 52
		Shorishabari	43	2018 60	9 8	2395 80	1461 00
	Faridpur	Madhukhali	20	1951 51	23 5	2874 96	1188 32
		Nagarkanda	6	2674 49	7 5	2963 82	2317.39
		Bederganj	21	1666 55	22 6	2361 00	1056.55
	Mymensingh	Haluaghat	4	1522 01	18 2	1855 00	1184 83
		Atpara	51	1167 69	23 8	1609 98	1184 83
		Gouripur	14	914 45	46 5	1792 93	520 98
		Trisal	41	1204 11	28 2	1786 50	600 04
	Kishoreganj	Pakundia	4	1890 50	26 6	2721 63	1427 03
	Tangail	Madhupur	80	2252 14	16 6	3018 71	1048 92

Table 1 contd. .

Table 1 contd.

Division	Region	Location	No of cuts	Estimated yield (Kg/acre)	Coefficient of variation (%)	Maximum yield (Kg/acre)	Minimum yield (Kg/acre)
Khulna	Khulna	Fakirhat	10	2016 58	15 0	2429.60	1540 28
		Daulatpur	23	2010 19	16 5	2558 71	1415 05
	Barisal	Agailjhara	15	2520 50	6 6	2979 50	2352 24
		Banaripara	81	2068 86	25 7	3239 12	235 22
	Jessore	Magura	3	1593 57	38 6	2036 43	724 19
		Keshabpur	19	1460 29	40.9	2940 30	504 22
		Jhikargacha	55	1637 35	29 1	3018 71	649 22
		Sailkupa	8	1348 03	24 5	1727 07	541 02
	Kushtia	Bheramara	2	1470 91	6 6	1568 16	1373 66
Rajshahi	Pabna	Atghoria	21	1828 07	14 9	2302.84	956 23
		Belkuchi	33	1585 88	20 1	2288 12	786 17
	Bogra	Kahalu	79	1769 41	14 2	2548 26	1143 45
		Dhunot	80	1574 84	26 4	2652 80	714.38
	Dinajpur	Tentulia	2	341 95	1 9	348 48	335 41
		Boda	8	1339 58	19 7	1812.10	1045 44
		Chirirbander	42	1951.08	15 7	2980 59	1463 62
		Thakurgaon	31	1829 69	10 5	2248.79	1404 81
	Rajshahi	Natore	25	2184 35	24.6	3393 32	1332 94
		Singra	49	2120 03	18 7	2632 94	1097 71
		Godagari	1	1888 33			
		Bagatipara	10	1394 31	41 8	2272 53	396 40
		Shibganj	45	2568 25	15.5	3410 75	1916 64
	Rangpur	Nageswari	30	1868 24	32 6	3366 32	761 12
	Non-Remote		954	1793 76	27 0	3393 32	335 41
	Remote		735	1643 46	37 3	3410 75	156 82
		Total	1689	1728 36	31 9	3410 75	156.82

Table 2. **1989/90 Boro Paddy Yields in Non-Remote and Remote locations by Variety for Irrigated and Non-irrigated Crops**

(Kg/acre)

	Overall total	Local Varieties			HYV		
		Irrigated	Non-irrigated	Total	Irrigated	Non-irrigated	Total
Non-Remote	1794	1659	1282	1637	1799	1032	1797
	(954)	(16)	(1)	(17)	(934)	(3)	(937)
Remote	1643	897	726	764	1762	1166	1748
	(735)	(17)	(61)	(78)	(642)	(15)	(657)
Total	1728	1266	735	920	1783	1144	1777
	(1689)	(33)	(62)	(95)	(1576)	(18)	(1594)

Figures in parentheses are number of cuts.

Table 3. **Sample Distributions of Yields by Division and by Remoteness, 1989/90 Boro Paddy**

(%)

Division	Total	≤1000	1000-1500	Yield (Kg/acre) 1500-2000	2000-2500	≥2500
Chittagong	100	11	37	35	15	2
	(651)	(71)	(240)	(228)	(98)	(14)
Dhaka	100	10	26	23	25	16
	(366)	(38)	(95)	(86)	(90)	(57)
Khulna	100	6	16	37	26	15
	(216)	(14)	(34)	(80)	(56)	(32)
Rajshahi	100	3	18	44	25	10
	(456)	(15)	(80)	(203)	(114)	(44)
Non-Remote	100	5	23	39	25	8
	(954)	(45)	(223)	(370)	(242)	(74)
Remote	100	12	31	31	16	10
	(735)	(93)	(226)	(227)	(116)	(73)
Total	100	8	27	35	21	9
	(1689)	(138)	(449)	(597)	(358)	(147)

Figures in parentheses are number of cuts.

Table 4. **Comparison of 1990 Boro Rice Crop Cut Data with Other 1989 Data**

Crop year	Crop cut 1989/90		FLFUS 1988/89[1]		BBS 1988/89[2]	
Division	Weights[3] (%)	Yield (Kg/acre)	Weights[4] (%)	Yield (Kg/acre)	Weights[4] (%)	Yield (Kg/acre)
Chittagong	38.5	1026	39.4	833	29.7	858
Dhaka	21.7	1198	26.2	1058	34.5	1000
Khulna	12.8	1260	16.5	1275	9.2	1103
Rajshahi	27.0	1247	17.9	923	26.6	1001
Average	(100.0)	1153	(100.0)	981	(100.0)	968

As the conversion factor of paddy to rice 0.667 is used.

1) Farm Level Fertilizer Use Study by IFDC.

2) Bangladesh Bureau of Statistics, Monthly Bulletin of Bangladesh, March, 1990.

3) Number of Crop Cuts.

4) Harvested area.

Table 5. Comparison of Yields, HYV Seeds Diffusion Rate and Irrigation Rate, 1988/89 and 1989/90 Boro Paddy

(%)

Division	Change in yield 1988/89 - 1989/90			HYV diffusion rate		Irrigation rate	
	Total	HYV	LV	1988/89	1989/90	1988/89	1989/90
Chittagong	23.3 (23.6)	22.1 (23.0)	-11.7 (-11.7)	83.1	90.6 (89.8)	88.4	89.1 (88.6)
Dhaka	13.2 (17.9)	12.3 (19.1)	-22.5 (-22.5)	94.6	95.4 (94.8)	94.7	97.5 (97.2)
Khulna	-1.2 (-1.5)	-2.2 (-2.5)	-	90 3	100.0 (100.0)	93.9	100.0 (100.0)
Rajshahi	35.1 (33.4)	38.4 (34.3)	160.5 (160.5)	99.8	96.3 (93.9)	100.0	100.0 (100.0)
Non-Remote	10.9 (13.3)	9.9 (12.3)	21.2 (21.2)	94.0	98.2 (97.9)	95.0	99.6 (99.9)
Remote	28.6 (24.2)	29.3 (26.6)	-10.3 (-10.3)	85.3	89.4 (87.0)	90.5	89.7 (87.5)
Total	17.5 (17.5)	17.0 (17.6)	-10.2 (-10.2)	90.3	94.4 (93.3)	93.0	95.3 (94.5)

Figures for 1989/90 are percentage of number of sample cuts

Source for 1988/89 : IFDC 1988/89 Boro FLFUS.

Figures in parentheses are calculated with the estimates from 41 locations sample for 1989/90.

Table 6. **Farm-level Monthly HYV Paddy price and Changes in Boro Rice Production, 1986-1990**

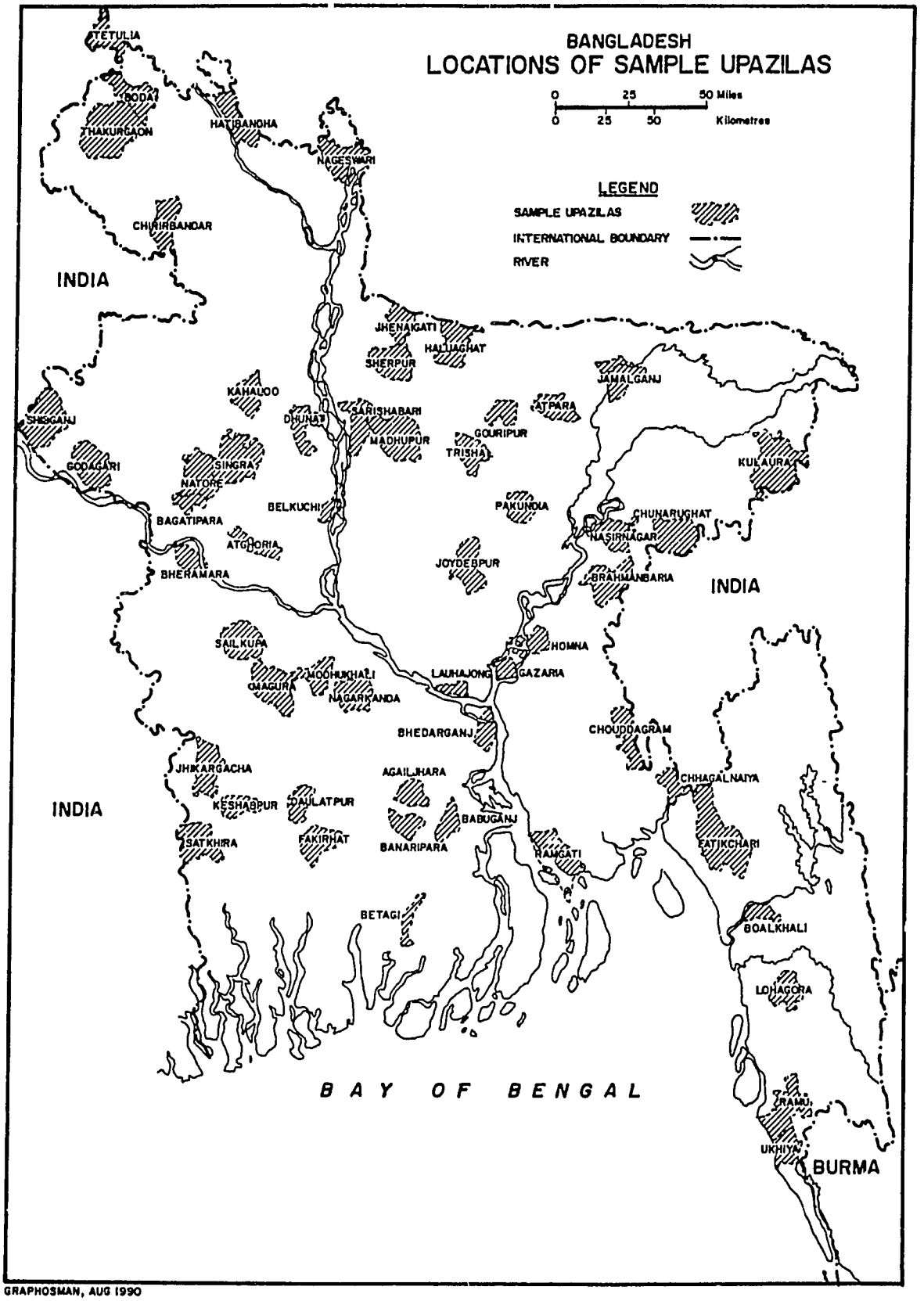
Month	1990	1989	1988	1987	1986
	(Tk/50 Kg)				
January	288	334	322	300	233
February	326	331	335	326	236
March	337	344	346	346	243
April	322	388	299	339	243
May	231	338	276	290	252
June	239	280	271	299	229
July		286	267	284	235
August		294	279	291	234
September		290	301	333	259
October		291	291	322	281
November		251	287	292	274
December		271	312	299	263
	(%)				
Change in price: Pre-harvest to Post-harvest[1]	-31.9	-27.8	-21.7	-16.2	-5.8
Boro rice production change from previous year	23.4	23.3	18.0	9.2	-6.1

Source :

Price, IFDC, Farmer's Survey Monthly Report, various issues.

Production, BBS, Monthly Statistical Bulletin in Bangladesh, March, 1990 and 1989 Statistical Yearbook.

1 For pre-harvest the higher price of March and April, and for post-harvest the lower price of May and June are used.



GRAPHOSMAN, AUG 1990

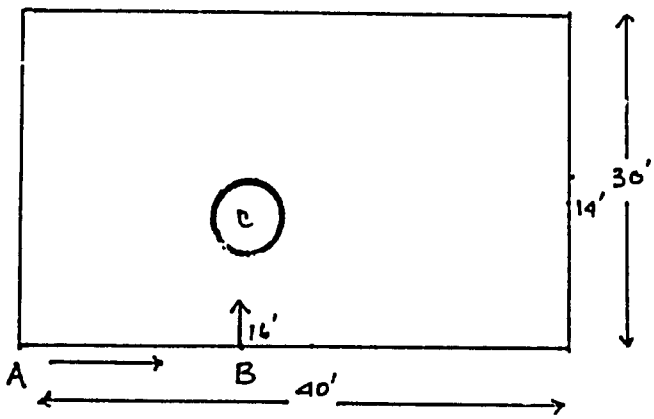
PROCEDURE OF CIRCULAR CROP CUT
(DETAILED INSTRUCTION MANUAL WILL BE FOLLOWED)

Step 1	Selection of the plot for crop cut.
Step 2	Random selection of the centre-for circular cut(Sketch 1, Appendix - III).
Step 3	Use of Crop Cut Materials(Sketch 2, Appendix -IV)
Step 4	Delineation of the inner most circle (2' radius) for first circular cut (Sketch 2a, Appendix - IV)
Step 5	First Circular harvest, threshing on turpulene sheet.
Step 6	Delineation of the second circle (middle circle) with 4' radius from the centre (Sketch 2b, Appendix - IV)
Step 7	Second circular cut (harvest of crop), threshing.
Step 8	Delineation of the third circle (outer circle) with 5.642' radius from the centre (Sketch 2b, Appendix - IV.
Step 9	Third circular cut (harvest of crop), threshing.
Step 10	Taking the green weight of three cuts(harvested crop) after cleaning the total quantity of harvested crop. Record the weight in data sheet.
Step 11	Taking sample of 1 kg. from the harvested crop and keep in the cloth bag and marked with code number (sample number by locations identification).
Step 12	Keep the sample crop for 10 days in the securely tied cloth bag and allow the crop inside to dry.
Step 13	On 10th day take another weight of the sample crop. Then on everyday take weight of the sample till the dry weight is stabilized.
Step 14	Write the required data in the record sheet (Appendix - IV). Convert the dry weight of 1 kg. sample into ton/acre by the factor 435.6 and to ton/ha by factor of 1076.4 and record in the data sheet.

APPENDIX-III

Sketch-1

Random Selection of the centre of the plot for circular crop cut



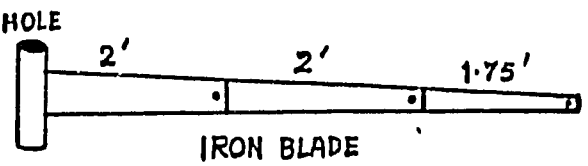
Start from point (A), North-west corner of the plot. Select a random number from the random table. The number should be more than 12 but less than 12 minus length as about 12 sheet diametre circular area is required for the crop cut. In this hypothetical case the number should be between 12 and 28 (40-12). Likewise another random number is to be selected for breadth of the plot. In this case it should be between 12 and 18. These two random numbers will be the axes to determine the centre of the circle for crop cut.

In this hypothetical case the random number for the length is 16 (i.e. 16') and that for breadth is 14 (i.e.14') taken from the random table. The centre of the circle has been determined as shown in the sketch above.

B is the point corresponding to the place for 16 feet along the length of the plot. Finally C is the point for 14 feet along the breadth of the plot which is also the centre of the circular cut.

Sketch-2

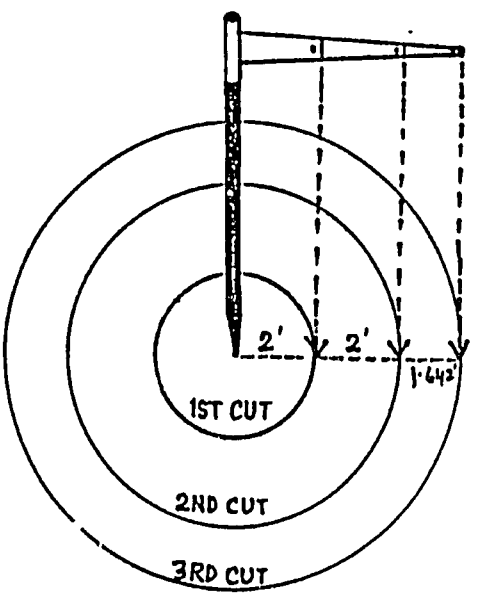
IRON PEG



List of Materials

Iron Peg. pole, blades etc.
Sickle
Turpulene sheet
Winnower
Cloth bag
Weighing scale
Nylon thread etc.

Sketch- 2a



Cut Area= 100 sqft.

Conversion Factors:

435.6 for ton/Acre

1076.4 for ton/Hectare

Sketch-2b

APPENDIX-V

Pilot Project on Crop Cut Experiment

Data Sheet

1. Crop Name ----------

2. Crop Condition ---------

Plot Identification

3. Location _____ 4. Code _____

5. Village _____ 6. J.L. No. _____

7. Farm Sample No. _____ 8. Name of Farmer _____

9. Plot No. _____ 10. Ownership of Plot ___

Farming Characteristics: 11. Variety HYV /Local

12. Irrigation Irrigated/ Non-irrigated

13. Fertilizer use: Yes/ No.

14. Farmer's Expected output of this plot _____kg.

15. Plot Size: 16. Length _____ 17. Breadth _____

18. Crop Cut Size 19(Radius) _____ 20. Cut Area_

Green Weight: 21. Inner Circle(first cut)_____kg.

22. Middle Circle(Second Cut) _____kg

23. Outer Circle(Third Cut) _____kg

24. Total _____kg.

Dry Weight of 1 kg. sample:

10th day _____kg. 11th day _____kg.

12th day _____ kg. 13th day _____ kg.

14th day _____ kg. 15th day _____ kg.

16th day _____ kg. 17th day _____ kg.

25. Stable dry weight of 1 kg. sample_____kg.

26. Per Acre Estimated Production 435.6x _____ kg. _____ton

Per Acre Estimated Production= 1076.4x _____kg _____ton

27. Persons present at Crop Cut 28. Date of Harvest _____

1.
2.
3.

Signature of Field Investigator_____Signature of Supervisor___