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MENNONITE CENTRAL COMMITTEE



AGRICULTURE PROGRAM

BANGLADESH
REPORT No. 14
1987

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AGRICULTURE PROGRAM

REPORT NO. 14

July 1987

1/1 Block "A", Mohammedpur
Dhaka -7, Bangladesh

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DEFINITIONS/ABBREVIATIONS

- aman - Rainy season rice crop, July - December
aus - Spring rice crop, March - June
bari - Bangladeshi homestead
bigha - Area measurement, one third of an acre
char - Newly formed land
dal - Local pulses
decimal - Area measurement, 1/100 of an acre
godown - Warehouse
ha - Hectare
HYV - High-yielding variety
kg/ha - Kilograms per hectare
LIV - Locally-improved variety
maund - Weight measurement, 82.2 pounds or 40 seers
mds - maunds
MLT - Multi-location trial
NGO - Non-government organization
PVC - Polyvinyl chloride plastic pipe
rabi - Winter (dry) season, November-April
seer - Weight measurement, 2.1 pounds
T-aman - Transplanted aman rice
t/ha - Tons/hectare
Tk. - Taka, Bangladesh currency, current exchange rate US \$1 = Tk.31

ACRONYMS

- ART - Appropriate Rural Technologies Project, Mennonite Central Committee
AVRDC - Asian Vegetable Research and Development Centre
BADC - Bangladesh Agricultural Development Corporation
BARC - Bangladesh Agricultural Research Council
BARI - Bangladesh Agricultural Research Institute
BAU - Bangladesh Agricultural University
BMDC - Bangladesh Management Development Centre
BRAC - Bangladesh Rural Advancement Committee
BRRI - Bangladesh Rice Research Institute
DANIDA - Danish International Development Agency
FPDC - Food Products Development Centre, MCC
GUP - Gono Unnayan Prochesta
HSP - Homesite Program, MCC
IDE - International Development Enterprises
IRDP - Integrated Rural Development Program
JCCIP - Joint Caritas-CRS Irrigation Program
LRP - Dutch Land Reform Project
MAWTS - Mirpur Agricultural Workshop and Training School
MCC - Mennonite Central Committee
RDRS - Rangpur Dinajpur Rehabilitation Services - a project of the
Lutheran World Service
RSP - Rural Savings Program, MCC
VERC - Village Education Resource Centre

INTRODUCTION

The Agriculture Program has undergone many changes since the first annual report was written fourteen years ago. Originally begun as a five-year project to increase the cultivation of crops during the dry season, the Agriculture Program now encompasses not only year-round agronomic and horticultural practices with small-scale farmers, but also includes work with rural women and landless groups.

Eleven years ago, then Director of MCC Bangladesh, Paul Myers, defined the long-term program objective as self-sufficiency for Bangladesh on the basis of nutritional requirements. Today, our objective is much the same. But the complexity of need in rural Bangladesh has demanded continued and increased efforts towards that objective. This is the fourteenth annual report of the MCC Bangladesh Agriculture Program, and covers our efforts from July 1986 to June 1987.

The major share of total Agriculture Program resources continues to be devoted to the extension of known and proven technologies to economically disadvantaged and socially disenfranchised segments of rural Bangladesh. The Extension, Homesite, and Rural Savings Programs are primarily extension-oriented activities, which promote profitable agricultural practices to subsistence farmers, activities for improved family nutrition to rural women, and cooperative savings and investment activities to the landless. Combined, these extension programs work with well over 2,000 Bangladeshis, fostering self-reliance in the process.

Both the Research and the Appropriate Technology Programs are dedicated to developing and adapting new technologies for use in our working area. Although cooperative work is performed with national research institutions and other development organizations, the primary thrust of these research programs is towards developing technologies which can be promoted through the MCC extension channels.

The Training and Administrative Services Programs fulfill the important role of supporting our research and extension activities. While playing a less visible part in the development process, these support programs are responsible for eliminating obstacles to efficient and effective development work.

So, while the number of programs and projects has increased over time, the unique contribution of MCC towards meeting the overall goal of nutritional self-sufficiency remains the same: adaptive research and effective grass-roots extension.

During the past year, program activities continued largely as planned, but expansion was limited as a consequence of budgetary restrictions. Projections made in the MCC Bangladesh five year plan (1987-1991) were adjusted downward to reflect these conditions.

Program spending limits notwithstanding, the Extension Program witnessed dramatic growth. The number of field extensionists grew from 19 to 31. This growth, combined with greater effectiveness from veteran extensionists, resulted in the growth of program beneficiaries to 1301 farmers, more than double the number of farmers worked with the previous year (562).

The Extension Program also increased its own non-agronomic research. Experiments with shrimp, poultry, and livestock were pursued by program staff, reflecting the need of marginal farmers for new, non-agronomic technologies for income supplementing activities.

The Soybean Project, administratively part of the Extension Program, reported a successful year, reaching the targets for 25 percent growth in each work area. With the promising experience with Pb-1, a variety from India, project emphasis is beginning to shift to utilization and marketing.

While the Homesite Program (HSP) staffing remained at last year's level, Homesite activities were expanded to cover eleven villages and 137 women. The process of improving family nutrition through homesite agricultural extension and health education was continued. Nearly three-fourths of participating women raised summer gardens and more than one-third raised winter gardens to HSP standards. Similarly, poultry vaccination by village women exhibited strong growth. Health and nutrition lessons were continued, and program results will be recorded for the first time next year, as groups begin to complete HSP training courses.

The Rural Savings Program (RSP) grew slightly to cover 56 groups and 684 group members. This growth was almost entirely in the women's sector, which experienced a 40 percent growth in the number of groups (the men's sector

remained the same). The program activities were maintained, albeit at a low level, despite continued staff turnover. The functional literacy program particularly suffered during the year. A definite highlight for the year was the development of a proper group formation process, which identifies specific stages in group maturation, thus identifying the necessary assistance and instruction required from RSP.

The Research Program continued efforts on three land-types, namely medium high land, medium low land, and char land. The link between MCC and national research institutions was strengthened by the secondment of Tom Ewert, an MCC volunteer, to the Bangladesh Rice Research Institute.

The Research Program also made major strides in reorienting its efforts towards MCC extension channels. Recognizing the need for a more diversified approach, the team agreed to replace the departing agronomist at the char site with an animal scientist. As a result of this change, cropping systems, or on-farm, research will be referred to as "farming systems research."

The Small-Scale Irrigation Project (a.k.a. Rower Pump Project) also experienced a name change, becoming the Appropriate Rural Technologies Project (ART). The new name reflects the intention to diversify the project's marketing effort. For the coming year (1987-88), vegetable seed distribution to general farmers is planned.

The past year witnessed a major reduction in program staff from fourteen to five, reflecting the need to streamline for efficiency. While sales also dropped, expectations remain high for increasing sales in the coming year.

The Appropriate Technology Research and Development Project (ATRD) was split off from ART, but remained administratively a part of the Appropriate Technology Program. ATRD pursued research on low-cost drinking water and sweetwater for the char pump technology, both drawing on original **rower** pump design. Cooperative work with the MCC sanitation project in Saidpur on developing a pit pump was also continued.

The Training Program was revived with the arrival of a volunteer to fill the leadership position. As a result, Agriculture Bulletins were begun again, and monthly Agriculture Meetings were made more regular.

The Training Program holds great promise for future contributions in the area of staff development.

All of the above activities and accomplishments were possible only with the support of the Administrative Services Program (ASP) staff. The ASP staff have a remarkable record for integrity, stability, and efficiency. It is only through the combined efforts of extension, research, and program support that the Agriculture Program can benefit the rural poor of Bangladesh.

Franck Wiebe

Agricultural Administrator

September, 1987

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EXTENSION PROGRAM

The Extension Program attempts to extend to farmers new technologies to improve their overall socio-economic status, to aid the wider effort of food production in general, and to provide a link between the MCC Research Program and the farmer.

To achieve these objectives the program works with both subsistence level and general farmers. The work with the subsistence farmers involves the contacting of individual farmers and working closely with them, while, with the general farmers, work involves the motivating of these farmers to grow and consume soybeans.

METHODOLOGY

Subsistence Farmers

In our effort to reach the poorer segment of the farming community, which is in keeping with the overall organizational emphasis of helping the poor, we have listed farmers and farm labourers who cannot meet annual food requirements from their own resources of land, capital and other assets. These farmers generally hire themselves out to other richer farmers and augment the income from their fields with the sale of physical labour. After these farmers are listed a complete inventory of their resources is made. When this is done, the extensionist can plan with the farmer to increase the returns from his land by introducing new technologies. The extensionist strives to develop a close relationship with the farmer and gain his confidence. Even as the plans are being drawn up on new cultivation techniques, the farmer is involved right from the start. Every new undertaking by the farmer is laid out as a project. Thus, the farmer can see, before he starts investing time and money, how much he is required to invest and how much he could possibly expect to earn from the project. By laying out the activity as a project, the farmer and the extensionist are forced to calculate and think over their moves.

Each farmer is kept in the program for four years, after which he is released. We believe that our present technology package is exhausted after that period of time.

A typical case would be to let the farmer know that his plot of land can be used to grow cabbage or cauliflowers in the winter. The extensionist would sit down and explain to the farmer as much as possible in detail the nature of the crop and its cultivation practices. He would then tell the farmer what it would cost to grow this crop and what the returns would be. After looking at the proposal, if the farmer is in agreement with the extensionist, the extensionist and the farmer would then proceed with the project. If, however, the farmer has doubts that the extensionist can not eradicate, he would then propose some other project for the farmer.

This work with the farmer would continue throughout the year, always attempting to give a higher paying crop option to the farmer. The extensionist is required to visit the farmer at least once every two weeks. However visits are more frequent for first and second year farmers than for third and fourth year farmers.

Soybeans

The extension program also extends soybeans, which is a protein-rich pulse or oil crop. This crop is extended to the more wealthy farmers who have larger holdings and are better disposed to taking risks. In this case, extensionists contact farmers and motivate them to grow soybeans. For those who are new, only a fraction of a field may be suggested as an acreage, amounting to .05 to .03 acres, or even only a row or two. The extensionist then tries to prove to the farmer that soybeans are a dependable crop. The extensionist also places trials/demonstrations in farmer fields with different varieties and also as a relay or inter-crop to demonstrate to the farmer the versatility of the crop.

Cooking demonstrations are held throughout the year in some locations, with emphasis during the harvesting and preplanting period.

The demonstrations are given by local women hired on contract, who visit every single bari in the village which grows the soybeans and, if time allows, the bari of the adjacent villages, demonstrating to the women and men the different recipes for soybeans.

In areas where there are no soybean cooking demonstrators, the soybean expert from the Food Products Development Center goes out to a village where 20-30 women are invited to demonstrate how soybeans can be prepared as palatable and tasty Bangladeshi dishes.

Farmer-Research Link

The program maintains extensionists in three locations, a medium high-land area, a medium lowland area and a Char-land area, where researchers put out trials and/or demonstrations in farmers' fields with technologies that seem to hold promise in that particular area. The extensionist puts out the trial or demonstration in the farmer's field as designed by a Research Agronomist, and collects data on the different aspects of the crop, in accordance with the agronomist's wishes. Demonstrations are also put out at other locations, with technologies that agronomists feel are good and stable enough to recommend to farmers.

ORGANIZATION

During this past year the Extension Program grew, with the addition of twelve new extensionists. There were also changes due to staff resigning from the program and for inter-program transfers and promotions.

Apart from this, the number of grade IV extensionists has been reduced from four to one. The services of one grade IV extensionist was terminated as the office and extension area was closed down, and another one was promoted to Program Officer, a grade V position. Another resigned due to health reasons. All these changes meant that there were fifteen new extensionists in the program.

RESULTSSubsistence Farmers

In our work with subsistence farmers, we worked with 1203 farmers last year, which was an increase of 214 percent over last year's total. The increase in the number of farmers is due to the increase in the number of extensionists. Each extensionist worked with average of 63 farmers. Up to last year, farmers with the program were categorized as 1-2 year old and 2-3 and 3-4 year old. This year they have been categorized as simple 1, 2, 3 & 4 year old farmers. Because of this some of last years 2-3 year olds have become reclassified as either 2 year old or 3 year old. As result, the numbers in some these categories will have increased or decreased.

Another change that has occurred this past year has been the way the sufficiency was being calculated. Before last year a month sufficiency meant the farmers monthly requirement of rice only, but last year the program used a taka figure of 250 per adult per month. All persons below 12 years of age were considered minors and two minors were calculated as one adult. This Tk. 250 per adult per month increased the sufficiency cost by about Tk. 50 to 60 per head per month and therefore the period of sufficiency achieved for each family was lowered.

Given below is a table showing the position of the program in relation to the subsistence farmers it worked with.

Duration of involvement farmers		0	1	2	3	4	5	6	7	8	9	10
Less than 1 yr	692	598	65	15	6	3	4	-	1	-	-	-
1 year old	193	163	20	5	1	4	1	1	-	-	-	1
2 yr old	221	170	28	10	4	4	2	-	2	1	-	-
3 yr old	81	31	20	18	6	1	4	1	-	-	-	-
4 yr old	16	4	2	3	5	1	-	1	-	-	-	-
Total	1203	566	135	51	22	10	11	3	3	1	-	1

Some demonstrations were done on target farmers' animals last year to demonstrate better cattle feeds to farmers. During the months of January to March 11 farmers were motivated to feed their cows/ bullocks fish meal as a source of protein. Of these 11 farmers' animals, 10 were milking cows which the farmers used for ploughing as well, and one was a bull calf that had been castrated.

Each animal was fed 120 gms of fish meal per day. After 25 days of feeding, all the animals showed signs of improvement evidenced in their increase in the milk output, and the general improvement in the animal's health.

This feeding has since been discontinued and now it is being observed if the farmers will continue the practice on their own. MCC had provided the fish meal free of cost to the farmers during the trial period and now maintains a stock for farmers if they wish to purchase the feed.

In our work with these farmers between July 1986 and June 1987, a total of 2362 projects were planned and planted with 908 farm families which produced a total of Tk. 5,13,376. Thirty field days were held extensionists and farmers. Of these thirty field days, one was for government extension workers and one for B.R.D.B. workers in the Laksham area to show them minimum tilled wheat fields. One field day was conducted for soybean growers and the rest for subsistence farmers. The subsistence farmers were taken on two occasions to the Research Station and the cropping system site on the char to see the things that were being tried out there, especially wheat, and all the others were to other subsistence farmer homesteads to show farmers the successful projects of other farmers.

Soybeans

A total of 325 acres of soybeans were extended in the districts of Chandpur, Comilla, Lakshmipur and Noakhali. The yields were good and, there being some sort of a market guarantee farmers were happy. Extensionists had visited farmers' homes to enquire about

how the soybeans were being processed for sale or storage. Many farmers are retaining their own seeds for use next year.

Research - Extension

With the intention of strengthening the research extension linkage a meeting has been arranged at regular intervals between the Research Agronomists and the Extension Program Officers. At these meetings concerns and ideas are shared. Multilocation tests of two kinds are now being put out by the extensionists in farmers' fields. Last year trials were put out in Lakshani, Chars Jabbar & Bata and the Bordin area. The M.L.Ts are increasingly going into smaller farmers' fields, so that the technology being evaluated or demonstrated can be so done for the benefit of the smaller farmer.

HORTICULTURE PROJECT

The Horticulture Project serves an advisory and accessory role to other programs of the MCC Agriculture Program. Horticultural crops have one of the highest potentials for increasing income from small fields; as well, they may improve nutrition. The target groups by definition are those of the programs serviced - essentially the subsistence farmers of the Extension Program and people of similar level serviced by the Homesite and Rural Savings Programs. The Horticulture Project also serves as a link between Research and the above extension-oriented programs.

Program components remain similar to previous years with a year-round vegetable cultivation program during winter, summer, and rainy season, seed multiplication activities for the Agriculture Program; fruit and spice seedling distribution, and improvement of homesite trees; and farmer nursery establishment.

WINTER VEGETABLES

Seed Situation

Periods of wet weather destroyed many seedbeds twice during planting season. The second rain also destroyed many transplanted plots (see below).

Additional seed was purchased after both setbacks, and 10 kg. of radish seed was also brought in as a stopgap crop as the second rain struck after the recommended seedbed date for cauliflower. A few tins of tomato seed were also purchased late in Dhaka, Comilla, and Feni. These late purchases of seed were costly as the entire country's stock of seed had run low after two seedbed failures.

In the rush of packaging these late orders, some untested seed was released for distribution. This may have been a possible cause of germination problems in cabbage and kohlrabi. The godown manager's responsibilities and the seed packaging system have been reworked to decrease the peak time load and improve quality.

Once again, seed of cauliflower 'Snowball A' could not be obtained for the 1986-87 season and so 'Early Snowball' was used. The small amount of multiplied TaiSai was quickly taken up. Farmers were encouraged to

save seeds from those vegetables with which it is possible: taisai, palong shak, and some tomato seed was saved by some farmers this season. A total of 10% of subsistence program farmers saved seed of at least one winter vegetable.

Total sales volume increased by 60% over 1985-86 season, and the proportion of subsidized sales increased greatly (26 to 44%). This reflects two replantings with limited seed, as priority was given to subsistence program farmers in the second and third issues of seed. This is also a cause of the disproportionately high amount of tomato seed sold (see below).

Crop Performance

Dry weather in September encouraged many farmers to set early seedbeds. Most seedbeds were ruined by long periods of rain and cloudy weather in late September and early October. Seedlings under plastic, while kept dry, became etiolated and were lost to damping-off.

A mild cyclonic storm struck November 8-9, bringing heavy rain (12 in. at Feni) and unseasonable flooding which destroyed at least 75% of transplanted vegetable plots and up to half of the later seedbeds. Many seedbeds had been re-set without plastic due to the lateness of the season. After this many cauliflower fields were replanted with tomato and radish as the season was by then already too late to replant cauliflower.

Field problems occurring later in the season included some variety mixture due to the rush on the packaging system after the failures. Seed of the trial tomato variety 'Freya' was submitted for a germination test; the variety later turned up in two farmers' fields (which incidentally yielded very well). A few tins of tomato 'Roma V.F.' purchased late in the season were treated with a red pesticide seedlings from this seed were often permanently stunted with curled leaves, lateral growth, and low yield. Application of excess pesticide to the seed was suspected. The symptoms persisted until harvest.

Disease problems in tomato were generally less than previous years, probably due to forced late plantings and careful field selection by extensionists.

Table 1: Winter Vegetable Seed Sales 1986 (Extension Program only)

Vegetable/Variety	Packet size (g.)	Sales		Totals	
		Subsistence (percent)	General (percent)	Packets (no.)	Weight (kg.)
Cauliflower Early Snowball	2	42	58	2699	5.4
Cauliflower Tropical 55	2	23	77	511	1.0
Cabbage KK Cross	2	47	53	910	1.8
Cabbage Atlas 70	2	42	58	1217	2.4
Kohlrabi White Vienna	2	21	79	512	1.0
Carrot New Kuroda	5	20	80	647	3.2
Tomato Roma V.F.	2	48	52	4558	9.1
Tomato Marglobe	2	32	68	2389	4.8
Radish Mino Early	10	90	10	832	8.3
Turnip Purple Top W. G.	2	35	65	200	0.4
Sweet Pumpkin	5	77	23	335	1.7
Sweet Pepper Cal. Won.	2	Ø	100	20	0.04
Palong Shak local	10	26	74	100	10.0
Yardlong Bean Kagong Notaki	25	45	55	176	4.4
Hyacinth Bean Bata	30	99	1	215	6.5
TOTALS		44	56	15,321	60

Note: Yardlong bean sales cover period from July 1 - October 1, 1986. Sales from December through June 30 are recorded with summer vegetables (Table 2).

However, bacterial wilt, early blight, and virus were seen in many areas with early blight a major problem in Hyderganj area. Much of the rest of the country was struck by a severe outbreak of late blight which only entered our work area, in Dhorkhora and Bordain, towards the end of the season.

In Bordain area several cabbage fields were heavily damaged by black beetles at soil level.

There was once again a late-season drought problem in the char. It was noted during field visits that organic mulch material seems to be abundant there but it is little used. There is potential for water conservation by that route.

'Early Snowball' cauliflower exhibited leaves among the curd in many areas this year, reinforcing longstanding complaints about the variety. Almost no molybdenum deficiency was observed this year, perhaps due to increased use of compost and cowdung; but more probably due to the scarcity of cabbage and cauliflower in general due to the rains.

The market flooded in Bordain area with cabbage and cauliflower, and in the char with tomato at peak harvest time. This was the first time market saturation of cabbage and cauliflower has caused a financial loss in our work area. This was probably due to the harvests of many plots which, planted together after the last rains in November, also ripened together at once. It may portend problems in the future as vegetable cultivation continues to increase.

Trial Varieties

The tomatoes 'K-7' and 'Manik' (both believed at the time to be approved for extension, 'K-7' was later found not to be) were tested in demonstration gardens and farmers' field trials this season. Farmers responded with ambivalence. 'Manik', while free of bacterial wilt, had some fruit quality problems, such as uneven shape, tendency to split, and light in weight. Reports of wilt may in fact be due to confusion of fungal with bacterial wilts. Neither variety was seen as superior to the extended varieties. In a year with universally late planting, the disease tolerance of the new varieties were probably not fully demonstrated. 'Manik' thus remains slated for limited extension in the 1987 season.

A farmers' field trial with bush bean 'June Green' and sweet pea 'Green Feast' had most replications destroyed by the late rain. The results from remaining plots were good, and 'Green Feast' may be included in extension this coming season.

The local eggplant 'Sing Nath', tested heretofore as a rainy season vegetable, has shown itself to be a promising winter crop. One farmer in Laksam is still harvesting from plants over a year old, with the highest yield in the winter. A packet of cauliflower 'Snowball Y' from Comilla was tested in the Bordain demonstration garden. The yield was poor and very late.

Training

Extensionists conducted a total of 6 farmer group trainings in winter vegetables. No school programs were conducted.

Two days of trainings were presented on winter vegetables by the Vegetable Crop Specialist and the Horticulturist to each of 3 groups: Extension staff, RSP and HSP staff and Rower Pump staff. This year's training included new material on soil ecology, soil organic matter, and pest prevention all of which are useful year. Also, slides of diseases and nutrient deficiencies and an insect pest collection were used for the first time. All of the training handouts were revised to include new information and to change all units to metric. Also the Vegetable Cultivation Calendar was distributed to Extension, Research, RSP, HSP, and Rower Pump Programs in November 1986.

Seed Purchases for 1987

Seed orders for 1987 winter season are in process with two dealers in Dhaka. 'Snowball A' cauliflower has been obtained. About 14 kg. of seed was left over from last year and is in cold storage, as well as seed of taisai, palong shak, and sweet pea multiplied for extension (see Table 3).

Fifty winter-grown pumpkins were purchased in May near Comilla for seed, yielding 3 kg. of seed. About 24 kg. of 'Bata' hyacinth bean seed has just been bought in Sitakundi for immediate planting.

SUMMER VEGETABLES

Seed Situation

Summer vegetable seed sales volume (see Table 2) dropped somewhat from the previous year with a notable shift toward subsistence farmer sales. This mostly reflects limited seed supplies with priority going to listed farmers. Hopefully, sales can continue to drop as more and more farmers begin saving their own seed. Also a considerable amount of seed was taken by the expanding RSP, HSP, and Research Programs, which in some cases, limited the seed available for Extension. Because these programs are also engaged in general seed sales the priority hitherto granted them in seed allocation is being reconsidered.

Extension plantings were deliberately delayed until February 1987 for most varieties due to poor germination in cold weather. Some early plots were set by pregerminating the seed under warm conditions, some using cowdung, which gave good results.

Farmers have been strongly encouraged to save their own seed from MCC-extended summer vegetables to reduce dependency and the need for an ever-expanding seed multiplication program. An average of 17 percent of subsistence program farmers saved seed from at least one variety this past season.

Crop Performance

Heavy storm rains and flooding in April destroyed a large number of plots, particularly cucurbits. The fruit borer problem continues to be severe in the summer season. Also, beetles were an important cucurbit pest in the char and Bordain.

Due to better moisture conditions, yellow vein mosaic virus of okra was not severe, and most plots yielded profitably. Marginal yellowing and cupping of new growth (distinct from virus) was observed in many okra plots and is believed to be caused by nutrient deficiencies. Yardlong bean mosaic virus was not abundant either, but did appear in Bordain and Char Alexander.

Table 2: Summer and Rainy Season Vegetable Seed Sales 1987

(Extension Program only)

Vegetable/Variety	Packet size (g.)	Sales		Totals	
		Subsistence (percent)	General (percent)	Packets (no.)	Weight (kg.)
Kangkong	30	43	57	684	20.5
Indian Spinach local	10	49	51	1518	15.2
Bitter gourd Comilla local	5	41	59	1652	8.3
Snake gourd local	5	58	42	639	3.2
Ridge gourd local	5	69	31	153	7.7
Cucumber local	3	42	58	1639	4.9
Okra Pusa Sawani	30	50	50	1434	43.0
Yardlong bean Kagong Notaki	25	44	56	2007	50.2
Amaranth (data shak) local	2	69	31	471	0.9
Pumpkin - rainy season var.	5	83	17	54	0.3
Black chilli	2	98	2	63	0.1
TOTALS		48	52	10,324	154.3

Note: Sales of yardlong bean and okra will be continued through September.
This table covers through June 30, 1987.

Training

No school programs and only 9 farmer group trainings were conducted by extensionists in summer vegetables this year.

A one-day summer vegetable training session was conducted for Extension, RSP, HSP, Research, and Rower Pump staff on three separate dates. This training also included revised handouts and new materials. A training was also presented to World Vision International staff on summer vegetables and general information and soil/compost management.

Trial Varieties

Trials were conducted with two lines (CU 2110 and CU 2205) of African-origin okra obtained from Dr. Md. Salehuzzaman of Chittagong University. Multi-location trials and demonstration garden plots show that the new okra, while 100% virus resistant, has other agronomic problems, mainly slow germination and long season to fruition. Taste was the same as other types. CU 2110 has done better than CU 2205; the seed multiplication plot of CU 2205 has been abandoned due to very poor yield. Continued research in cooperation with Dr. Salehuzzaman is being planned, though the issue of release remains an obstacle to extension.

RAINY SEASON VEGETABLES

Considering the constraint of available high land, there is currently potential for diversified rainy season vegetable cultivation (and therefore year-round vegetable cultivation) for our farmers. At least seven vegetables are currently promoted for rainy season cultivation: amaranth (data shak), pumpkin, black chilli, kangkong, Indian spinach (pui shak), okra, and yardlong bean. The planting season for yardlong bean was extended to September 30 for the first time last year. Farmers were pleased with results from these later plantings which avoided the worst of virus and insect problems.

Of the teasel gourds (kakrol) extended through 1986, only a few have yielded enough fruit to market. Few of the potol vines brought last year survived their first year.

Some projects with taro (kochu) grown for runners and leafstalks were also planned for rainy season harvests. Farmers are pleased with the income, and taro, like kangkong, can grow in standing water.

A small-fruited local tomato discovered in 1986 rainy season was multiplied and a small plot is giving promising yields in one demonstration garden. The fruit, though small, may bring high prices if marketed long before the main tomato season. Further research and multiplication are planned.

SEED MULTIPLICATION

Snake gourd and ridge gourd harvests were completed in July 1986, yielding 7.2 kg. snake gourd and 2 kg. ridge gourd seed for use in 1987. Seed multiplication results for the 1986-87 season are shown in Table 3.

Table 3: Vegetable Seed Multiplication 1986-87

Vegetable/Variety	Seed left from previous season (kg.)	Production (kg.)
Kangkong a		30.1
Indian Spinach local a		0.3
Bitter gourd Comilla local c	16.25	12.0
Snake gourd local c		13.6
Ridge gourd local c		11.7 NC
Cucumber local c	2.3	13.3
Okra (spring) Pusa Sawani c		90.8
(fall) a		57.7
Yardlong Bean (spring) Kagong Notaki c		14 NC
(fall) a		69.2
Bush bean June Green b	10.0	19.0
Palong shak local b		20.0
Tai Sai b		3.0
Sweet Pea Green Feast b		3.0
TOTAL PRODUCTION		300.0 NC

NC - Harvest not complete as of July 25, about 50 kg. more yardlong bean projected.

a - Grown from June-August 1986 planting and sold immediately after harvest in early 1987.

b - Grown in winter season 1986-87 for use in 1987-88.

c - Grown in summer season 1987 for use in 1988.

Among winter vegetables, taisai and palong shak were multiplied with contract farmers for the first time because the vegetables are in high demand. Both yield seed readily, so farmers can save their own once introduced. A small plot of 'June Green' bush bean was also set to maintain the germplasm.

Early planted cauliflower 'Tropical 55 Days' was found to flower and yield seed. Research on the second generation plants has shown equivalent yields, only slightly larger heads, and slightly later maturity compared to new seed. Research should continue for another generation or longer to determine varietal stability.

Multiplication is also being considered for tomato 'Tropic' which was extended several years ago. 'Marglobe' was added to the program when seed of 'Tropic' became unavailable from importers, even though it is an approved variety. A few plants were grown from an old packet of seed and the seed was retained from all the fruit this past season. The plants were true to type and yielded well.

The okra and yardlong bean multiplication plots set in August-October 1986 yielded well without insect or disease problems. The cost of production per kg. of seed was lower by about 15 taka as compared to summer season planting. Also, more flexibility is added for increasing late seed sales. The program is to be repeated this year.

The Horticulturist and Vegetable Crop Specialist visited the seed multiplication project of A. R. Malik (a Dhaka seed importer) in January 1987. Several different vegetables were observed, and new ideas were obtained for research.

Table 3 shows production figures for 1986-87, plus the amount of seed stock currently in storage from the previous season. Indian spinach was largely grown from leftover seed from the 1985 season, as was much of the bitter gourd. Production goals and areas have not been shown, because for many varieties, considerable seed comes from demonstration gardens, multilocation trial plots, research stations, and other farmers' fields grown from MCC seed but not under the contract multiplication system.

Overall seed production increased over 50 kg. from the previous season, but was still lower than 1985. However, the number of varieties and seasons have increased and many multiplication plots are now being set with subsistence program farmers, greatly increasing the number of plots and the management required.

The overall MCC Agriculture Program demands for multiplied vegetable seed have increased since the beginning of the program (HSP demand alone increased five time from 1986 to 1987) to the extent that new plans to reallocate the required personnel time within Extension Program for seed multiplication will soon be necessary.

FRUITS AND SPICES

Distribution Program

The results of the fruit and spice distribution program in 1986, which was not completed until July-August at some offices, is shown in Table 4.

Five airlayers of the Thai guava variety 'Kazi' were brought from BARI for distribution to nursery farmers as mother plants. This variety has given single fruit weights of over 1 kg. in BARI trials.

Table 5 shows the results of the 1987 distribution program, which was completed quickly due to the simultaneous use of two vehicles and drivers and the fact that only outside-origin plants were distributed. The remainder of the demand was expected to be met from each office area's farmer nurseries. Of the plants still at the offices, some may yet be sold. Any remaining will be sold to the nursery farmers for resale next year. More than 200 additional plants have gone to subsistence-program farmers directly from the farmer nurseries so far this season and sales are still in progress.

A trial was also set at the Dhorkhora research site with cinnamon, bayleaf, and black pepper to determine survival under controlled conditions. A survey taken July 1 showed that an average of 50 percent of those planted in May were already dead. Either the plants are in poor condition as received or are damaged too much in transit. Thus, a decision was taken to close the distribution of these costly, outside-origin plants. All other seedling requirements were met from the farmer nurseries.

Table 4: 1986 Fruit and Spice tree Distribution compiled October 1986

(Extension Program only)

Tree Species	Variety	Type of plant	Total delivered to offices	No. died at offices	still at offices	Subsidized sales	General sales
Litchi	China No. 3	Air layer	474	64	52	193	165
Bayleaf	local	Seedling	681	83	35	271	292
Cinnamon	"	"	522	57	36	210	219
Black pepper	Malaysian	Cutting	457	52	50	117	238
Lemon	Kagozi	Seedling	247	16	57	63	111
Guava	Fotiya	"	50		34	15	1
Amoloki	local	"	145	5	47	82	11
Wood apple	"	"	25	8	2	7	8
Hog plum	"	"	144	12	16	66	50
Bulls heart	"	"	21	1	11	9	0
Papaya	Various	"	44	10	9	25	0
Totals			2810	308	349	1058	1095
% of total			100	11	12	38	39

Table 5: 1987 Fruit and Spice tree Distribution

Compiled June 1987. Extension Program only.

Species	Variety	Type of plant	Total delivered to offices	No. died at offices	Still at office	Subsidized sales	General sales
Litchi	China No.3	Air layer	449	53	40	254	102
Bayleaf	Local	Seedling	620	119	95	271	135
Cinnamon	Local	Seedling	520	43	109	230	138
Black Pepper	Malaysian	Cutting	262	25	5	145	87
Totals			1851	240	249	900	462
% of Total			100	13	13	49	25

Homesite Tree Improvement

Based on available records, at least 275 jujube buds were set in 1987 on about 125 trees; most in subsistence program homesites. 55 percent of these were successful. Some of the tree budded in the first year of the program (1985) are beginning to set fruit.

Close to 250 banana suckers were sold from homesite where bananas had previously been set. A few of these went to other subsistence farmers but in general the suckers brought prices beyond their reach. Farmers are generally pleased with the performance of the variety 'Shagor'.

Nearly 100 coconut trees are currently receiving chemical fertilizer in subsistence farmer homesites. Some visual improvement has been noticed in some of these.

Training

Trainings were conducted by the Fruit Crop Specialist at the March and April Ag. Meetings on jujube budding and seedling site selection, planting, and aftercare. This training was more thorough than any previously given and included a newly written set of handouts.

FARMER NURSERY PROJECT

A total of 15 farmer nurseries are currently in operation. Six of these have become functionally independent of MCC although some inputs of seed (paid for by the farmer) may continue. From this season on, each office area's demand for seedlings is to be met by that area's nurseries. Records in this report include both independent and new nurseries; subsequent reports will not submit counts of trees or accounts for the independent nurseries.

Sales information from the 1986 season is presented in Table 6. This information is obtained in October of each year after the end of sale season. A survey of the total plants in the nurseries before sales began this season is presented in Table 7.

In 1986, nearly 29,000 plants were purchased by the MCC Food-For-Work Program at a rate of 1 Tk./plant from 8 of the nurseries. These are the large numbers of mahogany, sissoo, koroi, babul, and ipil-ipil recorded in the first column of Table 6. The remaining plants in the first column were bought back by Extension Program for inter-office distribution.

Total sales from the 12 nurseries in 1986 totalled Tk. 64,317 of which Tk. 30,699 represented Food-For-Work and Extension Program buyback. There was, as of October 1986, only Tk. 229 outstanding loan to MCC for seed, plastic bags, and rower pumps from all of the nurseries. Nursery farmers are progressively gathering more of their own seed and some are making their own bags from roll plastic.

The Fruit Crop Specialist presented a training on farmer nursery management to the extensionists before planting season in March. A new set of hand-outs was prepared for the training.

Table 7 shows over 37,000 plants set for the Food-For-Work program this year. The varietal choice was based on a preliminary survival survey done in December and January. Since then, the ratio has shown much better results for ipil-ipil and sissoo (which were dropped from the plans after the first survey).

OTHER ACTIVITIES

As of summer season 1987 an average 27 percent of subsistence program farmers are making some form of compost, about the same as last year. One office area recorded 75 percent of listed farmers making compost. At least one farmer used latrine-origin compost this past winter season and reported a good yield of cauliflower. This prompted the issue of a memo in January 1987 on the safe use of human wastes as fertilizer. Nightsoil represents one of the last free untapped organic matter resources left.

The Vegetable Cultivation Calendar was distributed to many Agriculture Program staff in November 1986 and continues to bring good comments. Other NGOs are also beginning to realize its usefulness.

Work has continued on improving the efficiency and accuracy of seed packaging, including printing labels by stencil rather than stamp pad. It was also discovered that measurement of seed by volume with small vials is as

accurate over large amounts of seed as is weighing each packet volume measurement is quicker, saving program labor costs.

The collection of slides of diseases and nutrient deficiencies and alcohol-preserved insect pest specimens for training purposes continued throughout the year.

Progress has continued on the compilation of information and slides of local edible wild plants. The total count is roughly 60 species. A handbook on these is nearing the rough-draft stage and may be completed by 1988. Wild edible plants, especially leafy greens, represent an extensive and underexploited source of nutrition.

Table 7: Seedlings in Farmer Nurseries; June 1, 1967

<u>Species</u>	<u>No. of plants</u>
Siristi koroi (<u>Enterolobium</u>)	17,790
Mahogany	6,114
Babul (<u>Acacia</u> - 2 spp.)	13,328
CHAR ROAD SUB TOTAL:	<u>37,232</u>
Siristi koroi	270
Shil koroi (<u>Albizzia lucida</u>)	702
Mahogany	1,803
Sissoc (<u>Dalbergia</u>)	555
Ipil-ipil	58
Teak	1,653
Guava	1,816
Lemon ('kagozi')	1,180
Lemon (seedless)	50
Pommelo	250
Orange	116
Sweet Lime	25
Hog Plum	1,174
Jackfruit	835
Wood Apple	718
Carambola	50
Papaya	1,635
Coconut	162
Krishnachura (<u>Delonix</u>)	349
Betel nut	565
Custard Apple	150
Pomegranate	41
Jolopai (<u>Elaeocarpus</u>)	510
Davia (?)	16
Gab (<u>Diospyros</u>)	12
Arjan (<u>Terminalia</u> ?)	473
Shalta (<u>Dillenia</u>)	100
Litchi	200
TOTAL NON ROAD:	<u>15,548</u>
GRAND TOTAL:	<u>52,780</u>

(For additional name clarification, see Table 8 at the end of this report.)

RESEARCH SUMMARY

For more detailed information on the vegetable research results, consult the 1987 MCC Agriculture Program Research Results, available from MCC Bangladesh upon request. The following trials were conducted at the Feni Research Station.

Bittergourd

A trial was conducted to see how bittergourd responds to planting date. Of particular concern was the difference in fruit borer attack between planting dates. Planting dates were spaced three weeks apart beginning on 15/12/85. None of the planting dates escaped fruit borer attack. Only two of the 32 original seedlings from the first planting date survived. The planting dates 6/1/86 and 27/1/86 resulted in the highest yields (a3.40 t/ha and 10.88 t/ha, respectively). These two planting dates, it should be added, are not included as MCC Vegetable Calendar recommended planting dates for bittergourd, whereas, the 17/2/86 planting date is included, but yielded only 3.96 t/ha.

Cabbage

Late-planted cabbages in Bangladesh are known to produce smaller heads. An observation trial was undertaken to test two plant spacings: One at the normal 60 cm plant, 45 cm row spacing and the second at close spacing, 40 cm plant and 30 cm row, using the variety Atlas-70. The hypothesis was that the close-spacing would make up for the smaller head size, and good overall yields would still result. This proved true, and the close-spaced cabbages out yielded the "normal" spaced cabbages by nearly 29 t/ha (close-spaced yield was 79.0 t/ha and normal spacing yield was 50.20 t/ha). The smaller sized close-spaced cabbages sold on the market at 1.5 taka/head for the larger cabbages from the normal spaced treatment. Economic analysis demonstrated a better return for the close-spaced cauliflower treatment.

Cauliflower

A limiting fertilizer trial was conducted with Early Snowball, one of MCC extension program's important cauliflower varieties. Early Snowball responded the strongest to urea application (nitrogen), which essentially

doubled the yield compared to treatments not receiving this important nutrient. There was no response to application with phosphorus (via TSP) or potassium (via muriate of potash). Significant differences in yield resulted. The top yield (33.95 t/ha) and largest average weight per head (815 g/head) arose from the treatment receiving 80-0-110-30 (nitrogen-phosphorus-potassium-sulphur in kg/ha). Marginal economic analysis revealed a marginal rate of return of 2158% for this treatment, meaning for every additional taka spent above the variable costs for the next best treatment (80-0-0-30), a return of taka 21.58 could be expected.

Hill placement versus broadcasting of cowdung (or compost) beneath vegetable crops is recommended by MCC extensionists. In hill placement the fertilizer is mixed with soil directly beneath the vegetable plants. Four treatments of cowdung fertilizer for Early Snowball cauliflower were tested: broadcast at 10 and 20 tons/ha, and hill placement at 10 and 20 tons/ha. No significant differences occurred for yield, but the average of the two doses hill-placed was 42.9 t/ha versus a 35.2 t/ha average for the broadcast treatments, respectively. The average weight per head was, however, significantly larger for the hill placement treatment. This indicates that farmers may potentially gain favourable profit/yield from more effective placement of cowdung fertilizer. More research is needed.

In a cauliflower variety trial, Early Snowball had significantly higher yield and average head weight than all other varieties tested (36.52 t/ha and 880 g/head). However, maturity was 25-30 days later than the other varieties. This, along with the good performance of Snow King (yield of 24.75 t/ha, and 30 days earlier than Early Snowball) corresponds with results from previous years. MCC-produced Tropical 55 Days seed was stored for one year and compared with imported seed of the same variety. The yields were not significantly different but the MCC seed had a significantly larger head diameter and took five more days to mature.

A late-planted cauliflower observation trial using the variety Early Snowball resulted in smaller head size, but higher yield, for plants spaced close together (30 cm plant to plant, 40 cm row to row) compared to a treatment with plants spaced 45 cm apart and rows spaced 60 cm apart. Yield for the close-spaced cauliflower was higher, (34 t/ha), than for the other (MCC-recommended) spacing (28.4 t/ha).

Green (bush) bean

A cowdung fertilizer trial was conducted to compare green bean responses to 5, 10 and 20 t/ha of well-rotted cowdung. Significant differences in plant height were noted between each cowdung treatment; with each increase in cowdung application, a significant increase in plant height occurred. Treatment differences for yield were significant at the 10 percent level. The 5 t/ha cowdung treatment resulted in the highest yield, 50 kg/ha (dry bean). Further research will not continue with green beans, since the extension program is not extending the crop at present.

Tomato

In a Bangladesh Agricultural University (BAU) Cooperative Zonal tomato trial, coordinated by BAU, maturity date, wilt resistance and yield were of most interest. Roma-VF (an MCC extension variety) and BAU/TM003 yielded the best, 60.34 t/ha and 55.75 t/ha, but also lost the most plants to bacterial wilt disease. The varieties Manik and Raton had the best resistance to the wilt-causing organism, but also yielded among the lowest. Days to maturity (ripe fruits) were comparable for all lines tested.

In an observation trial of important Bangladesh tomato varieties, Manik withstood wilt attacks the best, and Raton the next best. As the trial above suggests, however, overall yield may be higher for certain varieties despite their greater susceptibility to the wilt-causing organism.

In a tomato cowdung placement observation trial, the difference in yield was only slight - 65.97 t/ha for hill placement versus 63.48 t/ha for the broadcast treatment.

Yard-long bean

The MCC extension program recommends planting dates of mid-December to mid-August for yard-long bean. Thus, a four month period is not, supposedly, practical for planting this vegetable. A major problem with summer season yard-long bean production is the beanfly which can attack and kill the plant at any stage. An observation trial was set up to see if certain planting dates could escape beanfly infestation and produce good yield. Planting dates were at three week intervals starting on December 12, 1985. Regard-

less of planting date, beanfly caused considerable damage to the plants. All plants also suffered from yellow mosaic virus. The mean yield of the four planting dates was 2.18 t/ha. Maximum yield (2.51 t/ha), occurred for the January 6, 1986 date.

A second date of planting observation trial was set up, this time for the entire year. This trial was begun on April 7, 1986 and continued (with three week intervals between plantings) until April 20, 1987, on a high-land plot. For many of the planting dates, yard-long bean did not produce any yield. Beans planted on April 7 and 28 were damaged by early rains, while beans planted on June 30, August 11, September 9, and September 22 were damaged by monsoon rains. Except for the June 30 date, no yield was obtained from any of those planting dates. Beans planted in December, January, February and March produced poor, insect, yellow mosaic virus and bean rust damaged plants; especially the latter two diseases were very damaging. Beanfly larvae were a problem from December into February. Planting dates that resulted in viable yields included: 19/5/86, 30/6/86, 21/7/86, 13/10/86, 3/11/86 and 24/11/86. Maximum yield for those planting dates was 6.41 t/ha (on 13/10/86), but the mean yield of the other planting dates was only 1.19 t/ha. These date of planting results indicate that yard-long bean may, potentially, be planted in October and November; however, high yields should not be expected for these dates.

Feni Rabi Vegetable Seed Treatment Trials

Ants create a problem in rabi seed beds, carrying away seeds. Three different insecticidal treatments were used to coat seeds prior to planting in the seedbed. The three insecticides were neem leaf extract, tobacco leaf extract and furadan (a commercially available insecticide). The first planting date was washed out by rains. The second plantings involved seed of tomato, cabbage, and cauliflower. Pressure from ants, the major seedbed insect problem, was reduced by this time. As such statistical differences in treatment effect were not noted, next year, this trial will need to be tried again with earlier, and several, planting dates.

CONCLUSION

A year-round vegetable technology package now exists for Noakhali subsistence farmers. The farmer nurseries have been very successful and should become a major factor in meeting the high demand for fruit and other tree seedlings throughout the work area. Other organizations have begun to take note of MCC's technical expertise, especially in vegetables. The use of the Vegetable and Fruit Crop Specialists for outside trainings promises to be an increasing trend of the future, in keeping with a longrange planning goal to that effect.

Table 8: English, Bengali, and Latin Names of Selected Plants

This table is meant to be an addendum to Table 7 in the corresponding section of the 1986 Annual Report; including new plants mentioned in 1987.

English	Bengali transliteration	Scientific Name	Family
(Fruits and Nuts)			
Indian Olive	jolopai	Elaeocarpus floribandus	Elaeocarpaceae
--	gab	Diospyros peregrina	Ebenaceae
(Timber Trees)			
Arjuna	arjan	Terminalia arjuna	Combretaceae
(Flowering Trees)			
--	chalta	Dillenia indica	Dilleniaceae
Royal Poinciana	krishnachura	Delonix regia	Leguminosae

(These are all plants in the farmer nurseries - see Table 7)

SOYBEAN PROJECT

MCC's work with soybeans continues to address the steady decline in pulse cultivation and the corresponding decrease in protein consumption in Bangladesh. With equal inputs soybeans can produce two to three times the protein of other pulse crops on the same land area. Therefore, soybeans are a very cheap source of high quality protein. The other nutrients also found in soybeans, such as edible oil, vitamins and minerals, are added benefits of increased soybean production and utilization.

Soybean production and utilization is promoted through the MCC Soybean Project. Agronomic research is done in conjunction with the MCC Agriculture Research Program. Under the MCC Job Creation Program, the Food Products Development Centre (FPDC) tests soyfoods and "The Source" markets soybeans in Dhaka.

The primary extension efforts are concentrated in and around Lakshmipur, Noakhali and Comilla districts, where farmers planted 138 hectares (340 acres) in the 1986-87 rabi season. Seed for this crop is produced in and around Chuadanga district where farmers cultivated 57 hectares (140 acres) in the 1986 kharif season.

This increase in area can be credited primarily to the encouraging results farmers received the previous year with the Indian variety Pb-1. In the past rabi and kharif seasons, despite heavy rains during harvest, Pb-1 performed well and proved its ability to tolerate adverse field conditions. Farmers in both locations were impressed with the yield and quality of the soybeans they harvested. With an increased effort to provide a ready market for their soybeans, farmers seem eager and able to increase soybean production substantially in the future.

KHARIF SEASON (Chuadanga)Seed Contracts and Sales

There was a strong demand for seed production contracts and all 80 hectares (200 acres) were spoken for well before planting time. Planting began in mid-June and continued until mid-August, and totalled 57 hec-

tares (140 acres). Some farmers did not plant for one or more of several reasons, including post-election disturbances, loans given for peanut cultivation, and lack of cash.

Seed was sold through a dealer in Darsona, an MCC extension office in Amjupi, and the main MCC office in Chuadanga. Previously all farmers had to buy seed from the Chuadanga office. Sales were spread well across the two months available for planting. Plenty of high quality seed (Pb-1 variety) was available. This seed was harvested the previous rabi season (April/May) in Noakhali.

Included in the 80 hectares of seed contracts were contracts for 8 hectares (20 acres) of Bragg seed. Bragg seed had been kept from the previous year's kharif season multiplication. Even though the seed was kept in cold storage, most of it had deteriorated to an unacceptable level for sale to farmers. Consequently, farmers planted only 3 hectares (8 acres) of Bragg.

Agronomic Observations

Stand Establishment: Plant populations varied greatly. Farmers were recommended to plant as follows:

<u>Planting date</u>	<u>Row Spacing</u>	<u>Seed Rate</u>
June 1 - 30	45 cm	8 kg/acre
July 1 - 15	38 cm	10 kg/ "
July 15 - Aug. 15	30 cm	12 kg/ "

Spacing between plants within rows was kept at 5 cm on all dates. Several fields, particularly those planted in late June, had severely reduced plant stands due to heavy rain and rabbit damage immediately after planting. It became obvious that these fields with reduced stands could easily compensate for the poor stand and that field with the recommended plant stands would be overpopulated (they lodged later in the season).

Further research will need to be done on plant spacing within rows. It was felt that row to row spacings were good but spacing between plants, at least on the early planting date, could possibly be increased to up to 10-15 cm. Planting in August should be done with 30 cm between rows and 5 cm between plants. For early planting dates, the seed rate should

not be changed, but that thinning at 20 days after planting would be best, as heavy rain combined with a low seed rate would result in below optimal plant stands and a loss in yields.

Plant stands of Bragg, which was planted in late July, were good.

Insects and Diseases: There were only a few reports of hairy caterpillars this year and farmers were able to control them easily. Girdle beetles continued to be a threat and damaged up to 10% of the plants in some fields. Control by systemic insecticides may be essential in the future.

As Pb-1 is not resistant to bacterial pustule, that disease was common in most fields, but yield losses were not considered serious.

Pb-1 is moderately resistant to yellow mosaic virus (YMV), which was seen in only a few fields. It is important that future varieties are also resistant to YMV. India is currently doing the best work on YMV resistance.

Heavy rains in early November, when Bragg was still in the field, resulted in serious seed disease problems and very poor quality of almost all the Bragg seed. Pb-1, which was in the field at the same time, did not show serious seed quality problems, despite the poor conditions. Heavy rains through mid-October, also did not affect the seed quality of Pb-1 which was maturing in many fields at that time.

Seed Production

Yields, calculated from buyback and what farmers said they had remaining in their bars, were 820 kg/ha. Yields of Pb-1 from the farmers variety trials were 1,780 kg/ha. There are many possible reasons for this discrepancy. One important problem is that many farmers under-report the amount of soybeans they keep for personal use for fear they will in some way be penalized if they don't sell all they produce to MCC. This was confirmed by businessmen who bought seed for MCC. A more realistic yield estimate would be 1,000 kg/ha. Estimated yield losses in many fields were between 10-20% (some up to 50%) in late September and early October. Water remained standing in some fields for the last several weeks of growth and maturity, while many fields were saturated for that same period.

Total seed purchased was 37,451 kg Pb-1, 194 kg Bragg and 4,221 kg non-seed. After separating, 15,199 kg of seed quality Pb-1 was transferred to non-seed.

Cropping Pattern Survey

A survey was conducted to determine how soybeans fit into the local cropping pattern. Thirteen different patterns were reported and are summarized in the table below.

Soybean Cropping Patterns, Chuadanga 1986

Cropping Pattern	Percent of area
Fallow - soybean - lentil	35.0
Fallow - soybean - wheat	29.2
Fallow - soybean - chickpea	12.0
Fallow - soybean - fallow	4.0
Fallow - soybean - tobacco	2.7
Fallow - soybean - vegetables	1.3
Aus - soybean - wheat	4.2
Aus - soybeans - chickpea	0.6
Aus - soybeans - lentils	0.2
Jute - soybean - wheat	1.4
Buro - soybeans - lentils ^{a/}	0.8
Buro - soybeans - wheat	0.1

a/ Buro is a forage grass the seed of which is eaten like millet. Cropping patterns were similar to other years with a significant drop in the single cropped, fallow-soybeans-fallow, pattern. Farmers should be encouraged to harvest an early kharif crop prior to soybean planting.

RABI SEASON (Noakhali, Lakshmipur and Comilla)Seed Sales

A large supply of high quality Pb-1 seed was available. Seed sales began in mid-December, but many farmers could not plant until January due to wet fields. Seed sales continued until January 31. Several farmers stored seed from the previous rabi season and purchased only inoculant. According to seed and inoculant sales, about 138 hectares (340 acres) of soybeans were planted.

Seed prices, including inoculant, were Tk. 11/kg in Raipur, Hydergonj, Lakshmipur areas and Tk. 10/kg in all other areas.

In several bazars, where farmers are familiar with soybeans, MCC advertised seed sales by hiring a microphone and rickshaw on market days. This practice will be continued in the future to inform farmers of planting dates, and seed dealers. This method disseminates the vital information to more farmers at a lower cost than could be done with extensionists in areas where people are familiar with most aspects of the crop. Personal extension can then focus on new farmers in new areas.

Agronomic Observations

Stand Establishment: Farmers seemed to learn quickly from last year's experience with Pb-1, when most plant stands were too heavy. Farmers planted about 25-30 kg/acre as recommended. Some farmers broadcast their seed and covered them with a moi. Results looked good, so farmers were encouraged to plough a well-prepared field at 30 cm intervals, broadcast the seed and cover the rows with a moi, pulling it in the same direction as the rows. This pushed seed into the furrows, forming crude lines. Insect and weed control is somewhat more difficult using the broadcast method, but farmers feel the savings in time and labour make broadcast planting more desirable than line sowing. In the future, broadcast planting should be encouraged, but with a warning of problems associated with this method. As planting in lines has been major cost of planting, this new practice should make soybean cultivation more attractive without adversely affecting yields.

The fine seedbed required for Bragg stand establishment may not be essential for Pb-1. Reducing land preparation costs for Pb-1 should be investigated.

Insects, Diseases, and Other Problems: Cutworms caused damage in some fields, reducing plant stands. Wet, cool soil conditions caused a higher than normal rate of damping off. The combination of these two problems left some fields with a less than optimal plant stand several weeks after planting.

Hairy caterpillars were seen in several fields but were not a serious threat.

Pod borers seriously damaged crops in some areas around Raipur. Farmers placed branches in fields for birds to perch, but in areas with large concentrations of soybeans, pod borer populations were too high to make this practice very effective. In some fields pod borers caused up to 75 percent defoliation, and in the same fields damaged up to 90 percent of the pods. Some yield recovery occurred after the effect, when some plants brought on a new flush of flowers, in some cases up to 50 flowers per leaf axil, most of which aborted or formed only one seed. This regrowth also caused uneven ripening. Also, fields with the most vegetative growth suffered the most. One farmer pointed out his largely unaffected field, and explained that he had not applied fertilizer, thus reducing growth. Fields with heavy plant stands, which birds could not penetrate easily, also seemed to suffer worst.

Farmers feel that chemical control of the pod borer is not possible, which has also been MCC's experience. Therefore in the future, acreage increase should remain scattered, and large blocks should not be encouraged.

Demonstration Plots: To encourage the cultivation of soybeans by non-traditional means, about 125 plots, demonstrating alternate cultivation practices, were planted in farmers' fields. Data collection was limited to observations made by the farmers and extensionists and recommendations for improving the demonstrated practice.

Intercropping soybeans with sweet potatoes was very promising. There seems to be no negative effect on the sweet potatoes if soybeans are planted between every 4-6 lines of sweet potatoes. Pod set on the widely spaced soybean lines is quite good, providing additional income to the farmer. When soybeans were inter-cropped with chillies and onions, yields were reduced in lines immediately adjacent to soybeans. The yield reduction was felt to be less with soybeans than with mungbeans, the crop presently used in this practice. Also, the yield from soybeans was felt to be higher than from mungbeans, although this difference is partly offset by the lower market price for soybeans. Planting soybeans in the drains and borders of such fields, or between every 6 to 10 lines of chillies or onions is recommended.

Relay planting soybeans between rows of potatoes seems promising. Soybeans should be planted between each row of potatoes within 25 days of potato harvest time. Earlier planting results in tall and weak soybean plants. Care must be taken while harvesting not to damage the soybean seedlings. It should be possible to plant relay aus into the soybean stand.

Zero-tillage planting of soybeans into rice stubble was demonstrated. The average yield was approximately 830 kg/ha. It seems critical that zero-tillage be done as early as possible and only into fields with very moist soils. In years with a wet fall, this method could be actively extended in the char areas. Applying fertilizer with this method should be profitable, as soil moisture conditions could allow adequate movement of fertilizer into the root zone.

Planting soybeans in huggla grass fields presented no problems and farmers were encouraged with their results.

In Ramgati, application of the recommended fertilizer was demonstrated. In many fields there was a noticeable response. Fields which did not show a response seemed to have other limiting factors, such as soil moisture. Farmers in that area traditionally do not apply fertilizer to the rabi season crop, therefore they are resistant to using fertilizer on soybeans.

Irrigation of soybeans was demonstrated in the Raipur area. Most farmers saw no benefit to irrigation as there were some rains during the pod-filling stage. Irrigation should continue to be promoted in areas with droughty soils or in years with low rainfall during critical growth stages.

Planting soybeans at a low seed rate with deep-water amon, either before or at the time amon is planted, allows the farmer to harvest a light crop of soybeans before the rains begin and the fields flood. The results of a trial testing the effects of several soybean seed rates on the amon crop is presented in the MCC Agriculture Research Program Annual report for 1987.

Yields

Soybean yields were quite stable throughout the production area. The average yield, taken from 26 crop cuts, was about 2.2 t/ha compared to yields of 1.4 to 1.8 t/ha in previous years. The highest recorded yield was about 3.0 t/ha and the lowest near 1.0 t/ha.

AGRONOMIC RESEARCH

Introduction

MCC has concentrated on three major areas of soybean research: cultivation recommendations, varietal selection, and seed quality and storage. Most cultivation recommendations have been established, but trials of this type are conducted as questions arise. Varietal selection continues to be a major emphasis. The selection criteria are primarily dependable production of high quality seed over a wide range of planting dates, adaptability to present cropping patterns (a short rabi season duration of 125 days or less), grain yield, as well as other agronomic characteristics. Seed quality and storage involves harvesting seed under conditions suggested to produce high seed quality, storage of varieties in ambient conditions to determine inherent seed longevity, and storage method possible for a farmer to use to retain his own seed from season to season.

Chuadanga

Kharif Season: A variety trial with 12 varieties was planted on two dates. On the early date in mid-June Bragg yielded highest at 2.42 t/ha, but seed quality was poor. PK-308, MTD-65, Pb-1 O.T. (an off-type of Pb-1), Pb-1 and G-2120 yielded from 1.86 to 1.35 t/ha respectively and also produced high quality seed. On the later date in late August all varieties produced high quality seed and yields ranged from 1.83 to 1.20 t/ha.

Six promising varieties were planted across four dates. Average yield was 2.8 t/ha on the earliest planting date, May 25, and decreased to 1.50 t/ha on the latest planting date, July 6. Across the dates Pb-1 O.T. yielded best at 2.98 t/ha, but Pb-1 was not significantly different at 2.73 t/ha.

The varieties MTD-65, Pb-1, G-2120 and PK-308 were planted in 10 farmers field trials. Yields ranged from 1.84 to 1.52 t/ha respectively, but were not significantly different. Seed quality was excellent for all varieties except PK-308, and that variety has subsequently been eliminated from further research.

A major thrust in MCC's soybean research work is screening varieties acquired from abroad for agronomic adaptation. In this years screening trial 77 genotypes from several source were planted across six planting dates. Priority is put on varieties which exhibit resistance to field weathering (high seed quality) and resistance to yellow mosaic virus (YMV). Many varieties exhibit good resistance to field weathering but many of these were susceptible to YMV. This was particularly true of varieties from IITA in Nigeria. Several genotypes were advanced to next year's variety trials, while many were eliminated from further research.

Several cropping pattern trials were conducted. Because Pb-1 has a broader range of planting dates, it seems very likely that farmers will be able to grow one of several crops in the early kharif season before planting soybeans. Mungbeans, yard-long beans and buro grass looked like good early harvested options. In one observation trial Pb-1 yielded 1.3 t/ha when planted on August 26 after jute harvest.

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Rabi Season: In the variety trial, the shorter duration varieties tended to yield better than varieties of longer duration. PK-327 yielded 1.54 t/ha in 103 days. The trial was irrigated six times. This high water requirement makes soybean cultivation on late December planting dates very costly. Soybeans could be planted in November at wheat planting time, but varieties with tolerance to the cold winter temperatures would be needed. In a screening trial for cold tolerance several varieties seemed promising. Future variety trials in the Chuadanga area should be planted in November using varieties with some cold tolerance.

Noakhali Rabi Season

Raipur: Yields in this year's variety trial were excellent. Sao Luis yielded highest with 3.48 t/ha in 133 days. Lowest yielding was AGS-272 with 2.45 t/ha in 113 days. Of the shorter duration (below 120 days) Macs-57 yielded best with 3.33 t/ha. Pb-1 yielded 2.75 t/ha but was not significantly different from Macs-57. Although Pb-1 O.T. (off-type) was not different from Pb-1 it yielded 3.14. The off-type of Pb-1 has consistently yielded better than Pb-1 but seldom significantly better. The stronger stem strength of the off-type in the kharif season would make it more desirable while other parameters are similar.

In the genotype screening trial, several varieties looked promising, but most had undesirably long durations.

Char Bata: Six varieties were planted under both full and no-tillage was 1.78 t/ha. Varieties which flowered later did best under no-tillage, which was planted early. This is probably an indication of cold tolerance.

In the salinity screening trial a high degree of variability between varieties was again exhibited. Pb-1, MTD-65, SJ-2, Pb-1 and Santa Rosa R seemed the most tolerant to salinity.

Other Trials

Under the Chitosi cropping systems site two trials were conducted on soybeans. Urea was top dressed at 40 days after planting at three rates. Results were inconclusive, as in two cases there was a positive response

and in two cases the response was negative. Poor soil moisture seemed to be a factor in the fields with a negative response.

In a tillage observation trial on the Chitosi station, conventionally tilled soybeans yielded 2.38 t/ha compared 0.85 t/ha with relay planting and zero-tillage. Although the yields are low with reduced tillage, costs are also low, and reduced tillage allows soybeans to fit more easily into the cropping pattern.

Seed Storage Trials

A trial was conducted to determine the need for high quality polyethelene bags for storing seed from the rabi harvest. Thirteen farmers stored their seed for eight months in double polythene bags, supplied by MCC and in polythene bags available on the market. Emergence of stored in MCC bags was 72% compared to 63% for seed stored in locally available bags. The difference was highly significant thus emphasizing the need for high quality bags for seed storage.

A storability screening trial and a storage method trial are being conducted in Chuadanga and will be reported in the 1988 report.

To continue promoting soybean production it is critical that farmers have available to them the option to sell their soybeans. A system by which dealers stock soybeans for resale to wholesalers or processors, with a guarantee to the dealers that MCC will purchase his soybeans if a buyer is not found, seems to be the best way to stimulate a flow of soybeans from producer to consumer with a minimum of MCC involvement.

Research on food products was continued at MCC's Food Products Development Centre (FPDC) in Maijdi. Marketing of soybeans in Dhaka was conducted through "The Source" in Dhaka. As these are part of MCC's Job Creation Program their activities with soybeans are reported in the MCC Job Creation Program annual report.

UTILIZATION AND MARKETING

In the past year much more attention has been given to the problems of marketing and utilization. The long term objective continues to be the promotion of soyfoods in home level utilization by low income families,, but a much broader group of products with stable markets is important. Diversity will provide a strong cash market for soybeans. Also, to avoid the "poor man's food" stigma that would develop if it were only promoted for the poor, it is important to promote soybeans as a good food for everyone.

Presently thirteen women in Chuadanga and Noakhali demonstrate cooking with soybeans in homes in and around soybean production areas. They demonstrate a broad range of foods from simple soy-dhal to snack foods made from soybeans. Response to these demonstrations seems very positive when there is easy access to soybeans.

In Chuadanga town, demonstrations were started in one of the poorer sections. While people are very interested in the demonstrations, they continue to be reluctant to actually purchase soybeans from the local dealer and prepare soyfoods in their homes. The problem is partially related to the dealer, who was providing a very poor service.

A highlight of the year was a visit by Ellen Jayawardene from the Soyfoods Research Centre in Sri Lanka. She spent almost two weeks in Bangladesh, during which she demonstrated various foods made from soybeans in Sri Lanka, visited our project areas and gave training to our staff. Several new food ideas were presented, and the importance of proper preparation of soyfoods was stressed. Some of the ideas were implemented into the cooking demonstrations immediately. A new method for making soy-dhal was very popular. This new method was demonstrated to groups of women and men and in schools.

Giving demonstrations to groups has many benefits as opposed to demonstrations in individual homes. They also have potential problems. Giving demonstrations to larger groups to transfer new ideas or recipes to families already familiar with soyfoods should be very effective. Using group settings to introduce people to soyfoods could be tested in the future.

Ellen Jayawardene also demonstrated several soyfoods requiring some processing which would have potential in the snack food and other markets. Weaning food, tofu, tempeh, chana-chur, milk, yogurt, flour and its products are all foods which could be processed and sold in Bangladesh by interested businessmen. We continue to work with interested businessmen in Noakhali, Chuadanga, Dhaka and elsewhere. Presently the strongest interest is still with chana-chur, either making a flour which can substitute for kheshari to make the noodles or as split or whole beans, soaked, and/or boiled and fried in oil similar to other pulses. One businessman in Dhaka shown strong interest in marketing soyfortified egg-noodles as well as other soyproducts which could be marketed to the middle class on the basis of soybean's nutritional merits.

Soy-bhori, similar to black gram bhori was made in Chuadanga. A method has been developed which we will try to promote with farmers in the coming year.

Easy access to markets in some parts of Noakhali was felt to be a serious constraint. Often farmers could not sell the soybeans they produced when they needed cash. Also businessmen interested in buying large quantities of soybeans for processing could seldom find soybeans easily. To address this need dealers in areas with poorly developed markets were requested to buy soybeans from farmers. MCC purchased some of these directly from these dealers in two areas.

In other areas dealers were told that MCC would help them sell their stock within several months. If MCC is unable to find a market for their soybeans, or convince the dealer that a buyer would come, we would purchase their soybeans in September, if they are high quality, at Tk.8/kg. In this way, farmers received an easy cash market at harvest time and businessmen interested in buying soybeans for processing could be directed to other dealers holding a stock of soybeans. Transactions could take place without direct MCC intervention. On July 1, about 17,000 kg of soybeans were remaining with dealers in this agreement and about 29,000 kg of soybeans had been purchased directly from dealers at harvest time to stimulate strong markets and develop a stock for marketing in Dhaka.

HOMESITE PROGRAM

The objective of the Homesite Program (HSP) has remained to improve the nutritional and health status and, indirectly, the socio-economic status of selected families (see Annual Report 1986 for definition of "selected"). This objective is met by promoting kitchen gardens to provide nutritious vegetables, extending fruit seedlings, extending improved duck breeds for increased egg production, vaccinating village poultry against raniket disease, providing women's awareness discussions, and training in nutrition and health. These trainings are held once a week for a group of selected women at one woman's bari (homestead). Follow-up work is done by the extensionist visiting the individual women at their baris.

Homesite is presently working in ten villages, six of which were added this past year. These six villages are currently in Stage I, the initial stage when all lesson series are given through. Four villages are in Stage II, in which all lessons are repeated, incorporating suggestions and ideas from the village women themselves. Two villages are in Stage III, the group formation stage which is handled by DANIDA. Homesite is also involved in fuel-efficient cookstove and improved latrine experimentation and testing in conjunction with the Appropriate Technology Program.

Esther Kingsbury, HSP Agricultural Advisor, completed her term in August, 1986 and was replaced by Rebecca Sanders in November. Also leaving this year was Marilyn Stucky, the Health Advisor. Many of her responsibilities were handed over to Bette-Ann Bruulsema, the Nutrition Advisor who joined Homesite in December, and to Zakrina Ahmed, our Health Promoter as of March of this year.

AGRICULTURE

Homestead Gardens

Homesite continue to emphasize growing winter and summer season vegetable gardens as means of improving nutrition in the bari. During 1986, approximately 75% of selected women raised summer gardens to HSP standards (five different vegetables, three of which are extended by HSP, to harvest

maturity). Nearly 83% of selected women attempted to grow winter gardens, but many seedbeds were destroyed by late rains. Since the planting date for most vegetables had passed, HSP extended radish, because there was still time for replanting and demand was high. Extensionists encouraged women to eat radish greens in addition to the root because of the high vitamin content of the greens. Approximately 35% of selected women grew winter gardens to HSP standards, representing a 15% increase from last year. 1987 summer gardening is currently in process, with 77% of selected women participating.

HSP continues to extend nutritious, indigenous vegetables for both winter and summer gardens. Included among the winter vegetables are included local gourds, beans, and leafy greens (Table 1).

Table 1: HSP Winter and Summer Vegetable Seed Sales

Winter vegetable	Total packets sold	Summer vegetable	Total packets sold
cabbage	51	sweet pumpkin	74
chinese cabbage	97	kang kong	93
cauliflower	9	snake gourd	203
kohlrabi	92	ridge gourd	121
tomato	240	pui shak	56
coriander	173	bitter gourd	76
palong shak	134	cucumber	165
mustard	61	barboti bean	159
radish	69	okra	92
chilli	4	data shak	119
		chilli	17
TOTAL	930	TOTAL	1175

Selected women received training in both winter and summer gardening. Winter gardening lessons included motivation for gardening, seedbed preparation, transplanting, and winter garden care. Summer gardening lessons included compost preparation and general care of rainy season vegetables. Lesson attendance figures are presented in Table 2.

Poultry

Homesite continued its attempt to upgrade village chicken and duck flocks. Chickens were vaccinated against raniket disease every three months. During 1986-87, vaccinations were given four times in the six older villages and two times in the four newer villages. A total of 5491 injections were given. Forty-seven percent of selected women brought chickens for vaccination (Table 3). In addition, poultry of non-selected women were vaccinated.

In December, 1986, 12 women from six villages attended a two-day poultry vaccination training at the MCC office. The HSP staff instructed them on basic poultry care, poultry diseases, and injection procedures. Since the training, the vaccinators, assisted by HSP extensionists, have been responsible for providing regular poultry vaccinations against raniket disease in their villages. They receive as payment the money they collected for the vaccinations. Homesite is now planning to phase out of these six villages such that the vaccinators can continue to give vaccinations regularly, without HSP assistance, but in co-operation with government livestock personnel.

To upgrade village duck flocks and increase egg production, fertilized eggs of the improved duck breed Khaki Campbell were distributed in the villages, to be hatched under broody hens. During the summer of 1986, 58% of selected women in four villages purchased eggs. This season, HSP is extending two-week old ducklings instead of fertilized eggs. Vaccinations against Duck Plague were given in six villages in December, 1986.

Lessons on chicken and duck care were presented in the villages (Table 2). These covered housing and feeding needs, and disease symptoms, treatment, and prevention through vaccination.

Table 2: Percent of selected women attending agriculture and women's awareness lessons

Lesson series	No. of lessons	Village Name ¹					Average	
		Bokterpur	Maijdi Gram	Nironjonpur	E. Char Uria	Masimpur ²		Ramnathpur ²
Winter Gardening	3	85	87	62	64	67	63	71
Summer Gardening	3	93	67	69	63	74	67	72
Fruit and Spice Care	2	-	70	50	62	-	-	61
Care of Chickens	4	-	60	55	68	-	-	61
Care of Ducks	3	63	-	48	-	56	-	56
Women's Awareness	6	97	85	67	70	-	-	80
Average		85	74	59	65	66	65	

¹The four newest villages are not included

²Work began in Masimpur and Ramnathpur after three lesson series (Fruit and Spice, Care of Chickens, and Women's Awareness) had already been given.

Table 3: Number of Poultry Receiving RDV¹ and BCRDV² Injections

Month and Year	Village Name ³						TOTAL	% of selected women participating
	Bokterpur	Maijdi Gram	Nironjonpur	Char Uria	Masimpur	Ramnathpur		
August, 1986	90	43	103	69	-	-	305	60
November, 1986	83	200	180	278	-	-	741	49
February, 1987	201	438	811	1117	307	-	2874	40
May, 1987	112	310	314	648	187	-	1571	40
Total:	486	991	1408	2112	494	-	5491	

¹Raniket Disease Vaccine

²Baby Chick Raniket Disease Vaccine

³The four newest villages are not included

Fruit and Spice

During the summer of 1986, HSP extended guava, papaya, and mango fruit seedlings. Seventy-three percent of selected families purchased at least one; 53 percent purchased two or more. This season, HSP extended seedlings of lichi, black pepper, bay leaf, and cinnamon.

Staff Training

Homestead staff received training provided by MCC's Horticulture Program on winter and summer vegetable care, disease and pest management, and compost preparation. Also, four staff members attended a five-day training on poultry management provided by Bangladesh Rural Advancement Committee (BRAC).

HEALTH AND NUTRITION

Training

In keeping with our objective to improve selected families' nutritional status it is important to educate them about the means available to them to better their health and nutritional status.

Village Courses: All target women were motivated by the extensionists to attend the training courses comprised of: 1. The Treatment of Common Illnesses (7 lessons); 2. Maternal and Child Health (5 lessons); 3. Nutrition (5 lessons). An oral test was given at the last meeting. All courses were completed in the four older villages by December 22, and a review of lessons in these villages is currently in process. These lessons are being given for the first time in the six other villages. Six winter and ten summer season cooking demonstrations were given by the HSP Field Supervisor.

In the four older villages, 18 of the 46 women (39 percent) successfully completed the courses (attended a minimum of 80 percent of total lessons offered). Thirty-five women (78 percent) attended more than half of the lessons. There were mixed results among the 18 oral tests given.

As a result of the motivation received in the courses, the following activities occurred: i. All women ages 15-45 and their children are currently being referred to government and NGO clinics or being informed of nearby village immunization campaigns. ii. Forty-two of forty-six selected women visited an area clinic for de-worming (rickshaw fare given by HSP the first time only), with 30 women receiving worm medicine. However, due to poor results and uncooperative clinic staff, many women do not wish to return. iii. Thirty-three of forty-six selected women are of child-bearing age and married. Six of these are currently using family planning. Four other women were referred to a clinic in January.

School Nutrition Program: In February-March, the School Nutrition Program was presented by HSP extensionists in four village schools to class 5 students. The program consists of four lessons about nutrition (with special emphasis on Vitamin 'A') and vegetable gardening, including the planting of a school garden.

Status Evaluation

The health and nutritional status of selected women and their families is monitored for the purpose of evaluating the effect of our program and for assessing their needs, which we may be able to address through lesson content and motivation.

Family Health Form: For continuously updated information on selected families' health status, a family health form has been produced. This form will contain information such as name and age of family members; number of pregnancies, births, and deaths; immunization of children and women of child-bearing age; family-planning usage; nutritional status of children under five years by arm measurements; family health problems; and HSP trainings received. This form is to be filled out monthly/quarterly by HSP extensionists during visits to selected women's bars.

Baseline Survey: These surveys were done in two villages in September, 1986 and in four villages in March, 1987. Some results from the nutrition section follow.

In four of the six villages surveyed, most women (88-100 percent) did not feed their child colostrum (fluid secreted by the breast for a few days after delivery), believing it to be harmful or just following the tradition of not doing so.

In the six villages, 73 percent of the children were weaned from breast milk later than two years. This milk provides the growing child with a consistent source of vitamins, protein and energy and may help lengthen the time between pregnancies.

However, past the age of four months breast feeding should be supplemented with other foods. Most mothers did not start feeding energy foods (rice, suji, bread) or fruits and vegetables until after 12 months (54 and 52 percent respectively), and protein foods (fish, dal, egg) until after 18 months (55 percent). Thus, weaning food is a major emphasis in our nutrition education program.

From the armband measurements of children under five years old, the nutritional status averaged 38.5 percent normal, 32 percent borderline malnourished and 30.0 percent severely malnourished, with extremes among the villages of 100 percent normal and 56 percent severe.

Diet Survey: Diet surveys were conducted in four villages in October, 1986, two villages in April, 1987, and four villages in June, 1987. In each village there were between 9 to 14 women surveyed. To conduct the survey, HSP extensionists went to each woman's bari during five consecutive days (three days for April and June surveys) and asked her questions concerning the food eaten the days before; the amounts and weights of all ingredients used; whether food eaten was leftover or freshly cooked; whether food was obtained from the bari or bazaar (Table 5); how many people ate; and at what time they ate.

Diet survey results are presented in Table 4. The recommended dietary intake in tolas/person/day (t/p/d) is fish/meat - 3, egg - 3, milk - 9, pulse - 5, cereal - 30, oil - 3, sugar - 3, fruit - 3, vegetable - 6, shak shak - 11 (Pustiman: Nutritive Value, BADC, 1980, p. 29). More generally, protein foods intake of 20 t/p/d, energy foods 36 t/p/d and fruits and vegetables 26 t/p/d - a total of 82 t/p/d - is recommended. This is a

useful measure for comparison, but is limited as it does not seem quite appropriate for Bangladesh because it recommends 9 t/p/d of milk (more suitable for some places in India where more milk is consumed). It also does not take into account the availability of fish in the area. We are still searching for a more appropriate recommended diet.

However, based on this recommended dietary intake, the intake of protein foods and fruits and vegetables should be increased. Although the total energy-foods content is sufficient, the sugar and oil intake (foods with a higher energy concentration than cereals) is far below recommended (17 percent and 27 percent, respectively, of recommended). Low oil intake may also pose a problem for the utilization of the fat-soluble vitamins A, D, E, and K.

Although the fish/meat eaten is sufficient, the other protein foods (egg, milk, pulse) are far below recommended (3 percent, 3 percent, and 54 percent respectively), and do not make up for the "excess" fish/meat. Also the consumption of fruit, tuber, and shak are below recommended. A large portion of fruit consumption is coconut, which has a low concentration of vitamins compared to most other fruits.

WOMEN'S AWARENESS LESSONS

A flip chart series entitled "An Expanded World for Women" was presented in four HSP villages. The pictures, and questions and statements of the training guide are designed to spark discussion on the village women's world, directing them to the knowledge that their world can change, and helping them realize that changing their world begins with them. HSP will continue to present these flip chart lessons to new HSP villages.

COOKSTOVES AND LATRINES

Homesite has worked closely with the Appropriate Technology Program during the past year, as we continued testing of both cookstoves and improved latrines.

Several stoves were distributed in two villages and monitored for four months. It was found that there were more disadvantages than advantages and that this model may not be suitable for our target group.

The latrine experimentation began this year to find a latrine design suitable for promotion by MCC. Latrines were installed in several Homesite villages. These latrines were monitored regularly by Homesite and Appropriate Technology programs. Participants were enthusiastic about the latrines. Presently, we are working on surveying all selected women who do not have latrines as well as neighboring women of the same economic level. The surveys are to determine whether people are interested in purchasing similar latrines or whether in fact more motivation is needed. Testing of the latrine is not fully completed. It has not yet been determined which latrine would be selected for extension. Until the Primary Health Care Program is started and staff are hired to continue work on this project, work will not be expanded.

More details on both the cookstove and the latrine work can be obtained from the Appropriate Technology Program.

GROUP FORMATION

Homesite maintained contact with the four groups which were handed over to DANIDA by selling vegetable seeds, providing technical support in agriculture, and helping in referring health needs to the appropriate facilities.

Initially, there were problems with group members' understanding of program differences and ways in which programs are implemented. DANIDA has provided their Mass Education Program (MEP) to group members. More recently DANIDA has offered these groups the option of becoming registered co-operatives, with ideas for income-generating projects.

If Homesite villages wish to continue into group formation in the future, DANIDA will continue to offer their services.

WOMEN'S BIMONTHLY MEETINGS

This past year, participants in the Women's Bimonthly Meetings took a number of field trips to visit different programs. These included Surjosnato, Job Creation Program's coconut drying project in Ramganj; Job Creation's fish ponds and paper-making project in Feni; the Gandhi Ashram;

Table 4: Diet Recall Survey Results

	fish/meat	egg	milk	pulse	cereal	oil	sugar	fruit	vegetable
Bokterpur t/p/d*	16.9	0.1	-	0.9	50.0	0.6	0.6	2.3	10.2
% of diet	18.2	✓	-	0.1	53.9	0.6	0.6	2.5	11.0
Char Uria t/p/d	4.2	-	✓	2.6	38.7	0.5	0.3	4.1	8.0
% of diet	6.5	-	✓	4.1	60.3	0.7	0.5	6.4	12.5
Maijdi Gram t/p/d	6.1	0.1	0.3	1.3	48.5	0.3	0.3	0.4	11.0
% of diet	8.9	0.1	✓	1.7	62.5	0.4	0.3	0.5	14.2
Nironjonpur t/p/d	4.9	0.2	0.5	2.4	48.8	0.7	0.8	0.9	9.2
% of diet	6.5	0.3	0.7	3.2	64.6	0.9	1.0	1.2	12.2
Masimpur t/p/d	2.4	-	0.8	2.7	48.8	0.7	1.3	3.9	7.1
% of diet	3.0	-	1.0	3.3	60.1	0.9	1.6	4.8	8.7
Ramnathpur t/p/d	4.3	0.1	-	3.6	44.5	0.5	0.5	0.7	4.7
% of diet	6.1	✓	-	5.1	63.4	0.7	0.7	1.0	6.7
East Aswadia t/p/d	3.1	0.1	0.5	2.7	38.4	0.9	2.4	1.8	12.0
% of diet	4.1	0.1	0.7	3.6	51.4	1.2	3.2	2.4	16.1
Modhum Char Uria t/p/d	1.6	0.1	✓	4.9	42.8	0.4	1.5	3.7	5.7
% of diet	2.2	0.1	✓	6.7	58.6	0.5	2.1	5.1	7.8
Mokimpur t/p/d	2.3	-	0.3	3.1	48.8	0.3	0.5	2.0	4.2
% of diet	2.6	-	0.3	3.5	55.6	0.3	0.6	2.3	4.8
Rajurgaon t/p/d	2.6	-	0.6	2.9	60.6	0.2	0.1	0.9	2.6
% of diet	3.1	-	0.1	3.4	72.5	0.2	0.1	1.0	3.1
Average t/p/d	4.8	0.1	0.3	2.7	47.0	0.5	0.8	2.1	7.5
% of diet	6.1	0.1	0.3	3.5	60.3	0.6	1.1	2.7	9.7

* t/p/d - tola/per person/per day; 1 tola = 11.65 grams

+: misc - salt, lime, tobacco

-: was not eaten

✓: <0.05 eaten

Table 4: Continuation

tuber	shak	misc ⁺	total totals	protein foods	energy food	fruit/veg. foods	date
3.5 3.8	4.5 4.9	3.1 3.3	109.6	17.9 19.3	51.2 55.2	20.5 22.0	10/86
1.0 1.6	3.1 4.8	1.7 2.7	64.2	6.8 10.6	39.5 61.6	16.2 25.3	10/86
1.6 2.1	6.5 8.3	0.8 1.0	77.7	8.3 10.7	49.1 63.2	19.5 25.1	10/86
2.8 3.7	2.7 3.6	1.8 2.3	75.7	8.0 10.7	50.2 66.2	14.7 20.7	10/86
4.7 5.8	7.2 8.9	1.6 2.0	81.2	5.9 7.3	50.8 62.6	22.9 28.2	4/87
8.0 11.4	2.4 3.4	0.9 1.3	70.2	8.0 11.2	45.5 64.8	15.8 22.5	4/87
5.3 7.1	6.1 8.2	1.4 1.9	74.7	6.4 8.6	41.7 55.8	25.2 33.7	6/87
3.3 4.5	8.0 11.0	1.0 1.4	73.0	6.6 9.0	44.7 61.2	20.7 28.4	6/87
5.0 5.7	20.8 23.7	0.4 0.4	87.7	5.7 6.5	49.6 56.6	32.0 36.5	6/87
4.5 5.4	7.6 9.1	1.0 1.2	83.6	8.4 7.9	60.9 72.8	15.6 18.7	6/87
4.0 5.1	6.9 8.6	1.4 1.8	79.8	8.2 10.2	48.3 62.0	20.3 26.1	

and the Muhuri Irrigation Project. Other meetings included training on how to use flip charts, a lesson on maternal-child health, and training on six preventable diseases by the Expanded Program for Immunization (E.P.I.) officer. These meetings also include a time for discussion on program progress and problems that have occurred since the previous meeting.

The meetings are designed to enhance communication between programs in MCC that work with women or are staffed by women. Those presently represented are Rural Savings and Homesite Programs and more recently Food Products Development Center (FPDC), although invitations are extended to other women within MCC.

Table 5: Food Obtained From Bari (% of total consumed within each food group)

	fish/ meat	egg	milk	dal	fruit	vegetable	tuber	shak
Bokterpur	23	100	-	0	31	42	4	76
Char Uria	23	-	0	0	27	52	0	52
Maijdi Gram	17	31	0	51	70	27	38	74
Nironjonpur	37	30	100	9	33	38	3	71
Masimpur	24	-	36	37	9	34	0	73
Ramnathpur	53	100	-	39	0	20	0	83
East Aswadia	59	50	0	13	20	32	0	90
Modhum Char Uria	23	0	-	0	41	62	0	49
Mokimpur	17	-	0	0	0	0	0	47
Rajurgaon	7	-	0	0	0	4	0	89
Average	28	52	19	15	23	31	5	70

- this food not recorded in diet survey

RURAL SAVINGS PROGRAM

This year, the Rural Savings Program (RSP) has focused efforts on supporting the activities of its existing men's and women's groups by helping them solve group problems and encouraging greater leadership abilities within each group. Little progress was made in providing regular trainings and functional education because of continued staff changes. However, added enthusiasm and interest of new leadership staff in the last half of the year allowed for some valuable planning and evaluating work to be accomplished. It is hoped that this work will provide clearer direction for program activities in the next few years.

OBJECTIVES

RSP continues to promote social and economic advancement for disadvantaged rural men women through a combination of activities in a group formation process. The specific objectives remain to encourage awareness of the target group to address their own problems through a group setting by facilitating discussions and planning of their group activities. More emphasis has been placed on working with the groups for a limited number of years through a more systematic group formation process which provides certain activities for the groups. Ultimately, it is hoped that groups will be able to provide their own leadership and function independent of MCC support. However, RSP staff recognize that the process of leadership maturity in a group takes time and constant motivation from field staff. Facilitating the collection and use of group members' savings to stimulate increased income generation for the group remains a specific objective which is highly valued by the target group, but which also needs careful monitoring by RSP staff.

METHODOLOGY

The RSP target group is comprised of men and women (generally older than 18 years of age) from rural house holds who sell their physical labor for at least four months of the year, and do not have permanent employment or engage in small scale trade with a capital base less than Tk. 2,000.

One basic assumption of RSP is that, to reach its objectives, working with groups is more effective than working with individuals. More people from the target group can be reached at one time through group formation. Group members can learn from each other about their social and economic problems and decide together how to address their needs in a positive way, while maintaining good relationships in their neighborhood.

This year a more systematic process of group formation was developed to give clearer direction for group activities, and to aid the group facilitators in motivating groups toward maturity. This process involves a series of stages which will be used as a guide to take a group from the early selection stage through consciousness raising training, group leadership development, proper project planning and finally dependence upon a central committee. This process was not developed with the intention of creating a hard and fast direction for the groups but will be used to advise groups and evaluate their progress.

The central committee stage, which would encourage groups to depend on leadership from a group-based committee instead of on RSP, is not necessarily the final stage for all groups in the process of maturity. This idea will continue to be evaluated as work goes on with two central committees. Leadership of this kind may be too complex and RSP may discard this idea if it proves to be too difficult or inappropriate.

In June of this year a two-week consultancy was conducted by an external consultant with extensive experience with groups and cooperatives in Bangladesh. He took a close look at RSP's work with its groups to evaluate the progress of the program and its impact on the target group. Advice he gave in dealing with group problems, project planning and program direction was greatly appreciated. RSP staff were encouraged by this positive feedback, which showed that the work with RSP's groups is valued by the target group and that the group formation process has had a strong start. The most difficult task of encouraging independent groups is still ahead.

STRUCTURE AND LOCATION

In recognition of the local culture and norms, RSP is divided into two sectors. Female staff and groups are in the women's sector (with the exception of two groups supervised by male group facilitators), while male staff and groups are in the men's sector. These two sectors work side-by-side, with the same objectives and strategies, jointly coordinated by the RSP program Leader. The Education Field Supervisor reports directly to the Program Leader in supervising the literacy program for both sectors.

At present there are five male and three female groups facilitators working in six union parishads of Feni and Dagonbhuiya upazilas of Feni district and one union parishad of Senbag upazila of Noakhali district. Each group facilitator is posted in the union where he or she is living and working with the target people.

The leadership structure change which took place in 1985-86, to include the expatriates in the administrative structure, has been functioning well this year. It has allowed for smoother implementation of program plans and activities and helped to stabilize working relationships.

Staff changes included hiring two new male group facilitators, and a men's and women's Field Supervisor and an Education Field Supervisor. In January the Men's Field Coordinator position was taken on by an expatriate, giving strong leadership for the Men's sector. The filling of all vacant positions has helped to stabilize the RSP. Although the orientation process of these staff has taken a major effort in the last half of the planning year limiting some activities that had been planned.

GROUP MEMBERSHIP AND SAVINGS

Work continued with older groups initiated in previous years and new groups were started only if a group facilitator had extra time or if an older group disbanded. Four women's groups opened bank accounts, raising the total to seven in that area. One new Women's group was started by a male group facilitator in Dumuria area. This group has not opened a bank account or made any investments yet. Work in the Kadra union of Senbag upazila was discontinued because groups showed little interest and there

was no group facilitator available since it was chosen to keep work in the Feni District as much as possible. A few men's groups in Rajapur and Sindurpur areas disbanded when group facilitators were replaced. These groups had lost interest during the time when group facilitators were not available. New groups were initiated where possible. The number of groups in Dumuria area increased due to good motivational work by their group facilitator. Thus, the total number of groups in the RSP increased by four this year.

All RSP groups meet weekly to discuss project plans to voice problems and concerns, and receive motivation and non-formal training from their group facilitator. At each meeting individual savings of one to five takas are deposited with the treasurer ("collector") of the group. These savings are recorded and deposited in the bank or held to invest in a project. This practice of having cash in hand can be a problem for groups because of the risk of theft or misuse by a group member.

The RSP recognizes this type of problem and has addressed it by creating more strict regulations and guidelines for the group formation process. New groups will be encouraged to handle their money very carefully with their own strict rules about investments, personal loans and distribution of profits or dividends. However, it is more difficult to make older groups understand the values of strict regulations often because they have been given conflicting advice previously. Additional effort will be needed to guide these groups to a clearer understanding of the ultimate purpose behind their projects, which is to create supplemental income on an equal basis for all group members.

Over time, total group funds have grown according to the return on the projects. The increase in the total figure for all groups is substantially higher than last year. This is mainly because the groups have not devised a method of distributing a percentage of the profits. Most of the groups want to see their capital fund grow, probably because they see a benefit in having it available for personal emergencies. While RSP recognizes the importance of asset accumulation, RSP is beginning to work with groups to encourage a system of regular payments to group members together with a scheme which allows limited personal loaning for emergency needs. (For details on membership and savings as of June 30, 1987 see Table 1).

Work continues with two central committees, one in Lharmapur and Dholia working areas. These committees engage in income generating projects and hold collective meetings. RSP will encourage greater leadership development in these two committees next year to determine whether this model represents a viable structure for groups to deal with problems among themselves. In the past the function of these committees has been rather vague.

INCOME GENERATION

Most of the groups have conducted a few income generating projects this year which provided extra profit. This profit is typically reinvested into other projects as members postpone increased income and consumption in favour of capital formation. All projects continue to be financed by groups' savings, except in one case when a group purchased a threshing machine on credit from RSP (See section on Banking and Credit).

This year groups in the women's sector invested a total of Tk. 127,665 in income generating projects and the net income on these projects so far is Tk. 20,273. In the men's sector (including the two women's groups in Dholia and Dumuria areas) Tk. 416,000 was invested in income generating projects and Tk. 165,000 was profited. Interestingly, this data indicates that the rate of return for projects in the man's sector (39.7 percent) is fully two and a half times greater than the rate in the women's sector (15.9 percent). Some of these projects are not yet completed so that the final net income will be slightly higher than stated here when the projects are complete.

Projects undertaken by women's groups this year are land mortgage for pisciculture and paddy cultivation, fish processing (shidal), cow rearing, mat-making, rice-husking and processing, Dhal processing and purchasing of rickshaws for employment.

Men's groups have undertaken projects in land mortgage for paddy cultivation and fish ponds, mat-making, vegetable cultivation, banana cultivation, fish processing (shidal), rickshaw purchasing for employment, threshing, rice processing for resale, cloth and oil sales, and cock rearing.

In both sectors members have taken personal loans from group funds, often to be returned with an interest payment. Staff are working to minimize personal loans based on strict group rules. However, RSP has been unable to prevent a few groups from engaging in lending to outsiders. This practice has been greatly discouraged this year with some success. Groups are discouraged from exploiting others or each other through loans.

This year the MCC Horticulture Project again supplied seeds and seedlings to RSP to be sold to group members. Unfortunately, few of the groups bought seeds to use for group-managed gardens. Most members used seed in their individual homesite gardens and were eager to buy if the seeds were delivered at the ideal planting times. Problems arose when seeds were sold later than the traditional planting time. By that time, individual gardens are full or weather conditions poor. Sales dropped slightly from previous years because of this problem with delivery. Seeds sold for winter and summer vegetable seasons in both sectors amounted to approximately 1400 packets. Varieties were those sold in the Extension program and the price was the subsidized rate.

A very few fruit and spice seedlings were sold to women's groups this year because women were not willing to take the risk to plant them in unsettled weather conditions.

Soap sales for women's groups have been discontinued this year because of lack of interest in the product. Soap sales of Neem soap will be continued to encourage treatment of scabies.

RSP has made a conscious decision to support only projects which are locally sustainable. Purchase of local products is encouraged. This is done under the assumption that the groups need to find projects that are manageable through local supply sources and marketing net works in order to become more self reliant.

ROWER PUMP SALES

This year two rower pumps were sold to RSP group members who used the credit scheme. Also in this year three rower pumps were paid off, and two more group members are continuing to pay for their rower pumps on the instalment plan.

FUNCTIONAL EDUCATION

Functional education in the form of adult literacy classes was provided on a minimal basis this year due to the lack of supervision and the unavailability of local instructors. The BRAC materials for adult literacy were used to instruct eighty-nine learners in eight classes. However, three of these classes were discontinued due to the lack of instructors or very poor attendance. So, only **forty** learners completed the course and, of those who completed only ten passed the final examination. The percentage of learners attending class regularly was about fifty-seven percent. Results with one class indicated that additional follow-up lessons and neo-literate material can be used to increase the learners retention.

During this year, RSP has developed a plan for a more intense functional education course which is more attractive to local instructors and which encourages better attendance of the learners. The revised literacy material has been chosen for next years classes because it has a flexible curriculum and is shorter in length. RSP hope that a more intense program will bring greeter performance from the learners, and therefore, more practical results in developing stronger group leaders.

TRAINING

Non-formal trainings for group members continue to be an important aspect of motivational work to develop leadership, management and group unity. The new group formation process will include a training on "Consciousness Raising" to help group members understand the objectives and benefits of group formation, and to develop a higher degree of ownership of the group activities. The second training on "Leadership" will emphasize group leadership, project management skills, group unity and future goals. Less emphasis will be placed on project skills training except as needed and available.

This year few trainings were conducted because Field Supervisors were unavailable. During October-January, four trainings were held at the Training Centre (TC). Topics included "Consciousness Raising and Group Leadership", and "Project Planning and Management". Group members who have received trainings from the RSP have shown a higher level of interest and leadership ability in the group meeting setting.

Trainings were held at the TC near Koroshmunshi Bazar in Rajapur union. The TC was also used as a place of residence for the women's sector staff and two male supervisors. A demonstration garden was planted there for the winter and summer seasons.

RSP staff received two trainings on winter and summer vegetable cultivation from Horticulture Project staff, and a brief training from the Small Scale Irrigation Project on the scheme for rower pump credit. Staff trainings from other organizations were provided for two supervisors and three female group facilitators.

HEALTH

This year minimal health advice was given to the women's groups by the expatriate health advisor, who made one visit to an RSP group each month during July to March. This was discontinued because no replacement has been provided for the health advisor position.

To follow-up on the proposal for a health component for the RSP women's sector, a feasibility study was begun in the last part of this year. One purpose of this study was to become familiar with the approaches previously used in Bangladesh for village health care by other organizations and to determine which method would be most appropriate for the RSP. A second purpose was to discover which government health services are available in the Dagonbhuiya upazila and particularly in the unions with RSP women's groups. Although the study is not fully completed it has been learned that initially RSP could help village women most appropriately by hiring a Health Trainer. She would teach and motivate groups members about basic health care practices and encourage use of the upazila health services in their local area. The RSP plans to begin with this type of program sometime in the next year.

BANKING AND CREDIT

RSP encourages its groups to open collective bank accounts in the nearest local branch of Sonali, Janata or Rupali Banks. Staff continue to deal with these local branches for many of groups. It continues to be especially difficult to encourage the women's groups to send one or two group members to carry out their own bank transactions. The new group

formation process methodology requires groups to be able to deal with the banks before a group graduates from RSP support. However, more work needs to be done to provide incentives for groups to deal with local banks. The group members continue to feel intimidated when dealing with bank employees. Groups continue to prefer reinvestment over institutional savings.

A special arrangement was made by RSP with one group for a direct "sale on credit". A threshing machine was sold by RSP to this group at a slightly higher than cost price. With an agreement to pay this full price back in several instalments. The group quickly returned the cost price, but did not want to pay the total price agreed upon. This problem arose partly from incorrect motivation by RSP staff so that in the end the group was allowed a concession and only paid back a portion of the remaining payment. The group has benefited from this sale on credit by paying for the machine with income that it brought. Next harvest season all their earnings from work with this threshing machine will be profit for the group.

Table 1: RSP Group Membership and Fund Status, June 1987.

Working Area	Groups member	Members	Total	T A K A			Savings
				In hand	In Bank	Invest	
<u>Women's Groups:</u>							
Panchgachia	3	29	24,373	486	3,018	20,869	16,731
Rajapur	7	75	41,326	3,212	6,771	31,343	27,530
Sindurpur	7	80	25,652	4,188	10,519	10,945	17,966
Koroshmunshi	7	89	36,013	3,130	10,674	21,909	27,932
Dholia	1	13	4,558	195	1,758	2,605	4,131
Dumuria	1	9	545	545	-	-	532
<u>Men's Groups:</u>							
Dholia	5	56	45,181	964	6,508	37,709	29,851
Dharmapur	6	84	156,948	12,567	6,347	138,034	60,464
Rajapur	7	92	104,751	3,003	9,689	92,054	37,818
Sindurpur	4	50	32,005	1,559	3,090	27,356	13,605
Dumuria	7	104	28,628	3,037	2,238	23,353	21,202
=====							
Total as of June, 1987	55	681	499,980	33,186	60,612	406,182	257,762

Total as of June, 1986	51	607	209,569	32,679	48,344	209,546	no figure available

*These figures are not another fund but indicate the amount of taka that has been put into the group funds through weekly savings.

STATION RESEARCH

At MCC Research Stations, new varieties, management practices and initial economic considerations can be tested under high management conditions. Research is directed towards the perceived constraints faced by our target group farm families, and also includes cooperative efforts with other research organizations. During the past year, research was conducted at Char Bata and Char Bhatirtek in Noakhali District; at Feni in Feni District; at Raipur in Lakshmipur District; at Nather Petua and Chitosi Station in Comilla District; and at Chuadanga, in Chuadanga District. The trials conducted at the Raipur and Chuadanga Stations, plus the soybean trials conducted at the other stations, are summarized in the soybean section of this report, under the agronomic research heading. The results from the vegetable trials conducted at Feni Research Station are summarized in the horticulture section of this report under the research summary heading. For more specific results, consult the 1987 Research Report, available upon request from MCC Bangladesh.

CHAR BATA

The research station is located near Khaser Hat, Char Bata union, in a moderately saline area. The research is centred on adaptation of new cropping patterns to saline charland. Salinity constraints are greatest on rabi and aus crop production, but aman research is also carried out, since it is the principal crop of this land type.

In the past year, field supervision and data collection were carried out by the Research Coordinator, Md. Golam Mowla. Experimental design and analysis up to Jan. 1, 1987 was conducted by Gary Kruger, research agronomist. From that date, Tom Bruulsema has taken on research agronomist responsibilities for the site.

A small change in the relationship to the local MCC extension offices occurred this past year. The Char Bata extension office in Dulal Miah Hat was closed, and the extensionist new workers out of the Khaser Hat research station office. This change facilitates direct cooperation.

Cooperation also continued with the Char Jabbar extension office and the Bhatirtek farming systems site. One field day with approximately thirty farmers was held in March, 1987.

Aus Season Highlights

In variety trials, the new HYV BR 20 again appeared promising. In the past three years it has yielded 10 to 11 percent more than the most popular local variety. Unlike other HYV's, it is tall enough to avoid flooding damage and is of short enough duration to fit traditional aus cropping patterns.

A seeding method trial confirmed that deep placement of seed can reduce salt injury on rice plants during emergence and early growth.

Plans for the 1987 aus season are to continue varietal testing and to try green manure crops on land too saline for aus.

Aman Season Highlights

In two separate HYV variety trials, twelve experimental lines from BRRI were tested, in comparison with released HYVs and local varieties. Some of these lines performed equally to the released varieties, BR 11, BR 4 and BR 10, but none surpassed them.

A double-transplanting method observation trial showed some promise for allowing HYV seedlings to be transplanted into deeper-flooded fields. This practice was observed in China by an MCC research agronomist on a study tour.

Nine deep-water aman varieties were tested for adaptation to the deepest-flooded areas of the char. However, these varieties were sensitive to transplanting and performed poorly compared to local aman varieties.

Plans for the 1987 aman season are to continue testing of new experimental varieties, and further examination of the double-transplanting technique. Economic studies of hill-to-hill spacing, weeding methods and supplemental irrigation are also planned.

Rabi Season Highlights

The early-sown crops, grasspea (Khesari), mustard and wheat have shown the greatest potential for rabi production on moderately saline land. Because of the 9 November storm, most grasspea stands were completely wiped out, and seeding of mustard and wheat were delayed. Yields for both these crops were economically marginal. Mustard yield responded very strongly to nitrogen and phosphate fertilizer. Wheat yield responded strongly to seed rate, partly because insect damage caused much thinning of stands this year. The wheat varieties Barkat and Agrani performed slightly better than the other released varieties.

Among later-sown rabi crops, soybean performed very well in relatively less saline soil. In a soybean variety and planting method trial, Pb-1 produced a yield of 2 tonnes per hectare when sown with conventional tillage in late December. For earlier seeding through the use of a no-tillage seeding method, other varieties appeared promising.

Cowpeas, groundnuts and mungbeans performed poorly. Rains in late April brought their growth to an early halt. Forty-five International Institute for Tropical Agriculture (IITA) cowpea varieties tested were all too long in duration to produce acceptable yields. Among sixteen groundnut varieties tested, none performed as well as Dhaka -1, a variety which is already locally grown.

Testing of the moldboard plow developed by BAU was continued. This year little difference was observed on the growth of wheat and soybean in comparison to the local plow.

Plans for the 1988 rabi season include a more intense focus on mustard and wheat production on moderately saline soils. Further testing of soybean as a replacement for other pulses will continue.

FENIAus Season Highlights

In an Advanced Lines adaptive Research Testing (ALART) trial, a cooperative trial organized by the Bangladesh Rice Research Institute (BRRI), seven advanced lines and varieties of aus rice were tested. The local variety, Purbachi, widely used by farmers in this region, yielded the best under direct-seeded conditions. The lines IR 25890-82-5-3 and IR-7156-720-3-2-1-1 followed behind Purbachi, and yielded an average of 2.27 t/ha.

Aman Season Highlights

There has been considerable interest in Bangladesh in recent years in the use of the nitrogen-fixing annual, dhancia (Sesbania aculeata) as a green manure. The performance of an aman rice variety, BR-11, following either aus rice or dhancia was compared. The treatment receiving dhancia plus 0 kg/ha nitrogen yielded as well (4.93 t/ha) as the treatment receiving dhancia plus 80 kg/ha nitrogen (4.98 t/ha); and better than the treatment planted to aus followed by 80 kg/ha nitrogen (4.57 t/ha). These yield values were not significantly different, but the results suggest that dhancia can effectively produce nitrogen for succeeding aman rice production.

In a transplanted aman variety trial, none of the tested lines yielded better than BR-11, a released, widely used variety.

In one trial ten lines, and in another 24 lines, of deepwater aman rice were tested in observation trials. The JWCT-156-0-0-0, IR-11185-B-B-850-1 and Habiganj Aman 4 all yielded over 4.0 t/ha. Several of these lines will be tested this coming year at the Chitosi Research Station, in a medium lowland area.

In a trial to determine the best time to apply nitrogen fertilizer to two popular aman rice varieties, no differences in yield were detected for three equal dose urea applications (10 and 40 days after transplanting, and at panicle initiation) versus four equal dose applications (at zero, 20 and 40 days after transplanting, and at panicle initiation).

Rabi Season Highlights

The results of the vegetable trials are summarized in the horticulture section of this report under the heading Research Summary.

Much of the wheat in Bangladesh is grown under rainfed conditions. Late-planted wheat can run into moisture stress problems, since February and March are often extremely dry. In a late planted, irrigated observation trial, four wheat varieties (Akbar, Kanshon, Shonalika and Annando) were tested. Heavy bird damage occurred, but yields could still be estimated based on extrapolation from undamaged wheat heads. The mean of the four varieties under irrigated conditions was 1.73 t/ha and under non-irrigated conditions was only 0.39 t/ha.

In a trial with mustard, three different insecticides, including neem and tobacco leaf extracts, were tested for effectiveness against aphids. Aphids are considered the most important pest of mustard in Bangladesh. Aphid populations did not reach the expected high levels. In spite of this, significant differences in yields between treatments were detected. Neem extract (333 kg/ha) and control (316 kg/ha) treatments yielded nearly the same, but significantly higher than either the tobacco extract (252 kg/ha) or Nogose (214 kg/ha; a commercial insecticide) treatments. This may indicate that the tobacco extract and Nogose treatments affected pollination in some way, perhaps by killing insects involved in pollination. The neem extract is known to repel insects, but normally does not kill them. Economic analysis indicated that the neem treatment was the most profitable way to control aphids. A larger aphid infestation this coming year would enable testing of the true effectiveness of these insecticides.

Blackgram is an important early season pulse in southeastern Bangladesh. Five lines were tested in a trial organized by the Bangladesh Agriculture Research Institute (BARI). While rats caused considerable damage, MAK-1 still yielded 1.48 t/ha and NG-135 yielded 1.37 t/ha.

In a trial conducted during the 1985-86 rabi season, digging trenches through the plow pan to depths of either 10 or 20 cm resulted in significantly deeper root penetration by maize. Yields that year, however,

were not significantly different. This past year, the same trial was repeated. Maize grown in the 20 cm trench treatment had significantly deeper root penetration and a significantly higher yield (1.67 t/ha) than trench depths of either 0 or 10 cm.

CHITOSI STATION

Aman Season Highlights

A deepwater aman variety trial was conducted with several new experimental lines from BRRI. The lines Janaki and IR 11185-0-0-0-88-2 produced as well as the local lines included in the trial. These lines are presently being tested in farmers' fields.

A soybean-aman cropping pattern trial was conducted. Several methods of relaying rice into the soybeans were tried. The rice did well; however, because the soybeans did poorly due to poor nodulation, not many conclusions can be drawn from the trial.

Rabi Season Highlights

A soybean seeding method observation with four treatments: (1) no tillage; (2) broadcast seed, then laddering the soil before adding a straw mulch; (3) asra minimum tillage; and (4) conventional tillage, showed that with progressively more tillage, soybean yield increased. A cowpea trial with the same treatments (except for the no-tillage treatment) had similar results. Cowpea yielded higher with more tillage.

Relaying fieldpea (the farmers' method) was tested against planting fieldpea with the asra minimum tillage technology. Yield differences were not significant.

Garlic, onion, marigold and coriander were grown as aphid-detering companion crops with mustard at the Chitosi Station Research Station. None of the five crops appeared to deter aphids. Coriander and marigold will be tried again next year at higher levels of interest.

CROPPING SYSTEMS RESEARCH

MCC conducts cropping systems research on three landtypes in the Noakhali and Comilla Regions. The land types are medium lowland, medium highland, and charland. The cropping systems site in each landtype is staffed by an agronomist and/or an economist, a site manager and one or two data collectors. Work at the sites includes monitoring of farmers' fields and/or individual farmers' enterprises. This provides a source of information on agronomic and economic practices, management and results. Data are also collected, usually from weekly bazars, on prices of commodities, labor, and draft power. In addition, research trials are done in farmers' fields to test new technologies against local conditions, and farmers' socio-economic constraints are examined through various studies. Research within the bari (homesite) itself commenced this past year. Periodically, field days are held for farmers at each site to present and discuss results and future plans of the cropping systems work. Sometimes farmers from the cropping systems sites also attend field days at the MCC research stations to see and discuss the work there.

In addition to the cropping systems sites, MCC also has extension offices located in each landtype. These cropping systems extension offices are situated in areas similar to the cropping systems research site. Personnel at the extension offices conduct multilocation tests (MLTs) and extend technologies originating from the respective cropping systems site. The frequent contact maintained between people at the cropping systems site and the extension offices facilitates such work and serves as a channel for feedback to the research program.

Brief site descriptions of each of the five sites are presented at the end of this report. The summarized results of the past year's trials at each site are presented below. A detailed report of work done at each site can be found in the 1987 Research Report, available from MCC Bangladesh upon request.

NATHER PETUA/CHITOSI STATION (Medium lowland)Aman Season Highlights

Intercropping soybeans with deepwater aman showed much promise in a trial conducted at the Eroain multilocation testing site. Aman yields were higher and the number of panicles per m² was significantly higher where soybeans were grown with the rice. This technology is being tested further in Eroain and continues to look very good in the farmers' fields.

Fertilizing with TSP had no significant effect on the aman yield in Nather Petua or Eroain. In the Khila Bazar area it appeared to increase yields economically.

Rabi Season Highlights

Azospirillum Brasilense is a dinitrogen-fixing bacterium. Inoculation of wheat roots, before planting, with a water slurry containing the bacterium was tested at Chitosi Station, Khila and Eroain. A brasilense did not significantly increase yield in Eroain or Khila, however it did appear to promote tillering, since the number of panicles per m² was higher where inoculum (bacterial slurry) was applied. In Chitosi this trial, along with a wheat variety trial and a wheat/fieldpea intercropping trial, was severely damaged by army worms.

A survey of farmers was conducted at Nather Petua, Chitosi Station, Eroain and Khila. This survey is presently being analyzed. A case study of five "poor" farmers and field-monitoring are on-going tasks at Chitosi Station Cropping Systems Research site.

TETUAYA/DHORKORA (Medium Highland)

Trials were conducted at Tetuaya during the aus and aman seasons. In November, 1986 a new site was opened near Dhorkora Bazar and the Tetuaya site closed December 31, 1986. Rabi season trials were then conducted at the Dhorkora site.

Aus Season Highlights

Aus variety trials were conducted both at Tetuaya and at the multilocation testing sites. Results suggest that the variety BR 21 could be an alternative to the popular variety, Purbachi, because of its good yield and longer straw. The line IR 9708-51-1-2, could also be an alternative due to good yield and a shorter time to maturity.

Aman Season Highlights

A BRRRI Advanced Lines Adaptive Research Testing (ALART) trial was conducted at Tetuaya during the aman season. The popular high yielding variety BR 11 gave the highest yield. The line, BR 316-4-4-1, matured considerably earlier than all of the other lines. In a variety trial the two lines, BRC 16-127-4-3 and BR 850-9-1-1, both yielded more than the check varieties, Pajam and BR 11. In a trial comparing mechanical weeding with weeding by hand, the mechanical weeder did not increase the yield of BR 11 significantly. A trial testing IR 50 as an early maturing aman variety did not give good yield data due to heavy damage of the very early maturing IR 50 plots by animals. Basal application of nitrogen fertilizer at the time of aman transplanting was compared with no basal application. No significant differences in yield were obtained, indicating that basal application of nitrogen not necessary. A trial comparing the planting of different numbers of seedlings per hill of Pajam rice at transplanting time indicated that one seedling per hill will yield less than the usual practice of planting 7-10 seedlings per hill. Two seedlings per hill, however, yielded approximately the same as the 7-10 seedling treatment.

Rabi Season Highlights

Eight soil samples were collected at the Dhorkora site and taken to the BARI soil science laboratory for analysis. Results indicated that, in general, fertility of the soil is low. The medium highland rice producing fields had a lower average fertility than the highland plots near the villages.

Fertilizer response trials of five rabi season crops were conducted at Dhorkora. Fieldpea responded positively to nitrogen, phosphorus, and

potassium, particularly to nitrogen and phosphorus. Wheat responded to all three nutrients, with the most response (yield reduction) to lack of phosphorus. Mustard responses were similar to those of wheat. Khesari (grass pea) and lentil responses indicated that fertilization with phosphorus and potassium is most important. In a sweet potato variety trial the varieties Tinirining and Cinjhi yielded a little more than the local variety. The farmers indicated that Tinirining is more suitable for marketing than Cinjhi. An intercrop trial with sweet potato and fieldpea suggested that intercropping is more profitable than growing only sweet potato. This was in spite of the fact that fieldpea reduced the yield of sweet potato in the intercropped plots.

BHATIRTEK (Charland)

The work conducted through the Bhatirtek Cropping Systems Site centered on varietal testing of rice, nutrient response of rabi crops, and economic monitoring of cropping alternatives. The main aberrations in the weather affecting crops during the past year were a prolonged hot, dry period just prior to the monsoon, heavy rain in early November, and early flooding of fields in April. Each severely curtailed agricultural production in the region. The drought period prevented transplanting of and increased salt injury to aus. The November rains and associated winds lodged stands of Rajasail, increased infertility in Karjasail, destroyed relayed crops, and delayed tillage and sowing in the rabi season. Flooded fields in April prevented full maturation of cowpea, chilli pepper, and peanut.

Aus Season Highlights

The local variety, Boilam, yielded 0.44 t/ha higher than the newly released HYV line, BR20. Tillage with a moldboard plough did not affect aus yield. Response of Boilam yield to phosphorus fertilization was 3.3 kg/kg P_2O_5 which was not profitable. BR9 and BR203-26-2 yielded 0.50 t/ha higher than IR8. Boilam gave very high returns to cash input but did not fully repay labour input at market rates. IR8 gave higher **net** returns than Boilam but required more input costs.

Aman Season Highlights

BR 11 yielded 0.50 t/ha higher than the local, Rajasail; it is not, however, suited to deeper flooded fields where the local, Karjasail, is grown. None of the deepwater lines tested were superior to Karjasail in deep flooding fields. Net returns for aman varieties decreased in the order: Karjasail, Kartiksail, BR 11, and Rajasail. Return to variable costs for aman varieties decreased in the order: Karjasail, Kartiksail, Rajasail, and BR 11. Karjasail had both the highest net returns and return to variable costs.

Rabi Season Highlights

Response of soybean yield to 25 Kg P_2O_5 /ha was 250 kg, which was highly profitable. Successful wheat cultivation in the char region requires a high seedrate, prompt sowing, and application of nitrogen and phosphorus. Yield response to 60-25-0 was 0.35 t/ha with late sowing. Response of ripe chilli pepper yield to 60 Kg N/ha averaged 350 kg/ha, which was not profitable. Response of sweet potato tuber yield to 60 Kg K_2O /ha was 1.6 t/ha, which was highly profitable. Sweet potato, lentil, peanut, sesame, and soybean (in this relative order) gave higher net returns over cash costs/unit area, compared with linseed, mustard, wheat, cowpea, chilli pepper and mungbean. The cutoff level for net return in this comparison was 5000 Tk/ha.

Socio-Economic Research

Socio-economic research was conducted at Tetuaya Cropping Systems Research Site (CSRS), Dhorkora Bazar CSRS, Chitosi Station CSRS, and Char Bhatirtek CSRS.

At Tetuaya CSRS, a survey was conducted upon completion of our 3-year term there. From this survey an analysis was done of MCC's impact in the area. A report was written, which outlines the new technologies which have been adopted in the area, and what types of farmers have adopted them (for this paper and others listed here, please see Research Results, available on request from MCC Bangladesh). One finding from this analysis is that subsistence farmers appear to be interested in adopting low-input, low-return pulse crops.

Dhorkora Bazar CSRS was opened when work was completed at Tetuaya CSRS. At this new site both a Sondeo (informal) survey and formal benchmark survey were conducted. A Sondeo report was written. These surveys were conducted to gain a better understanding of the socio-economic characteristics of rural households in the area, and to better direct our research effort towards the rural poor. During the Sondeo, livestock was recognized as an important asset of both subsistence farm families and rural households and was suggested as an item for research. It was also suggested that highland vegetables and fruit and spice trees be items of research. Following the surveys, a case farm study was initiated, which will look in detail at the income and expenditure patterns of 5 subsistence farm families, and 5 landless rural households. Analysis of this data will be done in 1988.

A Sondeo survey and formal benchmark survey were also conducted at Chitosi Stations CSRS. Here again, a Sondeo report was written. An interesting finding of the Chitosi Sondeo was the way villages are often dominated by a certain socio-economic class. It was suggested research be done on cultivating vegetables on medium-lowland areas in the Rabi season. Following these surveys, a case farm study was initiated which involves 5 farm families. Again, analysis will be done in 1988.

Surveys were not conducted at Char Bhatirtek CSRS because the site will be moved in late 1987. However, data collected in a 1982 case farm study in the area (actually from Char Dharnapur) was analyzed and a report was written. An interesting finding of this analysis was that although the Amon harvest is the single largest source of income throughout the year, its contribution to the families income comes at a time when large debts must be paid off. Thus, much, if not all of the income from the Amon harvest is used to pay-off loans.

One last report was written based on the benchmark surveys done at the research sites. In this report a general idea of the maximum landholding size of our target group was determined for Tetuaya, Dhorkora Bazar, and Chitosi Station.

Finally, informal input was given to agronomists regarding trials, and marginal analysis was introduced as a new economic technique to be used when analyzing trials.

CROPPING SYSTEMS SITE DESCRIPTIONSMedium Lowland Sites

Nather Petua: The bazar of Nather Petua is located in Uttar Howda South Union, Laksam Upazila, Comilla. It is approximately 10 km north of Sonaimuri on the Sonaimuri-Laksam road. It is also on the Noakhali - Laksam rail line. Nather Petua is in a large area of medium lowland. Flooding occurs from June to December, ranging in depth from 0.75m to 1.75m. Small plots near baris have been raised by farmers and could be classified as medium highland. There are also spots of very deep flooding that could be classified as lowland. The area generally has poor drainage and is subject to flash flooding. The soil is a clay silt to clay silt loam.

The main cropping patterns are broadcast aman-fallow and broadcast aus/aman-fallow. Rabi crops are grown to a very limited extent. There are several local varieties of aus and aman grown; the major aus variety is Kalapetia and the main aman variety is Keora. Because of a late aman harvest and the poor drainage, rabi crops cannot be planted very early. Rabi crops grown include wheat, mustard, linseed, lentil, and mungbean.

Fertilizer is used by farmers with investable resources. Little weeding is done during the rice season. Larger farmers who own an asra (rake) use it to weed their fields. Most farms are owner-operated; only a small proportion of land is sharecropped. Only the richer farmers own all of their agricultural implements.

The Nather Petua Cropping Systems Site was closed in December, 1986, and a new medium lowland site was opened at Chitosi Station.

Chitosi Station: Chitosi Station is located on the Chandpur fail line, 13 Km west of Laksam. It is in Mudafarganj #5 Union, Laksam Upazila, Comilla District. The Chitosi Station Cropping Systems Site was opened at the end of 1986.

Chitosi Station is in a medium lowland area (flooding depth of 0.75 - 1.75m). The depth of flooding, duration of flooding and potential for

for flash floods are the major constraints affecting the cropping pattern. Flooding usually starts in June and ends in November. The soil is a silty clay loam.

The main cropping patterns are deepwater aman - fallow and mixed aus/aman - fallow. About 60% of the fields are fallow in the rabi season. There are many local aus and deepwater aman varieties grown; the major aus variety is Fitta; major aman varieties are Keora and Gorcha. The aus and aman crops are usually planted around the end of March and beginning of April, respectively. Aus is harvested mostly in July. Aman is harvested in mid to late November.

The major rabi crops in this area are wheat, fieldpea, mustard, Khesari, lentil, linseed and mungbean. Boro rice, watermelon, chilli and potato are grown to a very limited extent. There is no irrigation scheme in this area.

The average family size, according to our surveys, is 6.7 persons. Based on the surveys, 96% of the families cannot produce enough from their fields to provide all the rice they need. Non-farm occupations include wage labor, rickshaw pulling, and petty trading. A large proportion of the men go outside the area in the off-season (July through October) in search of work.

Medium Highland Sites

Tetuaya: The Tetuaya Cropping Systems Site is located in the eastern part of Nangolkot Upazila in Comilla District. It is in the midst of a medium highland area that covers about 150 square miles. The Tetuaya site was opened in November 1982 and represented MCC's continued commitment to work in medium highland areas. Medium highland cropping systems work was carried out initially at the Gunabuti site in Chauddogram Upazila, but this site was closed in early 1982.

The physical and agronomic characteristics are typical of a traditional medium highland area. Maximum flooding depth is approximately 80 cm, with flooding normally lasting from the end of June until the middle of October. Soil is of the Tripperia soil association, a grey silt loam flood plain.

The major cropping pattern is direct seeded aus-transplanted aman-fallow. Some rabi crops are grown (mustard, lentil, fieldpea, khesari and wheat). Aus varieties are usually Chenal, Purbachi or some other local varieties. Pajam is the dominant aman variety. On the highland areas, aman seedbeds are followed with vegetables, pulses, groundnuts or sweet potatoes.

Tetuaya farmers have had little contact with outside agricultural agencies so information on different agricultural practices is scarce. Most of the farmers have very small landholdings, little excess capital, and usually work part of the year as daily agricultural laborers. Therefore, their capacity for risk taking is constrained by their present marginal existence.

The Tetuaya Cropping Systems Site was closed in December, 1986, and a new medium highland site was opened in Dhorkora village in November, 1986.

Dhorkora: The Dhorkora Cropping Systems Site includes the villages of Dhorkora and Shaktola located near Dhorkora Bazar in Cheora Union, Chaudogram Upazila, Comilla District. The site is approximately five kilometers west of the Dhaka-Chittagong highway. It was opened in November, 1986.

The Dhorkora site is in a large area of medium highland. Maximum flooding depth is approximately 60 cm, with flooding normally lasting from the end of June until the middle of October. Soil is of the Tippera Soil Series, a gray silt loam flood plain. The major cropping pattern is direct seeded aus-transplanted aman-fallow. Aus varieties are Purbachi, Chenal, Badali, and Baturi. Pajam is the dominant aman variety, but some BR 11 is also grown. The land is 80 percent fallow during the rabi season. Crops grown on the remaining land generally include mustard, lentil, khesari, wheat, and cowpea.

Highland areas within or near the villages are usually used for aman seedbeds. Other crops grown on these plots include aus, transplanted aman, sweet-potato, lentil, blackgram, ground nut and winter vegetable (radish, chili, eggplant, sweet pumpkin).

The average family size at the site is 6.5. Approximately one third of the families can provide more than 12 months supply of rice each year from their land holdings. The remaining families are classified as rice deficit or as landless. The average landless family owns 3.3 decimals of land (homesite area only) and obtains 81 percent of its income from non-farm sources (wage labor, professional, petty trading, foreign service). The average rice deficit family owns 44.7 decimals of land. About half of its income comes from farm crops, almost half from non-farm sources, and a small amount from other farms. The average rice surplus family owns 250.4 decimals and obtains two thirds of its income from farm crops. The predominant land rental methods at the site are sharecropping (bondhak) and cash rent.

BHATIRTEK (Charland)

The Bhatirtek Cropping Systems site is located 10 km south of Sonapur at Choumahani Bazar in U. P. No. 6 of Sudharam Upazila, Noakhali District. Nearby bazars include Hajirhat to the north north east, Bangla Bazar to the north, and Uttar Wabba to the west. Bhatirtek is a relatively new area of the Noakhali Char, formed from the tidal floodplain of the lower Meghna River. Most of the land is medium highland. Flooding may occur from May through to October. The soil is a medium-textured, calcareous silt loam typical of the Ramgoti soil series. The soil is moderately to strongly saline. Some pockets of lighter-textured soils are less saline and can be cropped to vegetables and chilli in the rabi season.

The predominant cropping pattern is fallow-transplanted aman-fallow. The main aman varieties are Rajasail (on the higher land) and Karjasail (on the lower land). The area is 70 to 80 percent fallow in the rabi and aus seasons. Where rabi crops are grown, they include khesari, chilli, cow-pea, linseed, and sweet potato. Eggplant, garlic, onions and peanut are common capital-intensive crops.

Absentee landownership is quite prevalent in the region. This, in conjunction with the sharecropping land tenure system, results in a significant proportion of the rice harvest being transported out of the area.

The mud roads make communication difficult, particularly during the rainy season. Essential inputs of seed, fertilizer and insecticides are often not available in adequate quantities. Farmers depend on their family members for labor, or for additional income if a family member holds another job. During the busy times of rice transplanting and harvesting, additional labor is supplied by migrant laborers. Many farmers own their own draft power.

APPROPRIATE RURAL TECHNOLOGIES PROJECT (ART)

The Rower pump project took on a separate identity from the Appropriate Technology Research and Development (ATRD) program this year. The scope of the project was also increased to include possible marketing of ARTs other than Rower pumps and, as a result, the project has been renamed Appropriate Rural Technologies (ART).

LONG RANGE DIRECTION

As a guideline for future program direction, the following plan for developing a local independent sustainable marketing network for ARTs was established.

Three phase process:

- a) Increase business efficiency of current program (i.e. increase sales, cost control and full cost coverage).
- b) Establish a semi-independent organization receiving funding and consulting from MCC. Possibly a co-operative venture with a local production workshop.
- c) Move to an independent, self-funded, owned and operated Noakhali-based organization, marketing (and possibly producing) ARTs.

The addition of ARTs other than Rower pumps would both increase the number of ARTs available to Bangladeshi farmers and allow greater capacity utilization of our existing dealer distribution network. The following new items were evaluated during 1986-87: Low cost drinking pump, quality winter vegetable seed, handweeder, pedal thresher and backsprayer.

STRUCTURAL AND STAFF CHANGES

Due to technical problems such as short sand layer, fine sand, excessive salinity, ten sales areas were discontinued from the program. Fifteen new dealerships were established to make extension more uniform in our working area.

The program technical supervisor was transferred to ATRD program where he will continue to research and field test manual handpumps and tubewells as well as do other research work. The transfer has reduced excessive hierarchical layers and duplication of supervision in the ART program.

Field staff have been reduced from twelve to five. The number of field staff was excessive for the working area covered and the job required. Also, the reduction is consistent with moving towards a self-supporting market. The shop dealers that sell the pump in their local shops will be given more responsibility and incentive to perform the role of an extensionist.

FIELD STAFF MANAGEMENT

Field staff received two training sessions on vegetable cultivation and a one day seminar on sales at International Development Enterprises (IDE). Training on marketing strategy has been arranged for The Marketing Officer at the Bangladesh Management Development Center (BMDC) in the coming season. There is the possibility of field staff also receiving training on sales at BMDC. To improve motivation and worker performance, monthly sales targets and a bonus plan for field staff have been established. (The monthly bonus will be based on actual sales as a percentage of target).

PROMOTION AND PRICE CHANGES

Promotion consisted of a farmers' rally in Feni for fourteen farmers and eight dealers; thirty-two slideshows in village centers; provision of calendars, posters, demonstration pumps, and field visits by staff. Forty-one shop dealers were given training on procedures for marketing Rower pump as MCC sales agents and twenty-seven tubewell installers were given instruction on proper installation and maintenance.

The installation subsidy provided by MCC was discontinued, except in the char (coastline) areas where it will be discontinued next season. A five percent service fee was charged dealers for ART's arranging of pump sales with large organizations such as Proshika and CIDA.

In order that Rower pump marketing move towards becoming self-sufficient, the Manual Pump Group (MPG), consisting of IDE, MAWTS, JCCIP and MCC, has agreed to phase out installation subsidies and add a 10% margin above pump material costs to reduce subsidies for promotion, transportation, etc. The MPG has emphasised the necessity of providing assistance to poorer farmers but believe credit to be a better alternative to continued subsidization.

SALES

Actual dealerships remained the same as the 1985-86 season (approximately 50) and covered the same geographic districts of Bangladesh (Lakshmipur, Noakhali, Feni and bordering areas of Chittagong and Comilla). This season ART marketed and installed 718 2-inch Rower pumps and 60 3" low-lift Rower pumps. Sales were below 1985-86 sales levels of 1012 and 69. The apparant seasons for lower sales this season were:

- a) heavy rainfall: 1182mm between September and April as compared to 403mm last season.
- b) Removal of MCC installation subsidy, resulting in a 15% price increase to the farmer.
- c) capital restraints on farmers because of forced loan recollection. Sales started the beginning of October and office sales close the end of July. 144 2-inch pumps were sold through other NGOs, 102 of which were installed in the Cox's Bazar area.

Manual Pump Group (MPG) nation-wide sales of 2" Rower pump for the season are approximately 9500. It is believed that at least one private business has sold between 2000 and 3000 additional pumps.

The potential for expansion of small-scale irrigation seems considerable, because currently in ART's working area, only approximately 28 percent of acres cultivated during winter and/or summer seasons, are irrigated. The major constraints appear to be lack of awareness of the pumps potential and lack of capital to purchase (especially the latter).

CREDIT

1986-87 was the second season of the MCC small scale credit program; an attempt make the rower pump affordable for small and marginal farmers through MCC programs such as the Extension Program. Repayment is supposed to occur in four installments over a two-year period. Thirty-two pumps were sold on credit this season. Next season, once the full two-year loan period has expired for 1985-86 season loans, an evaluation will be done to determine the success of this method of getting pumps to very small farmers.

For a number of years the National Bank has had a rural credit scheme for extension of credit to farmers for purchasing Rower pump. The major reason which has led MCC not to pursue this option this past season has been the extreme difficulty of getting local banks to comply with National Bank directives for such small size loans. This past season MPG has examined the possibilities of obtaining credit for pump dealers. The National Bank was approached, but once again it was expressed that the size of the loans would hamper implementation at the local level.

Another private credit facility was approached and has tentatively agreed to extend 10 lakh taka (US \$ 33,000) credit for small scale irrigation pumps through the MPG for the 1987-88 season. This should enable about 1,000 pumps to be extended on credit.

MARKET INFORMATION GATHERING

During the past season monthly field reports completed by field staff and a market survey were used to gather information on buyer characteristics for use in program planning. A summary of some purchaser characteristics and preferences are presented below. Sample size was 126.

Survey Summary

Average land cultivated during winter 0.78 acre, summer 1.92 acre.

Distribution of Rower pumps according to customers land size:

0 -0.9 acre	30%
1 -1.9	24
2 -2.9	14
3 -3.9	15
4 -4.9	7
5 +	10

Average land irrigated during winter: 0.41 acre, summer: 0.35 acre.

Acceptable price for manual pump:	<u>For irrigation</u>	<u>For drinking</u>
200-400 Tk.	14%	9%
400-800 Tk.	57	48
800-1200 Tk.	22	33
1200-1600 Tk.	7	7
no response	∅	3

Preference for regular PVC pipe compared to corrugated PVC:

preferred PVC	60%
preferred CPVC	40%

Method of financing purchase of rower pump:

Savings	66%
money lender	13
family	6
MCC loan	5
sale of assets	4
bank loan, neighbour, relief	2% each

Source of first hearing of rower pump:

Shop dealer	26%
field staff	25
poster	15
neighbour	14
demons. pump	13
Ag. extension	5
relative	1

who/what convinced person to purchase rower pump:

shop dealer	37%
field staff	28
neighbour	10
Ag. extension	10
demo. pump	7
mistory	3
MCC general	3
relative	1

96% said shop access was good.

29% said service of dealer and mistory work were good, 70% said it was satisfactory.

APPROPRIATE TECHNOLOGY RESEARCH AND DEVELOPMENT PROJECT

The purpose of Appropriate Technology Research and Development (ATRD) project is to serve as a technical resource for other MCC programs and other organizations. The ultimate target group is the rural poor (lowest 40%) in Bangladesh. Other MCC programs and other organizations will serve as intermediaries which request ARRD's assistance, and carry out the dissemination of the developed technology to the target group. The ATRD project consists of an Expatriate Engineer a Technical Officer, who is responsible for supervising field testing, and a Mechanic/Workshop Supervisor, who maintains the AT workshop.

In the past year a broad range of technologies have been worked on ranging from shallow tubewells to cookstoves to low-cost latrines. Efforts are being made to better define and prioritize projects for more efficient program operation.

APPROPRIATE TECHNOLOGY PROJECTS

Shallow Tubewell Technology For Saline Coastal Regions

Over fifty copies of the report, Handpump Technology for Domestic Water Supply in Saline Coastal Regions of Bangladesh were distributed to organizations working in the saline coastal regions of Bangladesh. The report outlines MCC's experience installing shallow tubewells beside ponds to tap the fresh water lens that is perched on top of the saline groundwater underneath the ponds. These tubewells provide an acceptable source of drinking water in areas where tubewells could not previously be installed due to high ground water salinity levels or high cost.

These shallow tubewells offer many advantages. They are inexpensive, Tk. 500-800, compared to the only alternative, deep tubewells, Tk. 30,000 -- 70,000. Previously, in some coastal regions of Bangladesh no tubewells, shallow or deep, could be installed due to high groundwater salinity levels and people had to rely on contaminated surface for domestic use. The tested bacteria water quality for the shallow tubewells,

less than 10 coliforms per 100 ml, is excellent compared to ponds, average of 13,200 coliforms per 100 ml.

Current work aims to determine site selection and tubewell filter placement criteria for shallow tubewell installation in saline areas. At present, the primary site selection criterion is the presence of a permeable sand layer directly under the pond.

The Filter Under the Middle of Pond (FUMP) experiment was begun in April to test the feasibility of placing the tubewell filter directly under the middle of the pond in the center of the fresh water lens, and to learn more about the salinity level and bacteria level variance throughout the fresh water lens over time and distance.

Drinking Water Pump

A low-cost drinking water pump was built and tested by replacing the metal Y-piece and surge chamber assembly on the Rower Pump with a PVC elbow. The modification reduced the cost of the pump head from Tk.400 for the Rower pump, to Tk. 232 for the drinking water pump. Forty drinking water pumps were installed in the char this past year for observation. The Appropriate Rural Technologies Project (ART) plans to start assembly and sales of the drinking water pumps in the coming year.

Corrugated PVC Tubewell Casing

In October 1985, the Dutch Land Reclamation Project and the Netherlands Embassy imported and donated 15,000 meters (49,212 feet) of flexible 50mm corrugated PVC pipe. The pipe was given to MCC to be tested for use as an inexpensive well casing for shallow tubewells in Bangladesh. The corrugated PVC pipe (Tk.4/ft) offers a potential 60 percent price reduction over 50mm rigid PVC pipe.

The MCC Rower Pump Program has sold 27 corrugated PVC tubewells in the 1986-87 marketing season. This excludes the 40 FUMP experiment tubewells installed in the char areas by the ATRD program, the 3000 feet of pipe given to CIDA for well casing in the Cox's Bazar region, and the 1215 feet of pipe given to IDE for testing in its tubewell program. By the

end of the 1986-87 marketing season, there will be approximately 35,500 feet of corrugated PVC pipe remaining in the MCC inventory.

In the past season two corrugated PVC tubewells collapsed and had to be re-installed. This represents less than two percent of the total number of corrugated PVC tubewells installed. The reasons for the failures were not determined. Overall, the durability of the corrugated PVC pipe has been excellent.

In the future greater promotional effort is needed to introduce corrugated PVC pipe to shallow tubewell purchasers. Installation of corrugated PVC tubewells is somewhat more difficult and risky than installation of rigid PVC tubewells, yet its lower price may outweigh these disadvantages. Responsibility for the corrugated pipe will be turned over to the ART in the coming year, as it will be conducting the marketing feasibility study.

In the coming season more effort could be put into promoting the pipe for use as irrigation water conduit, as there has been very little emphasis on this application in the past.

Low-Cost Latrines

In June 1986, MCC started a sanitation feasibility study and test latrine project in Noakhali to develop a latrine available to, and affordable for, people without sanitary latrines. To date, two rounds of experimental low-cost latrines, each with six latrines, have been installed in selected HSP villages, and monitored by the Homesite Program and ATRD Program with initial assistance from the MCC Saidpur Sanitation Engineer.

Experiment I latrines, constructed in June 1986, consisted of 30 inch diameter by 4 foot deep pits, with and without bamboo pit liners and various types of commodes: tin chutes, concrete commodes: tin chutes, concrete commode with PVC discharge pipe or concrete squatting slab. After a year, the latrines were still functioning although decay was beginning to show on the bamboo pit liners and pit covers. Frequent maintenance was required to replace soil which eroded from around the pit covers and the elevated latrine floors of the off-set pit design

latrines. The one pit, without a liner, remained intact due to the many tree roots in its walls. The cost of the Experiment I latrines ranged from Tk. 276 for the tin chute design to Tk. 500 for the concrete squatting slab design, not including the bamboo superstructure (cost Tk. 206).

Experiment II latrines, constructed in January 1987, consisted of 1-1.5 foot diameter by 4-5 foot deep pits, with and without bamboo pit liners, and commodes made by molding a 4 foot piece of 4 inch diameter PVC pipe. The cost of the Experiment II latrines ranged from Tk. 165 for the unlined, one foot diameter pit design to Tk. 183 for the lined, 1.5 foot diameter pit design, not including the cost of the "moidha" superstructure (Tk. 151). Two of the Experiment II latrine pits filled after six months use with an average filling rate of 3.2 liters/person/month. The owners plan to dig new pits as soon as the rainy season ends and the water level recedes.

Much has been learned from observing these experiments, yet more development and planning is needed before a design will be ready for dissemination. Further latrine development has been suspended until long-term resources of money and personnel can be committed to ensure that the process is carried through to the dissemination stage. A national staff person directly involved in the development process is especially required to provide continuity, as MCC volunteers are replaced every three years, and to provide more insight into the culture and environment throughout the development process.

Improved Cookstove

This past year, after the distribution of ten of the improved metal cookstoves to local women, feed back was gathered to determine the stove's acceptability. The results indicated the stove uses less firewood and cooks quicker than the traditional chula, but has many disadvantages, such as high cost (Tk. 151), limited fuel selection and lack of coals. Based on informal interviews with target group women, they are only willing to pay Tk. 10-20 for an improved cookstove. In the future any improved stove will have to be constructed with materials available to village women at little or no cost if the program is to be successful.

Further cookstove development has been discontinued so that ATRD resources can be committed to higher priority projects.

TRAINING PROGRAM

An organization such as MCC needs to train its employees throughout their employment period. Learning on the job through trial and error is inefficient because it wastes time, money, and materials. Training provides the correct techniques and skills for doing the work, increasing job performance and efficiency, reducing wastage of time, money and material resources. Thus, training is an important component in enabling MCC to achieve its objectives. MCC's Training Program itself has 3 objectives, which are:

- 1) New Staff Training. This need is especially important when an employee begins work in an area of service but possesses little knowledge about the nature of the job or MCC's philosophy, policies, and procedures.
- 2) Continuing Staff Training. This training is aimed at providing opportunities for increasing knowledge and skills leading to professional improvement and increased job performance. This training helps to keep employees up-to-date, and to adjust to changing work demands and shifts in program emphasis.
- 3) Promotional Training. A long-term goal of the Training Program is to motivate, develop, and train Bengali nationals to move into positions of leadership, thus reducing dependency on foreign skills and expertise. Promotional training is needed to prepare employees for greater work performance to facilitate smooth transfer to higher positions with a minimum of difficulties.

MCC's Training Program is concerned with increasing or improving the knowledge, skills, techniques, attitudes, and experiences of the employees.

METHODOLOGY AND MATERIALS

The Training Program uses an integrated combination of in-service and external training resources to meet its objectives. These resources include monthly Agricultural Meetings to enhance communication and serve as a medium of in-service training, and the maintenance of an Agriculture Library and the related distribution of books, journals, and publications. The Training Program maintains contacts with research

institutions, universities, government, and non-government training agencies, coordinating training for staff with outside training activities. The Training Program also serves as a consultant in designing training materials and demonstrations, provides feedback and jointly helps evaluate the other Agriculture Program training needs. The Training Program assists in facilitating the flow of information between the Agriculture Research and Extension Programs.

RESULTS AND DISCUSSION

The previous year was a period of rebuilding by the Training Program. The Training Program had been without a Program Leader for over 3 years, and thus was functioning under-staffed with only an Assistant Training Coordinator for part of the 1986-1987 Program year. In September 1986 the Assistant Training Coordinator resigned. Essential Training Program responsibilities were carried out by shifting some responsibilities to Administrative Services, and by the Program Leaders of the various Agriculture Programs providing for the training needs of their own staff. A new Training Program Leader was hired in January 1987, and following orientation and 3 months of language study, he was able to begin work in early May. Following the arrival of the new Training Program Leader, the Training Program has been going through a period of evaluation to determine the best way for the Training Program to address the needs of the various Programs within the Agriculture Program. Despite the numerous disruptions and the turnover in staff, considerable training was undertaken last year. These will be overviewed below.

Monthly Agricultural Meetings

Nine of the 11 monthly Agriculture Meetings were held last year, covering a variety of topics including rice, soybean, and vegetable cultivation, pest control, fruit and spice tree cultivation and management, livestock care, feeding, and management, and problems and work with development in women. Agriculture Meetings were attended by staff in Extension, Research, and Homesite Programs. Meetings were not held in October immediately following the resignation of the Assistant Training Coordinator, and in May.

Library and Publications

Arrival of the new Training Program Leader found the Feni Library disorganized with numerous publications missing. In addition, acquisition of journals and related publications had declined. The Ag. Bulletin had been discontinued, and the Bengali staff were no longer receiving copies of Krishi Katha and ADAB News in Bangla. Publications from the various Agriculture Research Institutes in Bangladesh were not being received by the Feni Library. However, the new Training Program Leader considered the Library resources as a critical component of overall staff development and for enhancing communication and the flow of information between MCC and the various national research institutions, so work was begun immediately to reorganize the Feni Library and acquire the necessary journals.

Outside Staff Training

Several Programs within the Agriculture Program took advantages of training offered by training agencies outside of MCC. An overview by program of training received from outside agencies is given below.

Administrative Services: The UAC for Maijdi received training for "Basic Principles and Techniques of Personnel Management, Industrial Relations, and Labour Laws", offered by BMDC.

Extension: One Extension Supervisor received training in "Poultry Rearing and Management", offered by BRAC, and the Extension Program Leader attended a seminar on Extension offered by BRAC.

Homesite: Three Homesite Extensionists and the Field Supervisor received training in "Poultry Rearing and Management", offered by BRAC.

Rower Pump: Five Rower Pump Extensionists attended a seminar in Dhaka on Salesmanship, sponsored by International Development Enterprises.

Rural Savings: The Women's Sector Field Supervisor received training on "Women in Development", offered by Proshika, the Education Field Supervisor received training on "Development Education and Group Management", offered by ADAB, and 3 Female Group Facilitators received training on "Poultry Rearing and Management", offered by BRAC.

In addition, Extension, Homesite, Rower Pump, and Rural Savings Program staff received training in vegetable cultivation offered by MCC's horticulture and vegetable specialists Bob Burns and Modhu S. Paul (see Horticulture Program).

SUMMARY

The 1986-1987 program year may have witnessed the lowest point in the history of the Training Program. The resignation of the Assistant Training Coordinator combined with a vacancy in the Training Program Leader position left the Training Program without any staff, and as a result Training Program activities were minimal. However, a new Training Program Leader began work in May, and the Program began a period of re-evaluation and rebuilding. Training received both "In-House" and from outside training organizations was below previous years' levels. This had both good and bad results associated with it. The fact that some training took place is a positive indication of the resiliency of the Agriculture Program to provide for training even in the absence of specialized staff. The decline in training received from outside training organizations may not have been serious, as outside training is expensive, so use of outside training should be minimized to situations where training cannot be provided from within MCC.

MCC's library and associated resources were underutilized last year. This may be due partially to the disorganization of the Feni Library, and the lack of a supervisor to coordinate acquisition and distribution of library materials. As the Feni Library is reorganized and updated, utilization of its resources should increase. Although the 1986-1987 program year was a low point for the Training Program, it was also the beginning of a period of rebuilding that has tremendous potential for the coming program year.