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INTEGRATED CEREALS PROJECT

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NEPAL

Work Plan

October 1982 - September 1984

HIS MAJESTY'S GOVERNMENT
MINISTRY OF AGRICULTURE
DEPARTMENT OF AGRICULTURE

INTEGRATED CEREALS PROJECT

WORK PLAN

PRE-PRODUCTION VERIFICATION TRIALS

TECHNICAL REPORT

Integrated Cereals Project

Work Plan

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ABBREVIATIONS AND ACRONYMS

AA	-	Agricultural Assistant
AADO	-	Assistant Agricultural Development Officer
ADB	-	Agricultural Development Bank
ADO	-	Agricultural Development Officer
AERP	-	Agricultural Extension and Research Project
AIC	-	Agricultural Inputs Corporation
APROSC	-	Agricultural Projects Services Centre
CS	-	Cropping Systems
DOA	-	Department of Agriculture
FFT	-	Farmer Field Trials
GTZ	-	German Agency for Technical Cooperation
HFPP	-	Hill Food Production Project
ICP	-	Integrated Cereals Project
JADP	-	Janakpur Agricultural Development Project
JT	-	Junior Technician
JTA	-	Junior Technical Assistant
KHARDEP	-	Kosi Hill Area Rural Development Program
MOA	-	Ministry of Agriculture
NZIP	-	Narayani Zone Irrigation Project
PACD	-	Project Activities Completion Data
PL	-	Production Leader
PLAA	-	Panchayat Level Agricultural Assistant
PO	-	Production Officer
PPVT	-	Pre-Production Verification Trials
RAD	-	Rural Area Development (Rapti Zone)
RCUP	-	Resource Conservation and Utilization Project
RD	-	Regional Director
SMS	-	Subject Matter Specialist
SPISP	-	Seed Production and Input Storage Project

Signs used in Cropping patterns between crops:

..	,	Sequential crop following another.
/	,	The second crop is relayed into the previously designated crop.
+	,	Both crops planted at the same time.

INTEGRATED CEREALS PROJECT

OCTOBER 1982 TO SEPTEMBER 1984

WORK PLAN

I. BACKGROUND AND PROJECT ACCOMPLISHMENTS

A. Focus of the Project

1. Project Amendment Statement

The Project Paper Amendment, June 1981, summarized the goals of the original project paper as follows:

"The Integrated Cereals Project (ICP) (367-0114) was designed as a five-year grant funded project to assist in strengthening the Government of Nepal's (GON) capacity (1) to generate improved production technology for the major foodgrain crops and related cropping systems, and (2) to transfer that technology to Nepali farmers in such a way that it is readily adopted. It directly addresses AID's sector goal for long-term improvement of agricultural productivity in Nepal, particularly in the hills. Further, the project's purposes and the sector goal they address are high on the list of GON development priorities as expressed in the Sixth Five Year Plan covering the period 1980-1985".

2. Cereal Crops

The crop commodity programs have been supported through technical assistance and experimental station development. Intensification of on-farm research by experiment station staff have included increases in Farmer Field Trials of varieties, agronomic trials, fertilizer trials, and plant protection trials, especially in maize, and a greatly expanded mini-kit program that disseminated new varieties of the cereal crops together with information on crop culture, and, in some crops, the addition of fertilizer and plant protection materials as a part of the mini-kit package.

3. Cropping Systems

In addition, technical assistance has been provided to assist in the establishment of a network of cropping systems research

sites where adaptive research has been conducted on farmers' fields in order to -

a. Test the suitability of existing experiment station technology in farmers' cropping patterns.

b. Develop a package of technology for cropping patterns in selected representative farming areas, especially in the Hills.

c. Develop an understanding through agronomic and socio-economic studies of the farmer situation - his crops, cropping patterns, why he uses these crops the way he does, the relationship to the whole farm enterprise, and the constraints which limit farmers from increasing production.

4. Sixth Plan Goals

The Sixth Five Year Plan (1980-81 to 1984-85) aims to increase production of rice by 13.5%, maize by 12.4% and wheat by 25.5% during the five year period raising production to 2.74 million tons of paddy, 0.95 million tons of maize and, 0.58 million tons of wheat or a total of 4.27 million tons annually.

a. The targets of the Sixth Plan were later consolidated to be achieved in a three year period. To achieve these targets with resources available to the DOA the country is to be divided into defined areas according to the availability of irrigation into -

i. Intensive areas where irrigation is available.

ii. Pocket areas where irrigation is seasonally available.

iii. Unirrigated areas.

Targets for the different crops in these areas vary according to the productivity that could be expected with the availability of water and other inputs. Improved management and availability of input supply and loan programs are additional components of the program.

b. Stress is placed on people's participation as a bottom-up approach to development with the following objectives -

"Run agriculture development programme by making public leadership responsible, active and able participants right from ward, village (Panchayat) and district level.

Make public representatives come forward in identifying specific problems of agriculture development work and their possible solution and be self reliant.

Bring closer relationship between public representative and governmental mechanism and run all the agriculture development programs (agriculture loan, agriculture input, Sajha Cooperative, land reform, irrigation, etc.) in a unified manner.

Increase agriculture production by maximum use of local labour, resources, materials, skills and available technology.

Plan and implement agriculture development programmes that are felt necessary at ward, village, area and district levels.

Properly utilize the investment of HMG and direct projects towards the targets with less expenditure and in short time.

Make each and every district of the Kingdom self-reliant in agriculture production."

5. Production Oriented Service Program

During this period a policy statement called "Production Oriented Service Program" seeks to make agricultural research more relevant to farmers and their problems by reorienting research to the following -

"Make agricultural research practical and follow-up type (meaning adaptive research as opposed to "theoretical scientific research").

Give priority to farmers' problems.

Conduct agricultural research according to geographical conditions and meteorological variations.

Concentrate crops research in definite agricultural research centers. (Eleven centers were identified including the three major cereals commodity stations.)

Make agricultural (research) farm extension oriented.

Policy determination, supervision, and evaluation of agricultural research work."

To achieve the latter the Research Coordination Committee was "consolidated, strengthened and upgraded to Ministry level".

The implementation of these principles is centered in a research outreach program which identified districts around principal research stations for research outreach activities. The research personnel of the respective stations are to spend 40% of their time in on-farm adaptive research in these areas. Districts of concern to the cereal commodity stations were the following --

Parwanipur (rice	--	Bara, Parsa, Rauthat
Rampur (maize)	-	Chitwan, Makwanpur, Gorkha, Nawalpur
Bhairawa (wheat)	--	Rupendehi, Nawalaparasi, Kapilvastu, Palpa

6. Supervision of Production

Implementation of production programs is to be brought about by a system of supervision by Class I officers. Thirty-five officers have been assigned, one to two districts each, and given the powers of the Secretary as they visit their districts so that on-the-spot decisions can be made to remove bottlenecks to production.

7. Common Targets for Production

At the same time a "Unified Plan" of developing production targets involves participation of the Department of Agriculture, the Agricultural Development Bank, the Agricultural Inputs Corporation, Sajha Cooperatives, Land Reform, and Irrigation. Representatives of these agencies in the districts will operate with common targets of production.

8. Defined Areas for Development

Superimposed on these efforts to mobilize for production is the allocation of defined areas of agricultural development and/or integrated rural development. These are to concentrate resources or funds from various assistance agencies, local manpower and other resources to implement development programs in the respective areas.

9. Cropping Systems Approach to Production

During this same period the cropping systems program of the ICP, through its adaptive research program, formulated a Cropping Systems approach to production. This involves extension or development personnel in a district or area to assist research in the following -

a. Reconnaissance of potential production areas in a district or area.

b. Surveys of the area to determine cropping patterns, varieteis and practices and the socio-economic status of the farmers and the area. The potential of an area could then be more precisely assessed.

c. On-farm trials of tested cropping patterns that would appear to fit the conditions and requirements of the areas, and simultaneous seed multiplication.

d. Pilot production programs in which manpower and inputs are mobilized in a production campaign to increase productivity of the land on a cropping pattern basis.

e. Full scale production - Ultimately the incorporation of production programs in larger areas and their implementation through programs involving farmers in a 'bottom-up approach to development.

10. Minikits and Their Role in Production

The minikit program for rice, maize, and wheat was launched in 1977-78 and provided a widespread distribution of seed of new crop varieties. The distribution of packets of approximately one kilogram of seed to many farmers allowed for an economic dissemination of these varieties. Where they were adopted there was a natural spread from farmer-to-farmer. The seed thus produced fits into a self-saved seed program. This existing source of seed constitutes by far (probably 95-98%) the main source of seed available to the millions of farmers in the Kingdom.

A recent study of the minikit program by AFROSC, covering a five-year period of the Integrated Cereals Project, was concluded:

'To summarise the findings of the study, it can be inferred that the Minikit Programme has been able to achieve a fair degree of success, considering the topographical nature of the country and such a short period availed to cover seventy-two districts, in exposing the improved crop varieties to a great number of farmers, as many as 49,597. As regards its impact upon the addressed farmers, the positive indicators are that the minikit farmers have reported to have increased their crop yields due to minikit varieties and they are also eager to get minikit crop varieties for growing by themselves. So it seems, the Minikit Program has been a right approach to disseminate improved crop varieties as quickly as possible, affecting production in targeted areas.'

Considering the value of the minikit program and the imperfections of the present system the report recommends -

'As the Minikit programme is an excellent extension approach to disseminate and popularize new varieties of crops and improved production technologies among the farmers, the Programme deserves continuation as well as improvement.

The Programme should be made a regular extension activity making concerned agencies equally responsible at all levels of execution to obtain better results from it.

To ensure good supervision and management of the minikits, there should be training programmes for local extension workers and ADOs about Minikits in offices of each of the Crop Coordinators quite frequently.

There should be uniformity in the make-up of minikits and a feedback card system to ensure the effectiveness of minikit programme.

ADOs and JT/JTAs should maintain the records of cards and farmers properly and see that the feedback cards are duly filled and returned to the concerned Crop Programme to facilitate analysis of the information for better planning of experiments by the latter.

Timeliness and good condition of minikits at the farmers' doors should be keenly observed.

(The) Department of Agriculture should clearly define the responsibilities of each of the agencies like Crop Coordinators, RDs, ADOs and JT/JTAs who should in turn fulfill their respective responsibilities regarding the Minikit Programme.

The resolutions of Workshop Seminar held at Parwanipur Agriculture Station on Minikit Programme in February, 1980 should be implemented earnestly.'

I. Research Accomplishments, 1976-82

1. Rice

Significant accomplishments during the 6-year period have been the development of new and improved rice varieties for both the Terai and the Hills. During this period varietal development for the Hills was expanded at Khumaltar with a testing center at Palung at about 6,000 ft. elevation. These two locations provide good evaluation for temperate

zone rices for a range of altitudes. As a result of the breeding effort two varieties were identified and released as Himali (IR-2298 - P/PB-3-3-1-1B) and Kanchen (IR-3941 - 4 - P/p 28). Two others, K39 (Ch1039 x IR580) and P33-16 (Improved Sabarmati x Ratna) have been tested extensively in farmers' fields. K39 can be expected to be released in the near future.

The rice program at Parwanipur concentrates on subtropical rices for both rainfed and irrigated lowlands and to a lesser extent for upland rice varieties. Four varieties were released for irrigated lowland conditions. These are Sabitri (IR2071-124-6-4), Durga (IET 2938), Laxmi (IR2061-628-1-6-4-3) and Janaki (BG 90-2). Two varieties have been released for upland conditions. They are Bindeswari (IET 1444) and Malika (Mala/J15).

The breeding program is now giving emphasis to lowland rainfed varieties. These conditions prevail in 75-80% of the rice growing area. While rainfed lowlands do not provide conditions where varieties can take advantage of high input levels, the scope for increasing yields is nevertheless of a percentage magnitude equal to improvements possible under irrigated lowland conditions.

A taller plant type is required for the varieties adapted to rainfed lowland conditions. These will receive greater acceptance by farmers because of the greater straw production under low management conditions. Mahsuri (Masuli) is such a variety now widely grown by farmers. A number of Mahsuri derivatives show promise as a replacement for Mahsuri itself.

In the Hills, blast resistance is a prerequisite for varieties with high yield potential. Without blast resistance the scope for increasing productivity in the Hills is very limited at best.

The rice improvement program has established centers for screening for blast in the Hills and in the Terai. By systematically screening segregating progenies and evaluating introductions in international trials, it should be possible to release only varieties that carry resistance to the strains of blast that exist in Nepal. The possibilities of exploiting higher yielding varieties still rests with agronomic management which to a great measure is water management and more efficient use of fertilizer. Because of late and/or irregular release of water the present irrigation systems do not offer opportunities for farmers to practice water management that would allow for efficient use of inputs. This constraint is evident from the level of production that has essentially stagnated over the past years (Table 1) in spite of the fact that spread of new varieties is in excess of 25% of the total area devoted to rice (Table 2).

The potentials of the new rices under upland conditions in the Terai have been demonstrated in Cropping Systems research trials at Sukchaina. Farmers have accepted and are growing the new varieties on a high percentage of the area in the village. The use of varieties in similar rainfed areas would appear to offer excellent opportunity to organize effective production programs in these areas. In the absence of production programs, strategically placed mini-kits will contribute significantly toward use of these varieties.

2. Maize

Research developments that have occurred within the maize commodity program have largely involved the breeding effort and the conduct of agronomic research trials.

a. Breeding Activities

Since the ICP started in 1976 five maize varieties have been released. The most recent is Arun, an early maturing

variety that was developed from a cross made at CIMMYT between a tropical downy mildew resistant variety from the Philippines and a temperate zone hybrid from France. Three cycles of mass selection followed by three cycles of half-sib selections were utilized at Rampur to produce the variety. Arun was widely tested in farmers' fields by the Maize Program and in the cropping systems sites in cooperation with the Cropping Systems Program. The variety has proven to be extremely useful in the Rice-Wheat-Maize pattern because of its earliness and good yielding ability. Its earliness makes it a valuable variety in the second maize crop in the Maize-Maize pattern found in the lower mid-hills and Inner Terai, and in the Upland Rice+Maize patterns in the Far Western Hills. The development of Arun is a clear example of the feedback process from the Cropping Systems Program to the Maize Program in specifying the type of variety needed for successful inclusion in intensive cropping patterns.

Also, the breeding program has continued the improvement of previously released varieties such as Khumal Yellow and Rampur Composite. Work is also ongoing to develop suitable white-grained early and full season varieties. Recurrent selection schemes have been followed to correct decifiencies such as poor husk cover in Khumal Yellow and its tendency towards lateness as compared to varieties farmers are currently growing. Intensive recurrent selection within Rampur Composite has been practiced to reduce plant height, increase yield potential and improve resistances to stalk rot and downy mildew. The selection for improved resistance to downy mildew has been actively carried out in cooperation with the Kasetsart University/ Rockefeller Foundation Maize Program at Farm Suwon in Thailand. Severe epiphytotics of downy mildew are created that provide a reliable screen for resistance.

Table 1. National Production Data During the Five-Year Period of the Integrated Cereals Project, 1976-81

Crop	1970-75 average			1976-77			1977-78			1978-79			1979-80			1980-81			Average		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Rice	1213	2.365	1.95	1262	2.386	1.89	1264	2.286	1.81	1263	2.340	1.85	1254	2.060	1.64	1276	2.464	1.93	1264	2.306	1.82
Maize	450	.794	1.76	446	.797	1.79	445	.740	1.66	454	.743	1.64	432	.554	1.28	457	.743	1.62	447	.715	1.60
Wheat	278	.312	1.12	348	.362	1.04	366	.411	1.12	356	.415	1.17	367	.440	1.20	381	.482	1.26	364	.422	1.16
Other	149	.163		146	.159		147	.149		150	.155		149	.142		148	.145		147	.152	
All cereals	2090	3.634	1.74	2202	3.704	1.68	2222	3.586	1.61	2223	3.653	1.64	2202	3.196	1.45	2262	3.834	1.69	2222	3.595	1.62

Source - Department of Food and Agricultural Marketing Services.

A - Area in 000 ha.

P - Production in millions of tons.

Y - Yield in ton/ha.

Table 2. Area Under Improved Varieties of Rice, Maize and Wheat in Nepal (1964-65 to 1980-81).

Year	Rice			Maize			Wheat		
	Area	Improved Varieties		Area	Improved Varieties		Area	Improved Varieties	
	1000 ha	Ha	% of Total	1000 ha	Ha	% of Total	1000 ha	Ha	% of Total
1964/65	1101	N.A.	-		-	-	100	N.A.	-
1965/66	1111	6,305	0.6	451	451	0.1	118	4,339	3.7
1966/67	1100	13,412	1.2	450	1,350	0.3	126	11,376	9.0
1967/68	1154	26,068	2.3	412	3,296	0.8	192	27,718	14.4
1968/69	1162	43,171	3.7	422	6,752	1.6	208	54,290	26.1
1969/70	1173	50,363	4.3	433	12,124	2.8	226	76,345	33.8
1970/71	1182	67,815	5.7	446	11,596	2.6	228	98,229	43.1
1971/72	1201	81,263	6.8	439	13,609	3.1	239	115,925	48.5
1972/73	1140	172,259	15.1	446	24,084	5.4	259	170,271	65.7
1973/74	1227	205,104	16.7	453	32,163	7.1	274	206,780	75.5
1974/75	1240	222,618	18.0	458	47,632	10.4	291	246,877	84.8
1975/76	1256	216,391	17.2	453	66,138	14.6	329	233,502	71.0
1976/77	1262	220,290	17.5	445	83,660	18.8	348	254,217	73.0
1977/78	1264	290,504	23.0	445	98,790	22.2	366	287,045	78.4
1978/79	1263	312,574	24.7	454	108,960	24.0	356	304,091	85.4
1979/80	1254	314,856	25.1	432	120,960	28.0	367	314,526	85.7
1980/81*	1276	325,560*	25.5	457	159,950*	35.0	381	318,257*	83.5

* Preliminary estimates.

Source: Food & Agricultural Marketing Services.

Perhaps most noteworthy in the breeding program, has been the decision to develop maize populations to use as sources for new varieties that are under-going selection and improvement in the areas and under the agro-climatic conditions where the ultimate varieties will be grown by farmers. Therefore, 5 such populations have been synthesized, each specific for a given agro-climatic and/or cropping situation. Each population is being grown at one or more locations consistent with the conditions where the resulting selected varieties will be used and selections and recombinations are being made at these locations. In this way, rapid development of varieties that will be immediately useful to farmers in specific agro-climatic zones will be possible.

The populations and locations are -

- Manakamana - 1 (White)	- Pakhribas
- Ganesh - 2 (Yellow)	- Lumle & Kakani
- Manakamana - 2 (Yellow)	- Khumaltar & Kavre
- Arun - 4 (Yellow)	- Khumaltar
- Khumal Yellow	- Khumaltar

b. Agronomic Activities

The main contribution of agronomic research has been to emphasize trials conducted directly with farmers in their fields. The impetus has been to encourage the maize scientists to move outside the fence of the experiment stations and test the new varieties and improved production technology under the conditions that exist in farmers' fields. This approach has clearly caused the scientists to recognize the fallibility of some of the previous recommendations and the need to make modifications so that farmers can apply them. The on-farm trials have paid off in two ways. First, the maize program has assigned four agronomists whose principal activities are on-farm testing and second, the nature

of many of the on-station agronomic trials are now addressing problems that are more relevant to situations confronting farmers in their fields.

3. Wheat

The wheat crop has increased in area over the past 15 years by over 3.5 times and it is expected to continue to expand although the rate of spread has slowed to just 9.5% in the last 5 years as compared to 30.9% over the previous five-year period. During the 15-year period the area covered by new varieties has increased to cover 80% (Table 2). Interestingly the area of rice and wheat devoted to new varieties parallel each other very closely from 1965-66 to 1980 81 when each crop had about 325,000 ha. planted to new varieties.

A very high percentage of the area planted to new varieties is RR-21 (Sonalika). This has created a "genetic vulnerability" situation and because of recent changes in the leaf rust pathogen the variety is becoming susceptible to the disease. Yields were reduced by a significant amount in some areas in 1980-81 even though the overall crop showed an increase in per hectare yield (Table 1).

Fortunately, the wheat improvement program has responded to the threat in two ways. One has been the development of an effective screening proceaure at Bhairawa which will enable identification of resistant varieties. The other is the identification and release of varieties which do have resistance and yield potential. These, especially UP 262, are occupying greater and greater areas in the Terai and hopefully can effectively combat the disease before it has opportunity, under especially favorable conditions for the organism, to have a devastating reduction in yields. Varieties released during the period include UP-262 (1977), Lumbini (1981) and Triveni (1982).

Constraints to wheat production include the effects of leaf rust, and other diseases such as loose smut and Helminthosporium, and the delayed planting forced, in many cases, by the late harvest of the preceding rice crop. New varieties of rice offer opportunity to remove the latter constraint and at the same time increase the potential of the rice crop itself.

Agronomic research has sought ways of overcoming delayed plantings by increased seed rates or increased fertilizer rates but yield depression is significant regardless of these expensive remedial measures which make the wheat crop less economical to the farmers. Other agronomic management research that has offered improved yields includes land preparation which enables better stand establishment of the crop and fertilizer practices for both rainfed and irrigated conditions.

4. Cropping Systems

The scope of the research activities and developments that have occurred within the cropping systems program during 1976 to 1982 is extensive. In order to comprehend the full nature of the work that has been accomplished, the reader should refer to the numerous publications and reports that have been prepared by the various staff members. In brief, the following provides a description of the more salient points.

The research approach that has been used provides an appropriate methodology to test and, when necessary, modify the existing component technologies for improving crop production by small farmers and insuring relevance to the farmers' actual circumstances and cropping patterns.

The format that has been followed at each cropping systems site is as follows:

a. Careful selection of the cropping systems research sites that represent broad agroclimatic areas.

b. Thorough site description to characterize the existing farming practices, land categories, available resources, social and economic circumstances and agro-climatic conditions.

c. Conduct research activities within the frame-work of cropping patterns (both existing and newly introduced, experimental patterns) in farmers' fields with the direct collaboration of the farmers.

d. Constant monitoring and adjustment of the technology involved to improve the production of the cropping patterns in order to ensure a suitable production and economic advantage as compared to existing farmer practices.

The six cropping systems sites where work has been conducted are Lele, Ratna Nagar and Parsa in the Central Development Region; Khandbari in the Eastern Development Region; Pumdi Bhumdi in the Western Development Region and Chauri Jhari in the Far-Western Region. Four of these are in the Hills, one in the Terai and one in the Inner Terai. If the required supporting services have been allowed to function, cropping patterns have been improved at each site that are economically advantageous as compared to the present patterns or practices.

For the sites in the Hills (Pumdi Bhumdi, Lele, Khandbari and Chauri Jhari) it has been found that the existing cropping patterns that farmers were already using in their uplands are highly intensive and varied. Still, striking increases in production has been demonstrated for many of the existing upland maize-based patterns by introducing improved varieties to these patterns, combined with a judicious use of chemical fertilizer in combination with the compost farmers routinely apply in these upland fields. In

Khandbari, the rapid adoption by farmers of the maize variety, Khumal Yellow, is an excellent example of increased yields and ready acceptability of a new variety. The same scenario is developing at Pumdi Bhumdi, although at a slower pace. In Chauri Jhari, it is expected that the maize variety, Arun will continue to expand in the Upland Rice-Maize patterns.

Pattern improvements for the lowland, rice-based patterns in the four hill sites have been mixed. Where irrigation is available, as in Chauri Jahari, the potential improvements in the existing Rice-Wheat patterns are great and farmers are rapidly adopting improved wheat varieties and, to a lesser degree, improved rice varieties. They realize the importance of fertilizer use to exploit the potential of the new varieties. Research has shown that there is scope for intensifying cropping in the lowlands of Chauri Jahari by planting mungbean or maize after wheat and before rice. However, for adoption to occur, uncontrolled animal grazing and irregular irrigation water release must be satisfactorily solved by appropriate community and government action.

In Pumdi Bhumdi and Khandbari, where most of the lowlands are rainfed, farmers have not accepted the available improved rice varieties. Farmers dislike the short straw and difficult threshing of the Taiwanese varieties even though their yields are substantially superior to the existing, local varieties. Introduction of peddle threshers has not made them any more acceptable.

Also in Pumdi Bhumdi and Khandbari, research results have shown that the cropping intensity, and thereby total production, can be increased in the lowlands by growing Rice-Wheat-Maize or Rice-Fallow-Maize in Pumdi Bhumdi and Rice-Wheat-Fallow, Rice-Fallow-Maize, or Rice-Fallow-Mungbean in Khandbari. Again, however, the principal constraint to adoption, especially in Khandbari, is uncontrolled animal grazing.

The cropping systems site in Parsa District has included two situations; rainfed lowlands and irrigated lowlands, both involving only rice-based cropping patterns. In the rainfed condition, the program has been extremely successful in increasing production in the Rice-Wheat-Fallow pattern. This pattern was an existing pattern in the area but characteriazed by low production. The introduction of an early maturing rice variety, Bindeswari, capable of being either direct-seeded or transplanted, allows the farmers to seed wheat earlier thereby taking more advantage of the residual monsoon rain as compared to the late date farmers were forced to plant wheat after harvesting the late-maturing, traditional rice varieties. The use of the early rice variety coupled with modest use of fertilizer in both the rice and wheat has more than doubled production. The area in the site where this technology is being applied is steadily increasing. Technology has also been developed to improve yields of other winter crops in such patterns as Rice-Lentil-Fallow, Rice-Chickpea-Fallow and Rice-Mustard-Fallow. Attempts to increase cropping intensity by including a third crop after harvest of the winter crops and before planting of rice under strictly rainfed conditions have not been successful due to the dry conditions and high temperatures in the spring in the Terai.

The irrigated situation in the Parsa Cropping Systems site has offered the most scope for both increasing the cropping intensity and developing alternative cropping patterns. All patterns are rice-based but a spectrum of potentially useful patterns has been tested including Rice-Rice-Wheat, Rice-Wheat-Maize, Rice-Mustard-Maize, Rice-Wheat-Dhaincha (for green-manure), Rice-Wheat-Mungbean, Rice-Maize-Mungbean, Rice-Rice/Lentils, Rice-Potato-Mungbean and Rice-Potato-Maize. This variation in potential patterns offers the farmer the opportunity to diversify his choice of crops in winter and spring which will allow him to adjust to water availability, labor constraints, capital availability, family food requirements and marketing possibilities. Improved varieties of most of the crops in the various patterns have

been identified and economic fertilizer rates have been developed. The opportunity to include legume crops such as mungbean and Dhaincha (as green manure) can contribute to maintaining soil fertility.

Ratna Nagar, which is located in the Inner Terai, was established as a cropping systems site during 1980. The end of the summer crops season in 1982 will complete two full years of research activities. Both upland maize-based patterns and lowland rice-based patterns have been studied.

As in the situations at other sites, the existing upland patterns are intensive. Two new, alternative patterns, Maize-Maize/Wheat and Rice+Maize-Mustard appear to have good potential. Arun maize has proven to be useful in the second maize crop. These patterns will need to be tested more thoroughly to determine their usefulness under the conditions at Ratna Nagar.

In the lowlands under rainfed conditions, much of the area is currently in Rice-Fallow-Fallow. Research has shown that cropping can be intensified by such patterns as Rice-Fallow-Maize, Rice-Fallow-Dhaincha and Rice-Wheat-Fallow.

In the lowlands areas with irrigation, Rice-Wheat-Maize, Rice-Potato-Maize and Rice-Wheat-Mung, all new, alternative patterns appear to be promising. Domestic animal grazing and damage from wild animals from the near by Chitwan National Park, however, are constraints to increasing cropping intensity by planting spring crops.

In summer, in most of the sites, especially in the Hills, the cropping patterns that are proving most successful are improvements in the existing patterns These beneficial modifications include improved varieties, modest fertilizer applications, improved land preparation, adjusting seeding rates and applying fertilizer more effectively.

Specifically regarding fertilizer use, the response to Nitrogen has been by far the most dramatic in all of the sites except in situations where very high levels of compost were used. There has been consistent though less dramatic response to phosphorus in the upland crops. Minimal or nil response to phosphorus in rice has been the general case. There has been almost no response to potassium at all sites, except for potatoes which have consistently responded to potassium application.

The results of the five years of cropping pattern testing in the six sites have been used to develop a publication entitled "Guidelines for Pre-Production Verification Trials of Cropping Systems Recommendations'. This document summarizes the recommended technology for those cropping patterns that have been thoroughly tested in the sites. It includes a suggested methodology to test the technology and is the vehicle by which results of the cropping systems research can be effectively extrapolated to other areas of Nepal.

C. Production Programs

Transferring the Cropping Systems technology to production programs started in early 1980 at Phumdi Bhumdi, with an upland pattern with good potential, (Maize/Finger millet - Wheat). Fifty farmers were involved in growing 3.7 ha. of maize. Yield increase was not spectacular, only 18% in maize, but finger millet yield increased about 20% because of residual fertilizer from the maize. Experiences in this first season indicated there were some obvious defects in the approach to production.

In these initial efforts no attempt was made to concentrate pilot production. As a consequence, parcels were often scattered over an area with many small parcels of non-participating farmers intervening. These farmers were not aware of what the new technologies could do. The demonstration value was lost to visitors as well. It was the result of comments of Mr. B.B. Khadka, then Secretary of the Ministry of Agriculture, that real efforts were attempted, in 1981-82, to concentrate pilot production efforts in contiguous areas.

Other deficiencies in the 1980 maize pilot production program prompted a survey to enable these deficiencies to be corrected prior to the up-coming wheat season of 1980-81. Results of the survey indicated that

1. Farmers were aware of the wheat variety, RR-21, being recommended and judged it to be suitable to their wheat growing area.

2. Adoption of the improved variety and practices had already begun as a result of their contacts with the CS program in the research phase.

3. The CS staff had been in contact with farmers and a good percentage of farmers wanted to participate and devote most, if not all, of their wheat area to the pilot production program.

4. The package of technology did not appear complicated nor expensive in terms of cash costs.

5. Output marketing did not appear to be a serious problem in the early phases of such a program.

6. Seed demand from the Agricultural Inputs Corporation will be less than the total seed requirements because farmers would use their own seed or could barter or purchase it locally.

7. Credit did not appear a constraint in these early phases.

8. Inputs (seed and fertilizer) required for the pilot production appeared to be generally available at the sites.

While these survey results favoured a successful pilot production program, other factors were to reduce the possibilities of success. These were a lack of

1. Understanding of the package of practices.

2. Knowledge of relationship of yields to input use and how yields could and would be affected by input use.

3. Full adoption of recommendations even after understanding the package of practices.

4. Credit from formal lending institutions, especially for fertilizer.

5. Seed quality control.

6. Shifting organic manures to other parcels.

One of the most serious constraints appeared to be the lack of knowledge about the recommendations and their effects on yields.

During the wheat season of 1980-81 active production programs were initiated at all cropping systems sites. Total area devoted to wheat was 62.3 ha. among over 400 farmers or an average of .14 ha. per farmer. Results and farmer reactions were generally favorable to the technology developed on farmers' fields. With this information it was possible to organize more effective production programs for the wheat season 1981-82 and the succeeding monsoon season. Data from production areas indicate farmers were obtaining about twice the yield of their neighbors who were not in the production program.

One of the features of the new stategy was a "Pilot Production Block". Pilot production blocks offer considerable merit in moving technology into production programs. Some of these are the demonstration effect; ease of servicing by the extension staff; training farmers for production; transmission of information; mobilization of other agencies involved in production; irrigation management; supply of inputs; the use of a contiguous block for local seed multiplication; organizing farmers themselves; the economic benefit of the patterns can

be more easily assessed; and the pilot production block can serve as a training base for additional extension personnel. Strategies for large scale production based on cropping systems as a means of transferring technology to small farmers can be developed from these organization and management experiences.

Where technology has been accepted farmers have benefitted even before we could organize institutions and agencies to mount organized production programs. Initial spread may be more rapid than a step-wise approach. However, we do not believe the natural acceptance and dissemination of technology will provide production increases of the magnitude required to meet Nepal's ever increasing food demands.

On-farm activity using the cropping systems research methodologies is developing a package and a system of transmittal that is a real asset to defined area projects in other areas of the country. Using the step-wise approach, one can more rapidly move into a production phase that is within the time frame of many of these projects. This can be accomplished without much trial and error and uncertainties that so often prevail when new projects are initiated by bilateral or multilateral assistance agreements.

D. Capital Development and Equipment

A summary of construction activities is presented in Table 3. It will be noted that in the first year (1981-82) of the extension of the contract essentially all of the construction had been completed with only a small portion remaining. Total investment (from PL-480 funds) for construction amounted to Rs.11,345,000.

The principal buildings were the office-laboratory complexes at the three commodity stations. This has provided adequate facilities for staff and necessary laboratory space in support of adaptive research being carried out in the farmers' fields and in the research stations. A second major construction component was the seed processing and storage units. Construc-

tion and equipment installation has lagged so these still remain to become fully operational. Landshaping and development of irrigation facilities at the stations was undertaken with the help of a consultant on three different occasions. This involved development of site plans for irrigation and land shaping and the actual participation by the consultant in the landshaping itself.

Bhairahawa facilities have been completed and a pump installed in the existing well to increase the capacity by nearly double the artesian flow. Fields were reshaped so that they could serve a dual role for wheat research and production during the winter and for rice research and production in the monsoon season. Broadly following a Rice-Wheat cropping pattern and changing varieties of rice to enable earlier harvest and with better water management, as a consequence of the land shaping and expanded irrigation system, total crop production has steadily increased. Now it is nearly 50% above the preceding five-year average.

Rampur land shaping is 50% complete but the tube wells are yet to be drilled and the irrigation pipe procured and installed. The well drilling rig is on site and some progress is expected during the coming dry season. The system should be fully operational by the end of the extension period of ICP.

Parwanipur facilities have not yet been developed according to plans but existing facilities have been serving until recent problems with an old irrigation pump has diminished water availability for irrigation. A complete renovation of the irrigation system is required to enable more effective field research to be achieved.

Later during the project, plans were developed for an irrigation system for the research complex at Khumaltar. These plans are fully developed and funded (jointly by PL-480 rupee funds and Swiss support through the Potato Improvement Program).

Table 3, Summary of Construction Activities under the Integrated Cereals Project.

Activity	Status as of September, 1982
PARWANIPUR	
Office/Lab	Completed
Threshing Shed	Completed
Seed Plant/Storage	Completed
Workshop	Completed
Advisor's Quarters	Completed
Greenhouse	Completed
Generator House	Cancelled
RAMPUR	
Office/Lab & Threshing Shed	Rs.50,000.00. Funds released for completion
Advisor's Quarters	Completed
Farm Water Supply	Nearing Completion
Farm Electric Supply	Nearing Completion
Seed Plant/Storage/Generator House	Nearing Completion
Office Quarters	Completed
Staff Quarters	Completed
Workshop	Cancelled
BHAIRAHAWA	
Office/Lab	Completed
Staff Housing	Completed
Workshop	Completed
Training Center	Completed
Seed Plant/Storage	Completed
Generator Shed	Completed
Soils Laboratory	Completed
HILL STORAGE	
Daman	Completed
Kakani	Completed
Jumla	Completed
Jiri	Completed
Doti	Completed
Dhankuta	Completed
KHUMALTAR	
Cropping Systems Building	Cancelled

Major items of equipment have included laboratory equipment for the various laboratories in the new facilities at the commodity stations; mechanical shop equipment for servicing and maintenance work; landshaping equipment - a large tractor and land plane to augment already available equipment; and a vehicle at each of the four research units directly involved in the ICP. A large truck has been procured for minikit distribution. In addition, spare parts are being provided to existing equipment to assist in the equipment maintenance program.

E. Improving Staff Capability

A critical objective of the ICP is the improvement of staff capability of the DOA through academic training and non-academic, shorter training periods primarily for skills development in crop production. Table 4 provides an up-to-date summary of the status of the academic staff development programs.

The earlier academic programs have been completed and staff have returned to posts in the DOA. Fifteen M.Sc. and one Ph.D. have now assumed duties out of the 29 M.Sc. candidates and 4 Ph.D. candidates selected under the ICP.

The short term non-academic programs have been provided to 59 participants while 85 have participated in research conferences and study tours. Most of these people were trained at IRRI, CIMMYT, or ICRISAT. Four women have been among those provided training during the six-year period.

Table 4. Personnel Selected for Academic Programs, 1976-1981.

M.S. Candidates		Status before Studies		
Name	Program of Study	Class	Post	Located at
T. Pokhrel	Wheat Breeding	III	Asst.Wheat Breeder	Bhairahawa
Ganesh K.C.	Entomology	III	Asst.Entomologist	Khumaltar
R. Chaudhary	Soybean Breeding	III	Asst.Agronomist	Rampur
B.R.Adhikary	Rice Breeding	III	Asst.Agronomist	Parwanipur
Shiva K.Chaudhary	Soybean Agron.	III	Asst. ADO	Makwanpur
R.S.L. Karna	Wheat Pathology	III	Asst.Agronomist	Nepalgunj
S.L. Shrestha	CS Agronomy	III	Asst.Agronomist	Rupendehi
J.D. Rana	Irrigation Engr.	III	Asst.Agri.Engr.	Rampur
K.K. Shrestha	Maize Agron.	III	Asst.Agronomist	Khairenitar
R.P. Sah	Pulse Breeding	III	Asst.Agronomist	Parwanipur
N.K.Rajbhandary	Agronomy	III	Asst.Soil Sc.	Khumaltar
M.L. Shah	Wheat Breeding	III	Asst.Agronomist	Bhairahawa
M.P. Upadhya	Wheat Breeding	III	Asst.Agronomist	Bhairahawa
R.C.Munakarmi	Soil Science(Wheat)	III	Asst.Soil Sc.	Bhairahawa
D.N. Sah	Maize Pathology	III	Asst.Pathologist	Rampur
B.K. Baniya	Maize Breeding	III	Asst.Agronomist	Kakani
B.K. Gyawali	Entomology	III	Asst.Entomologist	Khumaltar
G.L.Shrestha	Rice Breeding	III	Asst.Agronomist	Khumaltar
K.K. Lal	Maize Breeding	III	Asst.Agronomist	Rampur
K.K. Sherchand	Maize Agronomy	III	Asst.Botanist	Khumaltar
R.N. Sah	Soil Science(Rice)	III	Asst.Soil Sc.	Parwanipur
D.N. Manandhar	Rice Entomology	II	Entomologist	Parwanipur
B.P. Upadhyaya	Rice Pathology	III	Asst.Pathologist	Khumaltar
R. Misra	Soil Microbiology	III	Asst.Soil Sc.	Khumaltar
K. Upadhyaya	Extension	III	Asst. ADO	Biratnagar
D.N. Chaudhary	Cropping Syst.Agron.	III	Acting Farm Manager	Janakpur
C.R. Yadav	Maize Agronomy	III	Actg.Farm Manager	Doti
B.M.S. Basnet	Agronomy	III	Asst.Agronomist	Sindhuli
M.L. Jyaswal	Oil Seed Breeding	III	Asst.Agronomist	Sarlahi

Ph.D. Candidates		Status before Studies		
Name	Program of Study	Class	Post	Located at
F.A. Khan	Cropping Syst.Agron.	II	ADO	Kaski
B.B. Mathema	Rice Breeding	II	Agronomist	Parwanipur
J.R. Baral	Extension	III	Reg. Directorate	Kathmandu
M.P. Bharati	Agron.Grain Legume	III	Asst.Agronomist	Khumaltar

II. STRATEGIES FOR 1982-1984

A. Broad Project Strategies

The Project Paper Amendment summarizes the broad strategies to be pursued as follows -

"During the extension period the project will emphasize technology transfer. Special attention will be given to working with farmers directly to accelerate this transfer. Central to the extension period will be the following five sets of project activity:

1. Cropping systems work will continue verification trials for new varieties and cultivation practices. The project will also begin to apply cropping systems work in other areas. This will include survey and analysis of current cropping systems; identification of social, economic, climatic and ecological characteristics of the areas; and initiation of verification trials.

   The ICP will develop close linkages with RAD and RCU, as both projects will utilize ICP as a source of improved agricultural technology and improved extension approaches. ICP influence on RAD will be immediate since one of the five original cropping systems sites is located in the Rapti Zone.

   The MFA through ICP will begin survey work and verification trials in various RAD/RCU districts. The RAD and RCU Projects will fund training for JT/JTAs in cropping systems methodology. Verification trials and related minikit demonstrations will begin to impact on production in these zones by 1983.

2. Pilot pocket production campaigns will, where appropriate, disseminate proven technologies more widely in areas adjacent to the six cropping systems sites.

The pilot campaigns will test techniques for technology dissemination and methodology for organization of pocket production programs. Experience gained in these pilot efforts will be used to plan expansion into wider areas with similar agro-climatic conditions and in RAD/RCU districts following preliminary survey and verification trial work. The pilot campaign will also serve to demonstrate and quantify pay-offs possible from cropping systems work.

3. Findings and results of work done at the six cropping systems sites and at the commodity research stations will be translated into production information for extension workers and farmers. This will help to fill the need for technical information and agricultural recommendations at the district level.

4. Production minikit programs for rice, maize and wheat will be continued and expanded to include new varieties and wider geographical areas of coverage. A study of the impact of production minikits is currently underway. This will be a continuing output of the program and as the project goes forward will provide information to improve effectiveness and give further guidance to research priorities.

5. Socio-economic research will investigate the effectiveness of technology transfer mechanisms and the socio-economic viability of individual technologies. It will be directly linked to meeting the needs of production campaigns, the minikits program, and the extension service.

By the end of the project extension period, the ICP will have achieved substantial applied results in technology development, training and verification, and will have reflected these in the work of the extension service. The system used for research and extension

will be based on a cropping systems approach. Technologies developed will be made available to farmers through the pilot production campaigns of this project and through links with RAD, RCU, and other donor projects."

It is evident from these strategy statements that production programs are the project's first priorities and that these are to be cropping systems based. The first pilot campaigns implementing this concept are to be concentrated in the areas where the on-farm technology has been developed in the farmers fields.

B. Major Actions for Program Development

Implementation of these strategies will require three major actions in program development. While these are phased they will be progressing concurrently during the final two years of the project.

1. Technology Transfer

The translation and implementation of cropping systems research information into extension programs involves a systematic methodology of technology and information transfer based on cropping patterns. This includes reconnaissance, survey and preproduction verification before a pilot production phase. Reconnaissance with local leaders (farmers and extension personnel) can identify areas where there may appear to be potential for increasing production by the improved technologies. Surveys will seek to measure the extent such increases will be possible, the patterns to use to obtain these increases and socio-economic considerations. The Preproduction Verification Trials (PPVTS) are the mechanism by which the technology that has been developed over the past several years at the Cropping Systems sites will be extrapolated for testing in other similar areas in Nepal.

The extrapolation of the research results to other areas must be viewed as a logical step in the progression from technology development and testing in the Cropping Systems sites to wide-scale implementation of the proven technology in farmers' fields.

It must, however, be realized that the Cropping Systems Program per se cannot implement PPVT's in all the potential areas in Nepal. The strategy that is being developed is to evolve the initiation of PPVT's along two lines. First, a limited number of areas have been selected for PPVT's that will be supervised by Cropping Systems staff in cooperation with the ADO's and their extension staff in the selected districts where the trials are located. These areas are relatively near to the existing Cropping Systems sites so that management will be more efficient by Cropping Systems staff.

2. Production Programs at Cropping Systems Sites

The major thrust of the Cropping Systems Program for the period 1982-84 is to establish Pilot Preduction Programs in the Cropping Systems sites aimed at developing an extension delivery system for communicating effectively to farmers the cropping systems production technologies.

The extension activities today in Nepal are oriented towards increasing production of selected commodities. In the cropping systems approach, the goal is to increase the productivity of a farm. Extension strategies used by change agents will include a whole farm approach for the improvement in production of small farm and in the welfare of small farmers.

First, there is a need for re-orientation of extension goals from that of increasing the production of a commodity or commodities to increasing the total productivity of a farm. This will allow the extension workers the opportunity to plan and implement educational campaigns to teach farmers the most profitable cropping pattern in the area. As such,

the extension workers will then have to consider the whole year farming operation of a community when giving recommendations to farmers instead of just giving "piece meal" advice.

Secondly, there is a need to identify extension tools appropriate for effectively communicating to farmers the cropping systems technologies. The minikit for example, is effective in spreading new crop varieties to farmers but may not necessarily be effective in communicating to farmers a more productive and profitable cropping pattern.

Thirdly, there is an urgent need to develop an effective delivery system for inputs and credit which would encourage and allow maximum numbers of farmers to participate in a production program.

The Pilot Production Program has, therefore, been designed with objectives to:

a. Develop a strategy for organizing and implementing cropping systems oriented production programs with its goal of increasing total farm productivity.

b. Test and identify extension methodologies for effectively communicating cropping systems technologies to the small farmers.

c. Train extension workers on the new cropping systems technologies and extension methodologies for effectively delivering cropping systems technology to farmers.

d. Establish production blocks to demonstrate to farmers, administrators, planners, program managers, extension workers and others on the impact of the cropping systems technology in increasing productivity of the small farms of Nepal.

e. Identify constraints in implementing production programs utilizing the cropping systems technology.

3. Linkages with Defined Area Projects

Production projects in different areas of the Kingdom have a major role for implementing production programs in their respective areas. The ICP can serve as the source of technology, methodology and training for these projects.

Preproduction verification trials and the associated methodologies provide the approach to implementation of production programs in these agricultural development projects. Only through these projects can one expect to reach enough farmers to enable these technologies to have an impact on national production and have the resources (both financial and manpower) to implement the trials. PPVT's have already been initiated by the Rapti Integrated Rural Development Project, the Hill Food Production Program and the Agricultural Extension and Research Project. Other projects are being approached to participate in these trials.

C. Actions for Program Implementation

In support of the above program developments the following actions are necessary.

1. Focus of Minikits

The Minikit Program will more systematically reach farmers with improved varieties of rice, maize, and wheat and improved varieties of the minor crops in the system, as these become available. Minikits will be distributed in such a way that new varieties will reach new areas and new farmers rather than having these received on a repeat basis. The DOA will include the minikit into the extension planning as part of its result demonstration program. The minikit program will be one means of increasing production by the widespread dissemination of seed of new varieties.

2. Effective Extension Literature

Information services will be expanded to provide relevant literature for extension staff and farmers. Manuals on cropping patterns have been prepared for use in preproduction verification areas by extension and research personnel. In pilot production and production campaign areas, pictorial literature illustrating cropping patterns, cultural practices, plant protection, etc. have been developed. These will be for individual farmer participants as well as extension staff. Crop production manuals outlining detailed crop practices will be available for improving the technical competence of ADOs, SMS and JTs/JTAs.

3. The Role of Socio-Economics in Production Programs

Staffing and funding the socio-economic studies as a component of the DOA will enable continuing socio-economic support for creating a methodology of problem identification, for defining potential areas of production, for evaluating the technologies developed and applied, and identifying constraints to production. The staff will be involved in -

a. The collection and analysis of three types of data for preproduction verification. These are (1) data for developing the site description, (2) data pertaining to inputs, outputs and other agronomic information concerning the recommended practices and farmers practices used in the trials and (3) data containing the farmers evaluation of the PPVTs. They will also be involved in training staff to collect and interpret the data.

b. Monitoring production programs to determine:

(1) the suitability,
(2) the acceptability and
(3) the impact of the recommended technology.

4. Training for Production

Training programs for extension personnel (ADOs, SMSs, JTs/JTAs) and farmers (production leaders, PLAA, AA etc.) in the pilot production areas and specific project areas will be conducted. The extension training will include technical and extension methodology.

5. Coordination for Production

HMG's unified plans for production involving DOA, ADB, AIC, Sajha etc. will be implemented. From the institutional point of view coordination of effort will be essential if proper conditions are to be created to enable farmers to take advantage of the new technologies.

6. Involving Women in Production

Specific production programs to involve women in production at various levels will be emphasized. Results from the Status-of-Women Project indicates that women have important roles in decision making, both individually and jointly with the male members of the household. Special production programs will involve women and provide training so that decisions in which they are involved will relate to the new information available to them. Special studies related to these programs will determine the requirements for effectively utilizing women in development.

7. Research in Support of Production

Continued support to research at the Cropping Systems sites and commodity programs is essential to the development of extension/production programs.

a. Cropping Systems Sites.

In each of the Cropping Systems site there are cropping patterns that have been thoroughly tested for several

years. Many of these patterns are being utilized in the production programs that are being implemented at the sites by the Cropping Systems Program. Research of these cropping pattern trials per se will be phased out. The performance of the patterns can be monitored in fields where farmers are using the pattern technology in the production programs. Further research directed at these patterns will involve component technology studies to address specific factors to develop further production improvements e.g. new varieties that are being developed can be tested as they become available from the commodity programs; different fertilizer rates can be tried, especially if cost or supply factors change which might influence the economics of production; and modifications in other cultural practices can be studied.

In some of the sites, particularly at Ratna Nagar, where work was only initiated in 1980, there are cropping patterns that still require study at the level of cropping pattern trials and this will continue.

In a recent consultancy report, Dr. Richard Harwood stated that research activities of the Cropping Systems Program should concentrate upon:

(1) Fertilizer use efficiency,
(2) Fertilizer-compost combinations,
(3) More emphasis on the minor crops, especially the pulses,
(4) Introduction of perennial legumes (such as Leucaena) outside the crop production area, and
(5) Further use of annual legumes in cropping patterns.

These recommendations would appear to be sound since they are basically focusing upon nutrients and fertility which has clearly been identified as the key factor limiting production in Nepal. Considering the time limitations of the present project and the present on-going research the priorities will be in the order listed. Some effort will be made on all points so that a basis can be established for further research effort on all issues.

b. Commodity Programs.

Implementation of on-farm research as a part of the research outreach program of the DOA will be carried out by the use of cropping systems preproduction verification trials (PPVT) and the attending methodologies of area reconnaissance, area profile development, PPVTs and pilot production. The commodity programs will superimpose on these PPVTs the various component technology trials such as new varieties (in FFT), fertilizer - compost trials, plant protection trials, and crop culture experiments. This will provide problem identification for the research team. To sustain the adaptive on-farm research will require continuing on-station problem solving adaptive research involving breeding, agronomy, soil science, pathology, entomology, and other disciplines as the problems dictate. Agronomic research will continue to provide the key to the exploitation and realization of the possibilities of the production potential of new varieties and will be intensified both on-station and on-farm.

Minikits will continue to be a vital component of the commodity programs. Monitoring minikits has provided a wide ranging contact by research staff with the farmers and their problems in many areas. Minikit monitoring will become a vital component of research outreach for the commodity teams. Systematic, strategic and timely distribution of minikits will provide varieties to many areas of the districts not presently served by the existing distribution system.

a. Socio-Economic Research.

An important part of the cropping systems research program for technology development is a strong socio-economic input responsible for a number of activities. These include.

(1) Carrying out agro-climatic and socio-economic profiles of the sites where cropping system research is to be carried out;

(2) Developing a further understanding of the farming systems followed by farmers - what they do, how they do it, and why;

(3) Helping decide which types of cropping systems trials should be given priority within a site, given the location's characteristics, problems and potentials;

(4) Comparing the results of cropping systems trials with the results farmers presently derive by following their own practices;

(5) Helping get feedback from farmers about their evaluation of the cropping systems trials;

(6) Analyzing the suitability of new technology for the socio-economic environment facing the farmers in a site; and

(7) Helping decide which technology is to be recommended for pre-production verification trials and/or for Production Programs.

III. PLAN OF WORK

A. Cropping Systems Production Activities

Production plans based on cropping systems technologies are to be implemented through a series of logical, systematic steps which will involve the extension personnel in a manner that will project activities beyond the "Result Demonstration" phase to pilot production and full scale production programs.

These steps include -

1 - Area Reconnaissance
2 - Area Profile
3 - Pre-production Verification Trials
4 - Badhi Utpadan Karyakram - More Production Campaigns

1. Area Reconnaissance

At least one senior level cropping systems staff member will accompany the ADO and other officials on a reconnaissance of a new site where preproduction verification trials or production programs might be initiated. The cropping systems staff member will help judge the suitability of the new location for the program and will help decide what further work, in the development of the site profile and other activities, needs to be undertaken.

2. Area Profiles

The methodology for developing a site description for pre-production verification trials and/or for production programs has already been developed and successfully used by the socio-economic group of the cropping systems program.

Site descriptions have been developed for 41 different sites - 7 in the Eastern Development Region, 7 in the Central, 13 in the Western, 9 in the Mid Western, and 5 in the Far

Western Development Regions (Table 5). Most of these have been developed by the Seed Production and Input Storage Project using ICP staff to collect survey data. The Rapti Rural Area Development Project has also developed site surveys at 7 of the 9 sites in the Far Western Region.

All these offer a basis for implementing Pre-production Verification Trials by ICP in cooperation with other projects. Where ICP is not directly involved this will involve training DOA and project personnel to conduct PPVTs and organize production programs.

Site descriptions in sixteen more sites will be developed early in 1982-83. These are -

District	Type of site	Number	Implementation for Production
Parsa	Rainfed	1	AERP
Sarlahi	Rainfed and irrigated	2	AERP
Chitwan	Canal irrigated	3	AERP
Rauthat	Canal irrigated	2	NZIP, AERP
Rupendehi	Tube-well irrigated	3	AERP
Morang	Canal irrigated	1	Morang Sunsari Irrigation Project
Sunsari	Canal irrigated	1	
Jhapa	Canal irrigated and rainfed	2	Kankai Irrig.Project
Dhanusha	Canal irrigated	1	JADP

Responsibilities for implementing production programs following these surveys will be with the respective area development project as indicated above.

3. Pre-production Verification Trials (PPVT)

Preproduction verification trials can be utilized in many areas of the country relying on surveys which identify the principal cropping patterns, then comparing these patterns with those which have been found valuable in the on-farm adaptive research conducted at the various Cropping Systems

Table 5. Sites Surveyed Preliminary to Preproduction Verification Trials in Cropping Systems Sites and Project Sites of SPIS Project and RAPTI, Rural Area Development, Project.

Region	District	Site of Panchayat	Project
EASTERN	Sankhuwasabha	Chainpur	ICP
	Sankhuwasabha	Chainpur	SPIS - Mini seed house
	Khotang	Yamkhe	SPIS - Mini seed house
	Okhaldhunga	Rampurtar	SPIS - Mini seed house
	Illam	Illam	SPIS - Small ware house
	Panchtar	Phidim	SPIS - Small ware house
	Achham	Sanfa Bazar	SPIS - Small ware house
CENTRAL	Kavrepalanchowk	Nala Ugrachandi	ICP
	Kavrepalanchowk	Panchkhal	ICP
	Sindhuli	Sindhulimadi	SPIS - Small ware house
	Dolakha	Charikot	SPIS - Mini seed house
	Nuwakot	Trishuli	SPIS - Mini seed house
	Dhading	Dhading Besi	SPIS - Mini seed house
	Makwanpur	Daman	SPIS - Small ware house
WESTERN	Kaski	Rakhee	ICP
	Kaski	Bhalam	ICP
	Kaski	Ghachowk	ICP
	Kaski	Lekh nath	ICP
	Lamjung	Sunder Bazar	SPIS - Mini seed house*
	Baglung	Galkot	SPIS - Mini seed house*
	Parbat	Gyandi	SPIS - Mini seed house*
	Parbat	Phalebas	SPIS - Mini seed house*
	Gorkha	Arughat	SPIS - Mini seed house*
	Gulmi	Majuwa	SPIS - Mini seed house*
	Damauli	Tanakun	SPIS - Small ware house*
	Syanja	Walling	SPIS - Small ware house*
	Mustang	Marpha	SPIS - Small ware house**
MID WESTERN	Dang	Amritpur	RAD
	Dang	Gorahi	SPIS - Mini seed house
	Pyuthan	Bijaya Nagar	RAD
	Pyuthan	Bijuwar	RAD & SPIS - Mini seed house
	Rolpa	Jankot	RAD
	Rolpa	Liwang	RAD
	Salyan	Danda Gaon	RAD
	Rukum	Chibang	RAD
	Rukum	Chauri Jahari	ICP & SPIS - Small seed house***
FAR WESTERN	Doti	Dipayal	SPIS - Mini seed house
	Surkhet	Surkhet	SPIS - Small ware house
	Baitadi	Patan	SPIS - Mini seed house
	Bajhang	Chinpur	SPIS - Mini seed house
	Dandeldhura	Dandeldhura	Small ware house

* Sites in districts in which Hill Food Production Project is implementing cropping systems approach to production.

** Sites where RCUP is implementing production programs.

*** ICP only survey taken.

sites. These patterns are classified in the "Guidelines for Preproduction Verification Trials" and are summarized in Table 6 where they are classified by geographic region, water availability (e.g. rainfed or irrigated) and classification by fertility status.

A major effort of the next two years will be devoted to preproduction verification trials. However, the number of staff in the cropping systems program is very limited. The main emphasis in the future, therefore, will be to work with other projects such as RAD, RCUP, HFPP, AERP, KHARDEP etc. which can supply staff to conduct the trials and to collect the needed data. Work started with RAD in 1981 and with AERP and HFPP in 1982. ICP will collaborate with other projects as linkages develop.

The main contributions of the Cropping Systems program towards PPVTs, besides conducting a very limited number of trials, will be to provide -

a. Technical advice
b. Supervision when and where possible
c. Training
d. Data sheets and interview forms required
e. Assistance for site descriptions
f. Data processing of the trials, and
g. Assistance in preparation of reports.

The districts where ICP is to be directly involved include Sankhuwasabha, Lalitpur, Parsa, Chitwan, Kaski, and Rukum. These are sites where on-farm research has led to technology development. In addition, ICP will become directly involved in Rauthat, Sarlahi, Kavre-palanchowk and Rupendehi districts. Five to ten farmers in a ward of a selected panchayat will be involved depending on the number of patterns used.

Table 6. Cropping Patterns Tested and Recommended for Pre-Production Verification Trials (PPVT)

Land Classification by Water Availability	Land Classification by Fertility Status		
	Low	Medium	High
Terai Lowland Irrigated	Rice-Wheat-Fallow Rice-Rice-Lentil	Rice-Rice-Wheat Rice-Rice-Fallow Rice-Wheat-Dhaincha	Rice-Potato-Fallow Rice-Maize-Fallow Rice-Wheat-Maize Rice-Maize-Maize
Terai Lowland, Rainfed	Rice-Fallow Rice-Lentil-Fallow Rice-Linseed-Fallow Rice-Linseed+ Lentil-Fallow	Rice-Barley-F Rice-Mustard-F	Rice-Wheat-Fallow
Hills Lowland, Irrigated	Rice-Rice-Fallow	Rice-Wheat-Fallow	Rice-Rice-Wheat Rice-Potatoes-Fallow
Hills - Inner Terai, Upland Rainfed	Maize-Mustard Maize-F. Millet	Rice+Maize-Wheat	Maize/F.millet-Wheat Maize+Soybean-Mustard Maize-Maize
Hills-Lowland, Rainfed	Rice-Fallow-Fallow Rice Lentil-Fallow	Rice-Wheat-Fallow Rice-Fallow-Maize	Rice-Wheat-Maize

4. Badhi Utpadan Karyakram (More Production Programs)

a. Production Blocks at Cropping Systems Sites

Production programs will be implemented in four cropping systems sites: Parsa, Lele, Chitwan and Chauri Jahari (Table 7). Plans have been developed for Pumdi Bhumdi and Khandbari but potentials for these sites are less.

The program will start with a few production blocks is selected impact areas in each site, each block covering 50 hectares. This is designed primarily to enable the production teams to concentrate their activity in a small area during the initial stage of the program and be able to effectively follow-up most, if not all, of the farmers in the production blocks. This way, farmers will be able to apply correctly the recommended technology.

As a result of the demonstration effect of the 50 - hectare blocks and as the support system is organized, the area covered by the programs would be expanded rapidly to adjoining wards during the succeeding seasons.

A production goal of 6 to 7 tons per hectare per year is set for Chitwan, Parsa, Lele and Chauri Jahari. This would mean an increase in production per hectare by 30% at Chitwan, 55% at Parsa, 30% at Lele and 33% at Chauri Jahari (Table 8).

b. Technology Transfer

Rapid transfer of the cropping systems technology to farmers requires a specific strategy appropriate to the situation in Nepal. Described below are some of the approaches which will be used in the program:

(1) Block Approach from Pilot Production Program to Area Saturation.

The Pilot Production programs will start with the establishment of 50-hectare blocks in selected impact areas. Every farmer in the block will be closely assisted by the production team in planning what cropping pattern to use in the farm, crop varieties to grow, time of planting and in deciding what cultural practices to use. The farmers in the block will also be closely assisted in the field, from land preparation to harvest. The farmers in the block who need credit will be given production loans for one whole year of operation.

Fertilizer, seeds, insecticides and other inputs of production shall also be made available at the time when the farmers need them. Estimated requirements for winter 1982-83 are presented in Table 9. Similar estimates of input requirements will be developed well in advance of the season.

This approach of focusing the time and effort of the production team and available resources (seeds, fertilizer, insecticides, water, credit) in a specified block, ensures the establishment of a successful and impressive demonstration area. This will give the team a taste of success, a factor which is needed to give them the motivation and confidence to expand their program to the other parts of the panchayat.

The number of production blocks will expand rapidly in the succeeding seasons (Table 7). The number of blocks in each impact area will increase from two to eight in the first season to 10 to 120 in the fifth season, depending upon the total production area. By the fifth season all farmers in an area will be involved in the program.

Table 7. Program Area: Badhi Utpadan Karyakram, 1982-84

Site	No. of Impact Areas	Total Program Area(ha.)	Winter 1982		Summer 1983		Winter 1983		Summer 1984		Winter 1984	
			No. of Block	Area/ha.	No. of Blocks	Area/ha.	No. of Blocks	Area/ha.	No. of Blocks	Area/ha.	No. of Blocks	Area/ha.
Chitwan	2	3000	4	200	12	600	24	1200	40	2000	60	3000
Parsa	4	6000	8	400	18	900	54	2700	108	5400	120	6000
Lele	1	500	2	100	5	250	10	500	10	500	10	500
Chauri Jahari	1	500	2	100	2	100	4	200	6	300	10	500

Table 8. Production Targets; Badhi Utpadan Karyakram Program, 1982-1984

Site	Cropping Pattern	Production Target Tons/Ha./Year.	Increase in Production Over Local Practices %	Increased in Production (Tons)		
				1982	1983	1984
Chitwan	Rice - Wheat Rice-Wheat-Mung	4 + 3 = 7 4 + 3 + 1 = 8	30	180	2100	5100
Parsa	Rice - Wheat Rice - Wheat-Mung	4 + 2.5 = 6.5 4 + 2.5 + 1 = 7.5	55	550	3712	20130
Lalitpur	Rice - Wheat	4 + 3 = 7	40	120	1000	1400
Rukum	Rice+Maize-Wheat Rice Wheat	2.0+2.5+2.5 = 7 4 + 2.5 = 6.5	33	82	495	808
Total:-				932	7307	27438

As new component technology is developed to increase the productivity of a pattern the new technology can again be disseminated through the production block approach. A small block of 5 or 10 hectares will be used initially and the size and number of blocks will gradually increase as the technology gains acceptance in the area.

(2) Use of Full Package of Technology

Farmers tend to adopt more readily a technology when it proves to add a substantial increase in production. In order to ensure successful demonstration effect of the technology on increasing production, a full package of cropping systems technology will be used in all the blocks.

(3) Use of Production Leaders ("Namuna Kishan")

The use of local leaders is not new in Nepal. Where local leaders are carefully selected, trained and given the proper direction, they have proved very helpful in the successful implementation of village programs. Two farmers will be selected in every 50-hectare block to serve as production leaders in the block. The production leaders will be selected based on their ability to influence other farmers within the block to adopt new farming practices and their own willingness to adopt the new technology.

The main function of the production leader is to motivate the farmers within the block to participate in the program. The leader will inform the other farmers in the block about the general features of the program and the benefit of the program to

farmers, explaining how farmers can enter the program or informing them when to attend meetings. The leader will be the first one to apply the technology (maybe a new variety, planting method, or a package of new practices) and encourage the farmers in the block to adopt the practice. Assistance will be offered farmers in the block in performing certain operations learned from the JT. The leader will learn from the JT how to grow, process and store new crop varieties for seed purposes.

As a reward for help in making the program successful, the production leader will be given a small training allowance and free inputs, seeds, fertilizer and insecticide sufficient for ½ hectare, every planting season.

The production leaders will be given training in a series of sessions to help them become good innovators and effective motivators.

They will not be considered as employees but as "Namuna Kishan" in the villages.

(4) Training of JTs, JTAs and Production Officers

A change agent can only be a good change agent if he has the necessary knowledge and skills needed to transmit effectively a new technology. The extension personnel involved in the program will be given adequate training and technical support to make them effective change agents. The technology will be presented to them in simplified form; in the way they are expected to transmit the technology to the farmers.

Eighty percent of the training time will be spent in the field in the same situation in which they are expected to teach the farmers. The categories of trainees in each site are presented in Table 10.

(5) Supervised Credit

Credit is a very important service which most of the small farmers of Nepal need to enable them to participate in development programs. With credit in kind more farmers will be able to buy the required inputs of production in time, thus accelerating the adoption process of new technology. Supervision by trained staff will enable credit to be used more effectively to the benefit of farmers.

To allow wider participation by farmers in the program, a loaning scheme has been worked out with the Agricultural Development Bank of Nepal. The loaning scheme has the following features:

(a) Farmer participants in the program can receive a production loan using expected production as collateral. Farmers will not be required to submit their land registration certificate as collateral. They merely have to show them to the loan officer to prove that they are bonafide cultivators of the land.

(b) The loan application covers a whole year of farm operation. With this arrangement, a farmer will be assured of the input of production for one whole year and will spend less time with the bank for loan processing.

(c) The JT/JTA or production officer will assist the farmer in preparing a farm plan and budget for a whole year's operation, which serves as the basis for the approval of the loan. This process ensures the use of the appropriate kind and quantities of

Table 9. Agricultural Input Requirements (Tons)
Winter 1982-83

Item	Chitwan	Parsa	Lele	Chauri Jahari	Total
Fertilizer					
20-20-0	40	60	20	20	140.0
Urea	17.3	26.7	5.9	3.9	52.3
Seeds (Wheat)					
UP 262	3.6	17.6	-	1.8	23.0
Lumbini	1.2	2.5	-	-	3.7
RR 21	7.2	5.0	7.5	3.0	22.7
NL 30	-	-	-	1.2	1.2

Table 10. Production Team Personnel and Training Requirements, Cropping System Production Programs at Four Sites, 1982 - 1984

District	Site	Winter 1982			Summer 1983			Winter 1983			Summer 1984		
		Production Officer	JT or JTA	Production Leader	P.O.	JTA	P.L.	P.O.	JTA	P.L.	P.O.	JTA	P.L.
Chitwan	Ratna Nagar	2	4	8	2	4	15	2	4	20	2	4	40
Parsa		4	6	12	4	8	25	4	8	40	4	8	80
Lalitpur	Lele	1	1	4	1	1	4	1	1	4	1	1	10
Rukum	Chauri Jahari	1	1	4	1	1	8	1	1	10	1	1	10
	Total:-	8	12	28	8	14	52	8	14	74	8	14	140

Production Team Composition:

Production leader (farmer) - 1 for each 25 ha.
JTA - 1 for each 250 ha.
Production Officer - 1 for each Impact Area.

inputs needed by the farmer. This also permits a closer working relationship between the JTA, Sajha, ADB and the farmers. Supervision will become assistance to farmers through supervised credit and information dissemination.

(d) Wherever the local Sajha (Cooperative) is not operating, the ADB will provide direct loaning to farmers. A "Mobile Team" of the ADB will go to the village to process and release the loans directly to the farmers.

(e) Repayment plans will focus on repayment in cash or in kind at the threshing floor. This move certainly will assure a higher rate of repayment.

(6) Seed Multiplication and Exchange Program

Production programs have one critical input that can be produced locally. Seed of improved varieties produced locally can fit into the existing system which farmers have for maintaining their varieties. Strategic supplies of limited quantities of seed of recommended varieties will be introduced in the PPVT phase and additional quantities will be produced in the village for exchange in kind with other farmers in the village. Some 3-5 farmers in each of the selected villages, who are participants in the cropping systems pilot production program will be selected and assisted to grow, process and store, for seed purposes, their crops of a new variety or varieties in the cropping patterns. This is critical for minor crops as well as the major cereals.

The main objective of the program is to develop a system to grow in the village sufficient quantities of high quality seeds of newly recommended varieties of rice, wheat, maize and other crops.

The program will:

(a) Develop seed growers in the villages who could grow, season after season, seeds for the other farmers in the village or adjoining villages.

(b) Develop the skills of selected farmers on the appropriate procedure for harvesting, threshing, cleaning, drying, seed treatment with insecticide and/or fungicide, bagging and storage for seed purposes.

Wherever possible SPIS will be linked with this process and could serve as a source of seed and possible outlet for quantities of seed in excess of local needs.

(7) Information Dissemination

The educational campaign for disseminating cropping systems technology will involve different approaches, all directed towards increasing the production of farms, not of a crop. Wall-posters, which will be posted in all targeted communities, illustrated leaflets and bulletins, which will be distributed, and occasional news releases will be a part of the dissemination process. The kinds and numbers of informational materials are presented in Table 11.

(8) Extension Activities

A rapport with farmers is essential to the development of a block approach to production. This relationship can be improved by farmer meetings, field days, contests, field demonstration. These are listed in Table 12.

Table 11. Informational Materials Required in Production Programs at Four Sites, 1982-84.

Visual Aids	Chitwan	Parsa	Lele	Chauri Jahari	Total
Flip charts	6	10	2	2	20
Posters	100	200	50	50	400
Leaflets	2000	4000	1000	1000	8000

Table 12. Annual Extension Activities for Implementation of Production Programs in Four Sites, 1982-84.

	Item	Chitwan	Parsa	Lele	Chauri Jahari	Total
1	Farmers Meetings	12	18	6	6	42
2	Field Days	4	6	2	2	14
3	Method Demonstration	40	60	20	20	140
4	Yield Contest	4	6	2	2	14
5	Group Visits	20	30	10	10	70

5. ICP Assistance to Production Programs

Participation by ICP is, from the very beginning, to assist ADOs with their programs. ICP will not have separate production targets in districts. ICP will demonstrate production increases in identified areas and then plan production programs to cover an entire district where pattern technology fits. District production targets will be based on a pattern basis rather than on an individual commodity.

Direct participation of ICP in production programs in the districts is expected to decline starting the summer of 1984 or earlier. By that time, the officers in the districts and in the region will have witnessed the impact of the cropping systems approach towards increasing farm productivity. The program could then move from the pilot phase to a district-wide production program.

Implementation of the program on a district wide scale will require the following changes:

a. Re-orientation of program objectives of the district from that of increasing production of selected commodities to that of increasing the productivity of the whole farm.

   This would mean preparation of the production plans at the service center or village levels on a cropping pattern basis aimed at increasing production of the farms in the area and not only for selected commodities.

b. Preparation of District Plans on Cropping Pattern Basis. The production plan prepared at service center levels will be consolidated to develop production plans for the districts. The plan will be on a cropping pattern basis.

c. Re orientation of extension activities and messages to focus on increasing productivity of the farm rather

than the productivity of a single commodity. This will require training of officers, JTs, JTAs, PLAAs and all involved in the production program implementation to orient them on the cropping systems approach and provide them with the necessary skills and knowledge on the cropping systems technology and methodology.

6. Linkages with other Production Programs in Defined Area Projects

Based upon the experiences in assisting with implementation of production plans in the Rapti Zone Project (RAD), ICP personnel will be able to provide effective linkages to other projects through information dissemination of the technology, packages of practices, and training of personnel. The ICP cannot assume responsibility for implementation of such production plans, but with proper organization and management other projects can effectively use the methodologies and technologies being developed by ICP. It is important to recognize that such projects are structured for production and that the ICP can provide the means of utilizing manpower and other resources in achieving these goals.

The Rapti Zone RAD project was the first to take advantage of the potentials of the methodologies and pattern technologies developed by the Cropping Systems team. Training programs for ADOs and JTs were conducted before the surveys were undertaken. After the surveys were completed and reports prepared, CS staff reviewed the information and in discussions helped the districts plan their Preproduction Verification Trials (PPVTs). A Peace Corps Volunteer couple, Patty and Sandy Smith, were transferred to the Zone to assist in the layout and conduct of the agronomic trials and collection of agronomic and socio-economic data. The CS staff assisted in the summarization and analysis of data. As a result some very good data were obtained that enabled the development of comparable marginal benefit-cost data to enable district officers to decide what to plan for the ensuing season and years. As a result of this analysis, and in

discussions with district and zonal officers, it was possible to initiate pilot production plans.

Similar surveys, data collection from on-farm trials, analysis of the data and formulation of production plans can be implemented in other projects. This pattern was attempted with less success in the districts participating in the Hill Food Production Project, but efforts will be renewed during the remaining two years of the project. In other training programs too few personnel represented the project areas so that it was not possible to effectively implement the PPVTs in these areas, either in the Terai or in the Hills.

Key features of CS staff involvement in other projects include -

a. Familiarization of district leaders with data collected at CS sites.

b. Recognizing the importance of areas of impact where PPVT's can be established.

c. Training of staff of limited areas of the district to implement the PPVTs.

d. Project staff conducting on-farm trials to establish credibility for the extension staff and to collect relevant data regarding performance.

e. Analysis of data by project staff.

f. Meetings to report on data collected to determine what steps can be taken toward production programs or whether further testing is needed.

g. Assist in organizing (1) pilot production programs based on trial data, (2) an implementation plan which involves

seed, fertilizer, input, and credit, and (3) production blocks to enable large scale demonstrations of the technology which, in turn, will create a common interest among farmers.

7. Monitoring Production Programs

The socio-economic component of the team will be involved in the production phases to determine suitability, acceptability and impact of the new technologies. This information is to be obtained through crop cuttings and through surveys with farmers and agricultural personnel.

a. Suitability

The suitability of technology must be judged by the relative agronomic performance of the new practices and the farmers' practices in agro-climatic environment of the location where production programs are to be carried out. Further, the suitability must be judged according to the relative net benefits farmers could derive by following the new practices within their own socio-economic environment i.e., input availability, credit availability, market prices, levels of income, tenancy arrangements etc. Suitable technology should provide increased crop production and/or increased net benefits to farmers.

b. Acceptability

Although the recommended technology may appear to be both agronomically and economically suitable for an area, it may not be acceptable because of such things as social beliefs, customs etc. Good feedback from the farmers themselves can provide important information on:

(1) The degree the technology is acceptable,

(2) The constraints to adoption from the farmers' viewpoint, and

(3) Suggestions for modifying the technology in order to make it more acceptable.

In a well implemented production program a large amount of confidence about: (1) the agronomic and economic suitability and (2) acceptability of new crop technologies will have been developed prior to the initiation of large scale production programs. This confidence can be gained from preproduction verification trials and from pilot production programs. However, the monitoring of the acceptability and suitability of recommended technologies should continue as a production program proceeds to ensure that unanticipated problems do not develop.

c. Impact

A measurement of the impact made by the adoption of the new technology in a production program, with the farmers and local community, will be very valuable when attempting to gain the support of the Government Officers, support institutions and assistance donors for other production programs. The benefits that could be measured include changes in: (1) total food production, (2) net income to farmers, (3) nutrition, (4) agricultural employment, (5) non-farm employment, (6) fodder availability for livestock, (7) education, (8) tax revenues, etc.

A complete analysis of the impact of production programs can be carried out only after the efforts to increase yields have been undertaken for a number of years and only after the effects have had time to influence farm practices. However, the season-by-season progress of a production program during the project period can be shown, on a limited basis, by documenting the number of

farmers participating, the area covered, the yields harvested and the inputs used.

These activities will be carried out in conjunction with the preproduction verification trials, pilot production programs, and production programs. David Mergen and David Lipinski, two Peace Corps Volunteers will be involved in this phase of the socio-economic activities of the CS program.

8. Minikits as a Part of Extension and Production Programs

Minikit programs have become an established component of the commodity programs of the major cereals linking these programs more closely with extension programs. As new varieties of minor crops are developed similar minikit programs will be initiated for the minor crops. Minikits also serve in extension programs as result demonstrations and as such will become a part of the extension program development and annual budgeting processes. Because of the linkage with the research programs, joint responsibility will continue so that the minikit programs will provide a point of contact between extension and research.

During 1982-83 the DOA was to assume 33% of the cost of these minikits while USAID funds would support 67% of the cost. In 1983-84 the DOA should fund 67% of the cost and USAID 33%. In the year following the PACD it is expected that the DOA will assume all costs of the minikit program.

Costs for the program in 1982-83 were divided with USAID (ICP) funds being Rs. 374,000 and the DOA costs, Rs. 133,000. In 1983-84 the cost will be Rs. 134,000 for USAID (ICP) and Rs. 401,000 for DOA. During 1984-85, the cost of minikits will be 100% from the DOA with approximately 80% of this cost with the commodity programs and the balance with the Regional Director.

At that time support from extension and the commodity programs should enable the minikit program to be estabilized at about the following levels.

	No. Individual Packets of Varieties		
	1982-83	1983-84	1984-85
Rice	15,000	15,000	15,000
Maize	5,000	5,000	5,000
Wheat	5,000	5,000	5,000
Minor crops	1,000	1,500	2,000

Costs have been averaging Rs. 10 to Rs. 40 per minikit. Using this as a measure, the budget costs are calculated as follows -

	Rs.'000		
	1982-83	1983-84	1984-85
Rice @ Rs. 10	150	150	150
Maize @ Rs. 40	200	200	200
Wheat @ Rs. 23	115	115	115
Minor Crops @ Rs.40	40	60	80
Total:-	505	525	545

These estimates may vary considerably depending upon the development of new varieties in each commodity program.

9. Women Extension Activities - The Involvement of Women in Cropping Systems Production Programs

a. Findings and Recommendations of the "Status of Women in Nepal" Studies.

The main finding of the status of women studies was that "Women's roles in subsistence agriculture and the market economy, including their considerable decision

making responsibilities, are not reflected in any development agency strategies for extension, training, credit, employment, etc. Instead these strategies are targeted almost exclusively towards men, resulting not only in a failure to mobilize the full production potential of women, but in the tendency to actually lower their relative status by not reaching through the inside/outside dichotomy to draw women into the highly complex and increasingly important structures of the development process and the wider spheres of society'. It was therefore recommended that 'To fully mobilize women in the development process and to provide them increasing (rather than the current decreasing) opportunity to lead secure productive lives, women should be specifically targeted within each development sector' and that "development planners can intervene to encourage greater equity in the distribution of benefits' between men and women.

The main focus of the recommendations are on the means by which the status of women in Nepal can be increased. That training women for agricultural extension, will result in increased farm production is implied. Women were found to be "the centre of subsistence production and farm management decisions in the rural household'.

(1) Women carry out many of the crop production activities,

(2) Women most commonly decide on which variety of a crop to use (traditional versus improved),

(3) Women most commonly decide on which crops to grow (although many of these decisions would be based on tradition, especially for rice, wheat and maize), and

(4) Women have a fair amount to say on how the household budget is spent.

Some of the findings suggested that the use of women as extension agents could be difficult:

(1) 'According to 1975 census estimates, five percent of the female population in Nepal of 10 years and above were literate and 95 percent illiterate',

(2) In some ethnic groups, especially those of higher caste, it could be culturally very difficult for women to act as extension agents .....

(a) 'Patterns of extreme deference to affines decree that the young wife must be silent, self-effacing and obedient in the family. Above all she must be modest and retiring in her interaction with the rest of the village ,

(b) 'It is considered demeaning if a household must allow it's women to perform wage labor for others and only among the very poor or the low castes in either community do women work for wages',

(3) There is probably a large Inter as well as an Intra Community Variation in the difficulty involved in effectively using women as extension agents as well as in the methods to be employed; in part because of differences in the relative predominance of the various ethnic groups and their interactions with each other.

(4) "Many men in the Ministry of Agriculture express doubt that the 15 women currently being trained will actually accept placement and become practicing JTAs".

The studies did enable some recommendations to be made on how women could be better used in extension activities.

Training, Extension and Functional Adult Education:

The problem of the inside/outside dichotomy which to varying degrees in different communities effectively cuts women off from participation in the development process can only be overcome through special efforts to involve women in training and extension. All studies point to the need to recruit local women from the community to serve as extension personnel. This will require either amending the current recruiting standards to waive the education requirements at the lower levels of service or preferably, the creation of special pre-entry job categories for locally recruited personnel. After initial training and two or three years service as 'Assistant' Auxiliary Health Workers, ward level 'Agricultural Assistants', etc., these local level extension personnel could become eligible for more extended training perhaps combined with special courses to prepare them for eighth class or SLC exams. An effective policy to encourage recruitment of local women would also require that explicit instructions to this effect and guidelines on the required qualifications -- and the degree of flexibility therein -- be issued from the central ministries or institutions to the regional and district offices responsible for the actual recruitment .

'Another point to be considered in the recruitment of local level women is the importance of selecting women who are well integrated and respected in the local community. For example, age was revealed as an important status factor in all the communities studied and this suggests that the best and perhaps only way to reach rural women in some of the more dichotomous communities is through mature married women. Such women have the credibility and prestige to move into the domestic sphere and gain the trust of their fellow villagers -- male and female. In non-dichotomous communities such as the Rai, Kham Magar, Baragaonle and Tamang, unmarried girls may be effective as channels for the diffusion of information and

initiation of new income generating schemes. Since young women are allowed considerable mobility in these groups, they can be brought to centralized training centres. However, in more conservative villages like Sirsia and Bakumdol, change agents should be mature married women and such women are rarely able to leave their own households, therefore, training in these communities must increasingly be brought to the villages rather than asking the trainees to come to urban training centres. Some steps have been made toward mobile training by the WATC and others but much remains to be done to upgrade the skills of the trainers themselves, to ascertain and develop means of delivering training in areas that are relevant to the concerns and needs of village women. One serious constraint to effective mobile training programs is the fact that the TA and DA allowances provided are simply insufficient to motivate the trainees to spend extended periods in the field. In addition, ongoing support in terms of materials, supervision and regular remuneration must be provided for the trained extension workers once they are in place. On the policy level an important step which could do much to streamline and regularize training would be the creation of a specific budget category for training. Currently, training is budgeted under Category 8, "Grants and Prizes' or Category 9, "Contingency/ Miscellaneous' or it is split between category 3, TA/ DA' and Category 7.5, 'Expendable Materials'. A separate category for training would highlight the critical importance of providing the departments with funds to do local level training'.

'In view of women's major role in agriculture, it is encouraging to learn that the Ministry of Agriculture is organizing a special training program for female JTAs. This program will fill a long standing need and will hopefully provide a model for other "technical" extension such as forestry and soil conservation which,

unlike health, family planning and nutrition extension, have been viewed as purely male concerns to be directed solely towards male clients in the village'.

To be effective, however, such special training programs for women may need to be supplemented with some initial support in terms of preferential placement after training. Women want the training, do well at it and then are unable to accept postings which place them long distances away from their families. Initial posting for female trainees near their homes or within a day or two walk would reinforce greatly the benefits of such targeted training opportunities'.

"Bringing extension into women's sphere in the home and village is one important step towards overcoming the inside/outside dichotomy. The other complementary approach is to equip women with the skills they need to move out and interact with the structures of government, the judiciary and development bureaucracies. Women's adult education should be strengthened and focused around the reading, writing and accounting skills which are required to fill out loan applications, read extension materials and conduct business. The most productive approach would be to integrate literacy and numeracy training with practical on-the-job training in employment generation activities. For most women, unless their time spent away from household and agricultural chores can bring in some visable contribution to the family income, neither they nor their household will feel that the time is justified. The variation in seasonal workloads mentioned earlier as well as the daily schedule of essential domestic tasks must be kept in mind in the design of extension training or adult education for women (or men for that matter)'.

'More flexible scheduling may also be needed in the formal education system if the enrollment of girls is to be increased. Both the time allocation findings

and the data on attitudes towards female education show that the family's need for girl's labor is one of the major reasons girls are not sent to school. This suggests that perhaps up to fifth or sixth class, the length of the school day should be shortened from the current six hours to a more intensive two or three hours concentrated on basic literacy and numeracy skills. In compact villages where children would not have to travel long distances, perhaps evening literacy classes could be given as is presently being done in the Tharu village studied. Another factor which should be mentioned in connection with all education, training and extension efforts is the need for teachers and extension personnel to know how to communicate in the local language. In the Tharu, Maithali, Kham Magar and Baragaonle villages studied, learning is currently made even more inaccessible by the fact that Nepali texts and training materials are used without someone who can interpret and explain their meaning in the local language. This reinforces the previously mentioned importance of local recruitment for teachers as well as extension personnel".

Source

"THE RURAL WOMEN OF NEPAL' An Aggregate Analysis and Summary of 8 Village Studies by Meena Acharya and Lynn Bennett, Centre for Economic Development and Administration, Tribhuvan University, Kathmandu, Nepal, 1981.

b. Considerations

The goal of the Integrated Cereals Project is to help increase agricultural production and farmers' (households') income and not explicitly to increase the status of women. Since the studies reviewed focus on the status of women in Nepal and how to increase that status, questions remain un-answered on how, and on the need to use women as extension agents.

It is well documented that women do play an important role in Nepal Agriculture. Women carry out many of the crop production related tasks. Women also carry out some of the important decisions concerning crop production, especially in selecting which variety to plant. Women's knowledge on the relative performance of recommended crop technology could be a factor in determining how quickly adoption initially takes place. Women's knowledge on how to apply the new technology and to derive good results could be an important factor in determining if adoption continues and if production increases.

Research at the cropping systems sites indicates that the farmers' (head of household) lack of understanding of the recommended technology and the benefits that could be derived from following it, was one of the constraints to be faced for a successful production program.

It is uncertain to what degree and how quickly closing the farmers' knowledge gap on new crop technology will lead to increased women's knowledge thru discussions in the household or otherwise. Women's knowledge on improved technology could most probably be improved more certainly and more quickly if women were involved in village level extension activities such as training sessions, field days, yield contests, etc., th n if men alone were involved.

Because of their general low rates of literacy, it may be very difficult to train women in some aspects of the new technology... The proper kinds and doses of fertilizers and other chemicals to apply, may be the most difficult information to relay, especially when reading, measurements and division or multiplication may be required. It may be useful, however, to target women for training in activities they generally carry

out. These activities include compost making, compost handling, seed storage, seed treatment, seeding, weeding, harvesting, threshing, etc.

The relative merits of using men or women to train women in agriculture is unclear. If women are to be used as trainers, it is also unclear what the best approaches are in using the women. The best approaches could vary, to some extent, from community to community.

c. ICP Activities

(1) More emphasis will be placed upon having higher rates of participation of women in regular extension activities in the villages and/or getting feedback from women as well as from men about the new technology.

(2) Women will be targeted for certain types of training or activities i.e.

(a) Field days to view and discuss the relative merits of crop varieties,

(b) Training on:

(1) Compost making,
(2) Compost use,
(3) Seed storage,
(4) Seed treatment,
(5) Seeding,
(6) Weeding, and
(7) Harvesting and threshing, etc.

(3) A short term consultant will be hired to give ideas on how best to carry out activities '1' and '2' above. Included could be information on the need for and the best means of using women as extension agents.

(4) The ICP will continue to try to involve local women as extension agents in selected sites,

(5) The ICP will also try to work with women JTAs to help train extension agents working in their local villages and to carry out women-focused extension activities.

B. Technology Development

1. Cropping Systems Research

a. Research in Farmers' Fields

Table 6 summarizes cropping patterns by water availability and inherent fertility status of the soil. This serves to illustrate the level of technology available for different soil categories. Low-fertility status lands in the Terai and in the Hills are categories where more technology patterns are required to improve the fertility status and productivity and to enable increases in cropping intensity. Areas which now support only one crop of rice per year are quite extensive in the Terai and include such areas as Khandbari or Pumdi Bhumdi in the Hills. Other factors such as uncontrolled domestic and wild animal grazing also limit the possibilities of increasing cropping intensity. However, the basic condition is low fertility which in turn limits the scope of increasing cropping intensity. Where these soil conditions exist there is need for continued pattern testing. To control grazing, research-managed plots of a size that can be protected by fencing and conducted on land lease basis may be required.

Where production programs have been initiated, at Parsa, Chitwan, Lele and Chauri Jahari, the need for further research on the patterns in production can be limited to monitoring these patterns in comparison to farmer

practices and patterns. The need for long term monitoring of the 3-crop cereal patterns will be a research component of these production areas.

The Project Paper Amendment speaks of the new sites during the extension period. New sites in the mid hills may not be necessary. The Preproduction Verification Trial program now underway in 20 districts should indicate the applicability of the improved pattern technologies. This process will probably consume the remainder of the project period.

For altitudes above the levels for which improved technologies may be applicable it will be necessary to identify a site that has scope for improvement and has some measure of extrapolation to other areas. This will probably require the services of a consultant to visit possible sites and make a comparative assessment of potentials. The area served by the RCUP may contain such a site. If so, collaboration with RCUP would enable good implementation in both the research and production phases.

Component technology studies directed at the crops comprising these patterns will be continued as needed, especially as new innovations are forthcoming and/or when specific technology weaknesses are encountered in the patterns as areas covered by the production programs are expanded. New research thrusts will be incorporated into the research activities but all aspects of these thrusts will not be uniformly attempted in all of the sites. The feasibility of following through with these thrusts will be matched with the most realistic site or sites where the research can be more efficiently carried out. Some aspects of this research may well have to be initially carried out at experiment stations where more control can be achieved.

Targets have already been established for the HMG fiscal year 1982-83. Table 13 reflects the numbers of farmers involved in meeting these targets. There will be 36 pattern trials in the 6 locations with approximately 5 farmers for each pattern or a total of 180. An additional five farmers will be sampled for each pattern to measure local practices so as to make valid comparisons with these practices. Thus a total of 360 farmers will be sampled.

Likewise, in the nine patterns used in production a minimum of 20 farmers will be sampled and additional farmers will be sampled for farmer - practice performance. As sizes of the areas increase, 20% of the participating farmers in the Terai and 5% of the farmers in the Hills will constitute the sample. Initially over 200 farmers will be involved in getting valid comparative data. If the patterns involve two crops per year nearly 1200 crop samples will be collected throughout the year.

The data already accumulated from many of the patterns is sufficient to enable these patterns to move into production programs where they will be further monitored in the production phase. Actually, additional emphasis on sampling farmers in the production programs may necessitate an early reduction in strictly pattern testing.

The pattern testing in 1983-84 will be phased out at Khandbari, Lele, and Pumdi Bhumdi and will be reduced from 23 to 16 at the other sites. Numbers of patterns in production will increase from 9 to 11.

Component technology trials are listed by numbers of farmers involved. These trials will be superimposed on-pattern trials or on pattern production blocks and will not require separate farmers to carry out this portion of on-farm research. In addition to trials

listed, minikits of new varieties will be superimposed on the patterns in larger numbers than might normally be used. This will enable closer monitoring of minikits and provide a local source of seed if performance and farmer preference of these varieties exceeds their preference for other varieties in use.

The individual sites have been considered on a case-by-case basis and the research to be emphasized at these 6 sites in the ensuing two years is elaborated below.

(1) Lele

The cropping patterns that are being tested at this site are improvements in the existing farmer patterns. The alternative patterns that have been tried have met with minimal farmer acceptance. Since the current patterns being studied are also involved in the production programs, cropping patterns will be studied in the production phase. At present this involves two patterns, Rice-Wheat and Maize+Soybean-Mustard. Emphasis will be given to studying specific component technologies for the crops in the patterns, particularly the identification of high yielding leaf rust resistant wheat varieties, further testing of temperate zone rice varieties and further investigations of the problems that have been encountered in obtaining stable, increased maize yields. Some of these component technology studies can be carried out within the context of the production program so that the format for continued improvement in production technology by staff who are primarily involved in production activities can be established. In this way the logical steps in the evolution of a Cropping Systems site can be demonstrated. These steps are (a) research to develop and verify technology at the sites,

Table 13. Cropping Systems Site Research Activities, 1982-83

	Khandbari	Lele	Pumdi Bhumdi	Chauri Jahari	Ratna Nagar	Parsa	
						Sukh-chaina	Bahuwari
A. Research							
Agronomic & Socio-Economic							
1. Pattern							
a) Research*	6	2	5	4	10	5	4
b) Production**	1	1	1	1	2	1	2
2. Component Technology***							
a) Varieties	4 rice 4 wheat	3 wheat 3 rice	3 wheat 3 rice	3 rice 3 maize 6 wheat	3 rice 3 maize 5 wheat	3 wheat 3 rice	5 wheat
b) Fertilizer & Fertilizer Compost	2 maize	6 wheat	6 wheat	4 wheat		3-N-P-Zn	
c) Cultural Practices	4 maize	2 maize		3 water mgt.	3 wheat	1 water mgt.	
d) Plant Protection							
3. Legumes							
Winter varieties			1	3	3	1	2
Intercrop	2nd crop 4 legume maize						
Relay	4 1st crop maize cowpeas soybean			3			
4. Fodder/Fuel	4		4	4		4	
5. Minor crops	linseed mustard						

* Nos. indicate nos. of trials. Nos. of farmers will be n x (5+5) (5, trial farmers + 5, local practices).

** Pattern sampling, minimum 20 farmers or 20% of participating farmers in the Terai and 5% in the Hills. Local practices will also be sampled for each pattern.

*** Numbers in component trials indicate no. of farmers.

(b) adoption of the technology by farmers in and around the site through implementation of a production program and, finally (c) continued testing of new component technologies to steadily increase production. Because of the high fertilizer input use already present at this site and the ready availability of these inputs, fertilizer use efficiency can be an important component study.

(2) Pumdi Bhumdi

The situation at Pumdi Bhumdi is somewhat similar to that at Lele. Most of the patterns under test have been thoroughly studied and are being extended through the production program. As in Lele, pattern studies will be monitored in the production phase. Attention will be directed at component technology studies primarily directed at identification of more suitable (1) rice varieties, (2) rust resistant wheat varieties and (3) development of more realistic fertilizer recommendations for wheat, especially in the uplands where compost is being used. Attention will be given to identifying a winter legume crop that can be used for green manure/ fodder for planting in the low production potential lowlands which lie fallow for the most part during the winter. This site will also be useful for studying legume fodder trees since many farmers maintain milking buffaloes. Farmer reaction to use of fodder trees will be carefully evaluated as a part of the research program.

(3) Khandbari

Cropping pattern testing per se in the upland maize-based patterns will be phased out for the same reasons as given for Lele and Pumdi Bhumdi and pattern monitoring will constitute part of the production phase. Component technology studies directed at methods of maize planting for the first

and second maize crops in Tumlingtar; the possibility of intercropping black gram with the second maize crop in Tumlingtar; finding the optimum date of planting the second maize crop in Tumlingtar; and identification of better soybean and cowpea varieties to intercrop with the first maize crop in both Khandbari and Tumlingtar will constitute the main research activity at these sites.

In the lowland rice-based patterns increased attention will be given to identification of suitable improved rice varieties, since none have been accepted to date. Since over 80% of the lowlands is currently Rice-Fallow-Fallow, continued pattern testing to intensify cropping will be continued with particular attention given to planting crops in the spring season (Rice-Fallow-Mungbean and Rice-Fallow-Maize) which seem to offer more scope. There are pocket areas where wheat is planted in winter but the potential for expansion appears to be limited by lack of irrigation and uncontrolled animal grazing. Testing of wheat varieties will continue so as to identify varieties for similar areas where patterns including wheat are more extensively used.

Other winter crops like lentil, linseed, and mustard after rice have potential but will suffer the animal grazing constraint. The Khandbari area offers potential for utilizing legume fodder trees and this research will be given high priority.

(4) Chauri Jahari

The cropping patterns Rice+Maize-Wheat, Rice+Maize-Lentil, Rice+Maize-Chickpea, and Rice-Wheat-Fallow have been thoroughly studied and most are being included in production programs. Pattern testing of these patterns will be phased out and will be monitored in the production patterns. Attention will be given

to testing improved varieties of the crops involved, especially rice in the Rice+Maize patterns.

Since availability of fertilizer is a constant constraint in this remote area, additional work will be directed at optimizing the fertilizer recommendations, especially in wheat where compost is used. Attention will be given to the possibility of growing short season legume crops like mungbean and black gram which could be used as a relay crop to be planted shortly before the early maturing lowland rice and upland rice+maize are harvested. This will enable a grain legume crop to be harvested before land preparation for winter crops and the plant residues can be ploved down as green manure.

There is some scope for cropping intensification in the irrigated lowlands through use of Rice-Wheat-Maize, Rice-Wheat-Mungbean and Rice-Rice-Wheat patterns. These patterns will be tested although unreliability of irrigation water and animal grazing can be major constraints. Because of the large numbers of livestock, Chauri Jahari is also a location where the potential of legume fodder trees will be tested.

(5) Parsa

(a) Rainfed Conditions

Sukchaina village has been the site where cropping systems studies have been conducted under rainfed conditions in Parsa district. A production program is ongoing that is emphasizing the Rice-Wheat-Fallow pattern. Other patterns such as Rice-Mustard-Fallow, Rice-Lentil-Fallow, Rice-Chickpea-Fallow and Rice-Barley-Fallow have been tested for several years and improved technology

has been identified.

At Sukchaina much of the early work was carried out near the village with soils characterized as having higher production potential than soils more distant from the village. The cropping pattern trials are now being carried out in the lower production potential soils. It appears that the technology is suitable for these situations but it is possible that there may be different phosphorus responses especially initially until some phosphorus begins to accumulate as it is regularly applied to winter crops. There are clear appearances of zinc deficiency in some trials of the current rice crop. Therefore, there is adequate justification to continue some pattern testing in these low production potential areas combined with component technology studies to investigate potential differences in fertilizer requirement, the need for zinc applications and to test varieties of the included crops. Some of the component technology studies will be conducted within fields of some farmers involved with the production programs since the same staff member will be charged with both research and production activities. At Sukchaina the usefulness of legume fodder trees under Terai conditions will also be tested.

(b) Irrigation Conditions

At the Bahuwari tube-well site the supply of irrigation water is reliable, although problems occasionally occur. There are several patterns that have received adequate testing under irrigated conditions in Parsa and are included in production programs there. These production

patterns will be monitored in comparision to local practices. Research involving these patterns will be directed at component technology studies particularly emphasizing continued variety testing of the component crops.

The main thrust of the research of the Bahuwari tube well site will involve the evaluation of a group of contrasting cropping patterns. Patterns will include (1) only cereal crops, (2) cereal crops plus a legume crop, and (3) cereal crops plus a green manure crop. Additional patterns will include crops with contrasting water requirements, especially in winter and spring seasons. Detailed analyses of the research data will provide reliable information and summary statements on (1) comparitive costs of production and returns, (2) labor and power requirements, (3) actual fertility benefits derived from the inclusion of a grain legume or green manure crop, and (4) realistic water requirements. This information will allow farmers involved in production programs to be more selective in the choices of crops to plant, especially in the winter and spring seasons.

Research will be initiated to test other possible crops with emphasis given to legumes such as early maturing cowpeas and soybeans before rice. In order to gain farmer approval to conduct some of these trials it will probably be necessary to formulate an arrangement which will guarantee the participating farmer a fixed yield or other minimum reimbursement.

(6) Ratna Nagar

As mentioned earlier, work at this site was only initiated in 1980. Therefore, continued testing of

cropping patterns is crucial although the number of patterns being tested will be gradually reduced if new, alternative patterns prove unsuccessful. In addition, component technology studies will continue to be a major part of the research activity.

Further classification of land categories will need to proceed, especially in the lowlands. The situation involving irrigation in the lowlands is unstable due to unreliability of water release schedule in the area supplied by a canal and the fact that some farmers have hand-dug wells with pump sets. These latter farmers have flexibility as to whether they irrigate or not, especially during the spring and winter seasons. Major preference is given to providing supplemental irrigation to the rice crop from the wells. Clearly there is the potential to develop technology for the lowlands under both rainfed and irrigated conditions. Many times, however, a pattern trial is planned with a farmer who has access to a well and he agrees to irrigate a winter or spring crop but at the time of irrigation will back out due to cost and risk-related fears. For future trials that are planned with these farmers, the program will pay the cost of irrigation at the going rate so that money and time will not be wasted and trial results will be obtained.

b. On-Station Cropping Systems Research

Plans have been made to conduct long term cropping pattern trials in both upland maize-based and lowland rice-based conditions at research stations. These trials will

(1) Compare the performance over the long run of cropping patterns managed under normal farmer practices versus application of the technology recommendations generated by cropping systems research.

(2) Document the effects of continuous use of chemical fertilizer versus systems that predominately rely upon organic matter recycling through compost/farmyard manure application.

(3) Demonstrate the importance of enhancement of soil fertility over the long run by including legumes as component crops.

(4) Compare the merits of new alternative patterns versus farmers' traditional patterns.

The upland experiment will be conducted at Khumaltar in close cooperation with the Soil Science Division. The lowland experiment will be conducted either at Parwanipur or Bhairahawa. Some of the research involving fertilizer-compost combinations and fertilizer use efficiency will be conducted initially at experiment stations with the pertinent results extended to the Cropping Systems sites.

c. Socio-Economic Research

The specific activities of the socio-economic research in cropping systems will continue to be the following:

(1) Assure that the data collected allow comparisons to be made between cropping pattern trials and farmers' present practices.

(2) Carry out economic analyses of the results of cropping systems trials.

(3) Conduct farmer surveys to get farmer feedback and/or to provide answers for problems which are identified.

(4) Carry out site descriptions for new locations where cropping systems trials will be conducted.

2. Crop Commodity Research

a. Rice

The different phases of the rice program Genetic Evaluation and Utilization (GEU), Cultural Evaluation and Utilization (CEU), Research Outreach and Seed Multiplication have been well developed and will be continued through this period. Research outreach will receive greater emphasis. Linkages with cropping systems through research outreach will improve and be strengthened so as to more effectively serve farmers. This will be achieved by the use of the CS PPVTs in areas for which the rice station is responsible.

The tentative rice work plan for 1983 is summarized in Table 14. Final plans will be prepared at the Summer Crops Workshop in January 1983 and for the 1984 season in January of that year. Major changes from previous recent years will be noted in research outreach for Hill varieties and rainfed lowland rices. New varieties for these areas will be identified to be introduced into research outreach activities, including seed multiplication. Greater emphasis on the use of azolla and other biological sources of N should also reach the field utilization stage by the end of the contract period.

Screening trials will be carried out in those locations where incidence of disease and/or insect stresses can be expected to occur naturally, e.g. gall midge in Kankai and Parwanipur. Regional stations are developing capability and where the coordinated trials do not serve their needs, new trials will be established at these regional stations. Many of these will be agronomic trials or pest screening for insects and diseases such as the gall midge and blast.

b. Maize

The maize program will continue its emphasis on varietal improvement concentrating on the use of recurrent selection through half sib, full sib, and, to a limited extent, selfing. In addition, a hybrid breeding program will be established which will focus on the winter maize crop in the Terai. This will be a long range program but will utilize introduced inbreds from other sources, hopefully to gain some valuable time in hybrid identification. The stresses on the winter maize crop are much fewer than those on the monsoon crop. Yield will be a principal selection criteria. Early vigor will enable establishment of the crop before cool temperatures reduce rates of growth. Since maturity will be prolonged in this season, yield per day as well as seasonal yield will be important in identifying hybrids that will fit in cropping patterns used by farmers.

Recurrent selection within existing released varieties offers further varietal improvement. Uniformity will be only one criteria but is important to provide varietal characteristics identifiable by farmers, seed producers and certification officials. Yield will be a continuing selection criteria. Yield per day will be used to identify early varieties to fit those cropping patterns which demand an early maize variety.

Disease and insect screening of all progeny materials will enable the elimination of the more susceptible materials and reconstitution of composites carrying a higher level of resistance. Downy mildew selections will continue to be made at Farm Suwan, Thailand, but by the end of 1983-84, staff, laboratory and field facilities should be established so that this work can be done at Rampur.

Table 14. Rice Trials, Minikits and Seed Multiplication, 1982-83

Trial or Activity	No. of Entries	No. of Locations
1. Local Germplasm	750	1
2. Maintenance Breeding	500	2
3. Hybridization Nursery	52	2
4. Mutation Nursery	6	1
5. Progeny Nurseries		
a. Lowland, irrigated	245	1
b. Temperate rices	500-750	2
6. Screening Nurseries		
Blast Screening, Int'l - National	400	4
Bacterial leaf blight	100	2
Sheath Blight	140	2
Brown Planthopper	235	1
Gall midge, Int'l and Nat'l	180	2
Leaf Folder	50	1
7. Varietal Evaluation		
a. International Rice Nurseries		
Rice Observation	350	2
Rice Yield Nursery, V. early	28	2
Rice Yield Nursery, early	28	2
Rice Yield Nursery, medium	28	3
Rainfeld Lowland Observation	110	2
Rainfeld Lowland yield	28	1
Upland Rice Observation	185	2
Rice Cold Tolerance	175	3 dates
b. Initial Evaluation Trial, Rainfed lowland	30	2
Initial Evaluation Trial, Rainfed upland	25	1
Initial Evaluation Trial, Lowland irrigated	30	2
Initial Evaluation Trial, Hills irrigated	36	2
c. Coordinated Variety Trials, Lowland rainfed	16	4
Coordinated Variety Trials, Upland rainfed	16	4
Coordinated Variety Trials, Early lowland Irrig.	16	4
Coordinated Variety Trials Med. to late, irrig.	16	5
Coordinated Variety Trials, Hills	12	4

Table 14. (Cont'd)

Trial or Activity	No. of Entries	No. of Locations
8. Cultural Evaluation Trials		
- Characteristics of varieties and different dates of sowing	10 x 8	2
- Plant population x Nitrogen level	3 x 2	1
- Methods of planting under rainfed conditions	4	1
- Optimum levels of N for early maturing varieties	10	3
- Efficiency of different source of N	16	3
- Use of Biological Sources of N	6	2
- Long term fertility trial - rice-based patterns	8	5
- Irrigation Management, early varieties	10	1
9. Pest Management		
- Studies on Mealy bug	10	1
- Studies on Gundhi bug	10	1
- Population dynamics of Rice Insects	-	3
- Chemical Control of Insect Pests	10	4
10. General		
- Meteorological Data collection	-	12
11. Research Outreach on farmers' fields		
Farmers' Field Trials, Early/Irrig.	5	30
Farmers' Field Trials, Normal		65
Farmers' Field Trials, Upland	8	10
Farmers' Field Trials, Hills	6	15
Gall midge Resistant Varieties	6	2
Fertilizer Management	10	6
Direct Seeding	6	4
Minikits, early	3	600
Mini-kits, normal	9	4000
Mini kits, Hills	4	1000
Seed Multiplication, Terai	8	165 ha.
Seed Multiplication, Hills	6	16 ha.

Agronomic practices hold the key to increasing maize production and additional emphasis will focus on farmer practices and how they can be improved. The work plan for 1982-83 is summarized in Table 15. Trials for the next year will be similar.

c. Wheat

The wheat program has made significant strides during the past 6 years and payoffs in new varieties will be moving into the field testing stages in this 2-year period.

The work plan for 1982-83 is presented in Table 16. The research outreach program of 1981-82 is modified to incorporate the cropping systems approach to the testing of components of the technology superimposed on patterns and data collected on a pattern basis. The work plan for 1983-84 will be finalized during the workshop to be held in August or September, 1983, and is expected to be essentially the same as the 1982-83 season.

C. Training

1. Academic Programs

A total of 36 candidates have been selected for academic training. One voluntarily withdrew and two others were found to be ineligible for higher studies. The last participants to begin academic programs started in November, 1981, at UPLB in the Philippines. These students are expected to complete their training before the PACD, 30 September, 1984.

At the beginning of the fiscal year 1982-83, 15 participants were still in academic programs. The status of these and those who have completed their programs is summarized in Table 17. Five selected under ICP have been separately funded in India by USAID. Two of these are still in training.

Table 15. Maize Trials by Season, 1982 83

Trial or Activity	No. of Entries	No. of Locations	Season
1. Observation Nursery	18	2	Summer & winter
2. Maintenance breeding	8	1	Summer & winter
3. Ganesh-2 population	725	2	Summer
4. Manakamana-2 population	739	2	Summer
5. Rampur 2, population	789	2	Summer
6. Rampur 1/Manakamana 1, population	465	2	Summer
7. Arun-4	-		
8. Arun-1 (white)	590	2	Summer
9. NMDP Varietal Trial	10	8	Summer
10. International Trial	15		Summer
International Trial	17	1	Summer
International Trial	11	1	Summer
11. Hybrid Maize Development Program	78	1	Summer winter
12. Irrigation on winter maize	14	3	Winter
13. Row spacing, maize	6	3	Summer
14. Cultural Management on maize	10	2	Summer & winter
15. Effect of hand weeding and weeding by plow	2x3x3	1	Winter
16. Maize based cropping pattern(rainfed)	10	2	Summer
17. Long-term fertility Exp. on maize based cropping system	9	2	Summer
18. Methods of fertilizer application	3x4	1	
19. Field Biology of Army worm by survey and surveillence	5	5	Summer & winter
20. Field biology of maize borer		4	Summer & winter
21. Study on soil insects with special reference to wire worm and white grub	12	1	Summer & winter
22. Screening of some elite germplasm against maize borer under natural conditions	12	2	Summer & winter
23. Seed Treatment trial against DM of maize	5	1	Summer & winter
24. Loss Assessment studies on (a) DM (b) Stalk rot	20	1	Summer
25. International DM (stalk rot nursery)	100	1	Summer
26. Study on the control of stalk rot by cultural and management practices	4	1	Summer
27. Study on the effect of gunny sacs of different gades, seed moisture contents, and storage conditions on the germinability of maize seed		1	Summer

Table 15. (Cont'd)

Trial or Activity	No. of Entries	No. of Locations	Season
28. Post harvest losses at storage due to storage grain pests of maize under different storage practices	12	2	Summer
29. Management Trial on maize (method of planting, seed rate and population)	4	4	Summer
30. Varietal Trial on maize	4	4	Summer
Post harvest loss assessment	20	1	Summer
FFT Stations & Farms	7	10	Summer
FFT Farmers	7	50	Summer
31. Minikit Demonstration			
i) Monsoon mini kit	3150 pkts	36	Summer
ii) Winter mini kit	1945	17	Winter
iii) Spring mini kit	355	16	Spring
32. Maize seed multiplication program in farmers field			
1- Khumal Yellow	7		Summer & winter
2- Rampur Comp.	6		Summer & winter
3- Arun-4	1		Winter
4- Rampur Yellow	1		Winter
5- Kakani Yellow			Winter
6- Sarlahi Seto	2		Summer winter
33. Maize Seed Mult. Stations			
Khumal Yellow	5	5	
Rampur Composite	10	3	
Arun-4	8	3	
Rampur Yellow	4	1	
Kakani Yellow	5	2	
Sarlahi Seto	14	2	

Table 16. Wheat Trials and Nurseries, 1982-83.

Name of Trial or Activity	No. of Entries	No. of Locations
Varietal & Plant Protection Group		
1. Crossing program	100	1
2. Generation lines		
a. F_1, Nepal	212	1
b. F_2, Nepal	64	1
c. F_2, Irrigated (CIMMYT)	300	1
d. F_3, Nepal	383	1
e. F_3, Irrigated	336	1
f. F_4, Irrigated	69	1
g. F_4, early		
h. F_4, upland	108	1
i. F_5, Irrigated	236	1
j. F_6, Irrigated	352	1
3. Off Season Nursery		
a. F_3, Nepal	383	1
b. F_3, Irrigated	336	1
c. F_4, Irrigated	69	1
d. F_4, early	76	1
e. F_5, Irrigated	236	1
4. Local germplasm	136	1
5. Int'l Bread Wheat Screening	-	1
6. Bread Wheat Observation	-	1
7. Nepal Advanced Lines	94	3
8. Int'l Triticale Screening	-	1
9. Int'l Spring Wheat Yield	300-500	1
10. Uniform Regional Trial	10-16	1
11. Unif. Regional Trial	10-16	1
12. Advanced variety trial	29	9
13. AVT - Terai (Normal)	24	8
14. AVT - Terai (Late)	24	2

	Name of Trial or Activity	No. of Entries	No. of Locations
15.	Initial Evaluation Trial - Hills	36	4
16.	IET - Terai	30	4
17.	National Screening Nursery (incl.Sterility)	200	2
18.	NDN (National Disease Nursery)	205	11
19.	Regional Disease Screening	200	2
20.	Regional Disease Trap	150	3
21.	Fungicide Trial (Karnal bunt)	4	1
22.	Fungicide Trial (loose smut)	8	1
23.	Int'l Triticale Yield Nursery	50	1
24.	FFT - Hill (Khet)	6	66
25.	FFT - Hill (Bari)	6	30
26.	FFT - Terai (Irrigated)	8	83
27.	FFT - Terai (Rainfed)	7	26
28.	a. Seeding date cum variety (Terai)	28	2
	b. Seeding date cum variety (Hill)	20	1
	c. Seeding date cum variety (Hill)	8	1
29.	Effect of N and P topdressing on wheat yield	8	1
30.	Effect of different land preparation methods on wheat yield	7	1
31.	Performance of Triveni at different levels of N and P under rainfed condition	7	1
32.	Study of seed rate in wheat under rainfed condition	4	1
33.	Long term fertility trial	9	8
34.	Weed control experiment		
35.	Time and frequency of N topdressing in wheat	5	1
36.	Minikit	4652	
37.	Barley, F_2 (CIMMYT)		
38.	Barley, Yield Nursery (CIMMYT)		
39.	Barley, Yield Trial (CIMMYT)		

In the past, participants have returned to Nepal without specific assignments. Fortunately, most of these have been accommodated in the DOA service faculties. In order to overcome this problem, the project will develop specific plans for returning participants and specific assignments will be made which will relate as closely as possible to the training obtained.

2. Non-Academic Programs

Non-academic programs will be primarily of attendence at organized training programs at IRRI, CIMMYT and ICRISAT. During the 1981-82 fiscal year difficulty was experienced in identifying and clearing personnel that could utilize the training available. Part of the reason is that practically all eligible personnel from the commodity programs have been to one training program or another during the past six years. More attention will henceforth be directed to selecting personnel from the divisions at Khumaltar and, for production training, from the ranks of the ADOs and AADOs.

There are still definite training needs among these groups. However, these needs must be identified and prioritized if the training is to be of maximum benefit. Possible training opportunities which will benefit the program are listed in Table 18. The Project Supervisor will work with the DOA officers in making the selection for these training positions in 1982-83 and 1983-84. Funds will be available for only 6 to 8 persons per year.

In-country training will include training in field plot experimentation for a fourth group under the leadership of Dr. Doug Seeley. Together with GTZ, ICP will organize a training program for trainers to improve the capability of the training staff at regional training centers. Other in-country training programs related to production programs for farmers, JTAs, JTs and ADOs are planned. These are outlined in Table 10. The ICP staff will serve as resource

Table 17. Summary of Academic Programs Under the Integrated Cereals Project, 1976-1984

Name	Field and Degree	Institute	Class Initially	Class Presently	Post at Present	Location	Estimated Completion Date
T.P. Pokharel	Brdng (W) M.Sc.	N. Mexico	III	III	Asst. Wheat Breeder	Bhairahawa	
R. Chaudhary	Brdng (S) M.Sc.	Tuskegee	III	III	Act. Incharge Grain Legu	Khumaltar	
Ganesh K.C.	Ent. (G) M.Sc.	U of Cal.	III	III	Asst. Entomologist	Khumaltar	
B.R. Adhikary	Brdng (R) M.Sc.	Tex. A & M	III	III	Asst. Rice Breeder	Parwanipur	
R. Misra	Soil Micr.M.Sc.	U of Mo.	III	III	Asst. Soil Scientist	Tarahara	
J.R. Baral	Exten. Ph.D.	UPLB Philippines	II	II	Dy.Exe.Director APROSC	Kathmandu	
K. Upadhyaya*	Exten. M.Sc.	PAU (India)	III	III	Agri. Officer	Dhankuta	
D.N.Chaudhary*	Agron.(MC) M.Sc.	HPAU (India)	III	III	Asst. Agronomist	Tarahara	
C.R. Yadav*	Agron.(M) M.Sc.	PAU (India	III	III	Asst. Agron.Seed Farm	Jumla	
S.K.Chaudhary	Agron.(M) M.Sc.	Univ.of Illinois	III	III			
B.K. Gyawali	Ento.(M) M.Sc.	UPLB	III	III	Asst.Entomologist	Khumaltar	
G.L. Shrestha	Brdng(R) M.Sc.	U of Seoul	III	III	Uni.of Seoul,ROK Spons.	-	
K.K. Lal	Brdng (M) M.Sc.	KSU	III	III	Asst.Maize Breeder	Rampur	
Y.K.Sherchand	Agron.(M) M.Sc.	KSU	III	III	Granted leave for Ph.D.	-	
B.B. Mathema	Brdng(R) Ph.D.	UPLB	II	II	Actg.Rice Coordinator	Parwanipur	
R.G. Sah	Agron.(R) M.Sc.	U of Cal.	III	III	Asst.Soil Scientist	Parwanipur	
D.N. Manandhar	Ent.(R) M.Sc.	U of Cal	II	II	Rice Ent.	Parwanipur	
B.P.Upadhyaya	Patho.(R) M.Sc.	UPLB	III	III	Asst.Rice Pathologist	Parwanipur	
					Anticipated Assignment		
N.A. Khan*	Agron.(MC)Ph.D.	HPAU (India	II	II	Agri.Dev. Officer	?	June 1983
M.L. Shah*	Brdng (W) M.Sc.	PAU (India)	III	III	Asst.Wheat Breeder	Bhairahawa	April 1983
M.P. Upadhyaya	Brdng(W) M.Sc.	KSU	III	III	" " "	Kavre	Dec. 1983
R.C.Munankarmi	Agron.(W) M.Sc.	Ohio U	III	III	Asst.Soil Scientist	Bhairahawa	April 1983
D.N. Shah	Patho (M) M.Sc.	U of Wisc.	III	III	Asst.Plant Pathologist	Rampur	Mar. 1983
B.K. Baniya	Brdng(M) M.Sc.	Fla. U	III	III	Asst.Maize Breeder	Khumaltar	Dec. 1982
R.S.L.Karna	Patho(W) M.Sc.	Alabama A & M Uni.	III	III	Asst.Plant Pathologist	Nepalgunj	Mar. 1983
S.L. Shrestha	Agron.(CS) M.Sc.	IRRI/UPLB	III	III	Asst.Agronomist	Khumaltar	Mar. 1983
J.D. Rana	Ag.Engr. M.Sc.	Utah Univ.	III	III	Asst.Agri.Engineer	Rampur	Dec. 1982
K.K. Shrestha	Agron.(M) M.Sc.	IRRI/UPLB	III	III	Asst.Agronomist	?	Mar. 1984
R.P. Sah	Brdng(CS) M.Sc.	India(ICRISAT)	III	III	Asst.Pulse Breeder	Parwanipur	Oct. 1982
N.K.Rajbhandary	Agron.(CS)M.Sc.	IRRI/UPLB	III	III	Asst.Soil Scientist	?	Oct. 1983
B.M.S. Basnet	Expt.Opr. M.Sc.	IRRI/UPLB	III	III	Asst.Agronomist	JADP	Oct. 1983
M.L. Jyaswal	Brdng(CS) M.Sc.	N. Da. S.U.	III	III	Asst.Oil Seeds.Speslt.	Nawalpur	Dec. 1983
M.P. Bharati	Agron.Gr.Legume Ph.D.	Iowa S. Univ.	III	III	Asst.Agronomist	Khumaltar	Sep. 1984

* No charge to the project.

Table 18. Non-Academic Training Programs for Which Trainees Will be Selected.

	'Person' Months	Beginning
A. Short Term		
IRRI		
Rice Production	6	March
GEU	4	February
Cropping Systems	6	September
INSFFER	4	January
Water Management	2 wks	July or December
Agricultural Economics	3	October
CIMMYT		
Wheat Breeding & Pathology	7	February
Wheat Production	6	November
Maize Production	6	December
Experiment Station Management	4	April
ICRISAT		
Sorghum & Millet Production	6	May
Groundnut	6	May
Pigeon pea	10	May
Chickpea	6	September
MISCELLANEOUS		
Mechanic Training, TAFE/Madras	3	
B. Conferences, Seminars, Study Tours	Days	
Cropping Systems Workshops	5x2	2 meetings/year
Rice Research Conference, IRRI	5	
Chickpea Workshop, ICRISAT	4	
AICRIP Workshop, India	5	
AICWIP Workshop, India	5	
Regional Maize Workshop	5	
Supporting Discipline Meetings and Study Tours	5	

persons in training programs of the RAD, RCU, HFPP, AERP and other projects as they develop production programs in their areas.

D. Equipment and Construction

The building program that has been carried out during the past six years is essentially complete. Items remaining and budgeted in 1982-83 include the following:

Location	Description	Budgeted Rs.000
Khumaltar	Irrigation System (Civil Works)	600
Parwanipur	Irrigation Tubewell	67
Rampur	Irrigation Tubewell	293
Rampur	Irrigation System, Pipe	500
Rampur	Office/lab/sanitary works	50
Rampur	Farm Water Supply	34
Rampur	Farm Electric Supply	49
Rampur	Seed Plant	90
Nepalgunj	Irrigation System	200
	Total:-	1,883

The seed processing unit has been activated at Parwanipur. Materials have been procured for Rampur and Bhairawa and these units will be put in operation during the 1982-83 fiscal year. Decisions regarding drying units for Parwanipur and Bhairawa are dependent upon the performance of the drying unit at Rampur. This unit is a solid fuel (primarily maize cobs) drier and will be tested as soon as the drying floor is complete. The decision will then be made regarding the type of dryer for the other two stations.

Major items of equipment still to be procured for the project are:

Item	No.	Estimated Cost
Motor bikes for production programs	10	$ 25,000
Seed dryers and spare parts	2	10,000
Massey Ferguson MF 165 tractors plus spare parts	4	75,000
Spare parts for tractors, vehicles, farm machinery etc.		50,000
Laboratory equipment and spare parts		25,000
Transformer, switch panels and wiring for Parwanipur		25,000
Total:		$210,000

E. Technical Assistance

1. Resident Specialists

During the next two years, 96 person months will be provided the project by resident specialists. Carl H. Hittle assumed his duties as Project Supervisor, effective 1 October 1982, and Wayne H. Freeman continued with the project as advisor for four months. Dr. Kenneth D. Sayre continues for the 2 year period as Cropping Systems Agronomist, Dr. Marlin G. Van Der Veen as Agricultural Economist, and Mr. I.C. Bolo as Production Specialist.

Terms of reference for the resident specialists are as follows:

a. The Project Supervisor will work with the Project Director in implementing the Project by the following means:

(1) Formulating policies and programs that will be conducive to the establishment of the professional environment required for productive research directed toward increased agricultural productivity and profitability of farming;

(2) Planning and programming crop research activities; primarily in cropping systems but also in the commodity programs with which the project has been associated;

(3) Promoting professional interdisciplinary and inter-commodity research relationships among the staffs associated with the several commodity groups in order to ensure understanding and implementation of program objectives and development of continuing cooperative relationships;

(4) Allocating funds available from external sources for programs involving IADS;

(5) Processing training awards in consultation with national and international staff members;

(6) Developing and maintaining close working relationships with the international agricultural research institutes, the Agricultural Inputs Corporation, the Institute of Agriculture and Animal Science and other pertinent national and international organizations.

b. The Specialist in Agricultural Economics will serve as a joint leader with a Nepalese Agricultural Economist of the Department of Agriculture. Working as a team along with scientists in the farming systems programs, they will be jointly responsible for planning and conducting research in the social and economic aspects of existing and new technologies at the research network and farmers' field trials in cropping systems research sites, preproduction verification programs, and production programs. Research will be designed to study -

(1) The production economics of different cereal crops including agricultural inputs as related to the subsistence farmer and the market-oriented farmer;

(2) The impact of multiple cropping patterns upon labor employment and distribution.

(3) The effect of new varieties and other technologies on cropping patterns, profitability, and production;

(4) The market impact of varieties and technologies on production and income;

(5) Managerial ability as it relates to quality of decision-making and efficiency of farm operation;

(6) Relationships and implications of activities of this Project to national socio-economic problems.

c. The Specialist in Agricultural Production, working as a part of the team of the Integrated Cereals Project, will be jointly responsible for creating a technology delivery system which will increase farmer production by:

(1) Organizing production programs at the cropping systems sites and working with project leaders in other development projects to organize production programs;

(2) Organizing training programs for the transfer of Cropping Systems technology to production programs at the farm level;

(3) Assisting in the integration of the Cropping Systems approach to production into the Extension system of the Department of Agriculture;

(4) Assisting in developing an understanding and appreciation of (a) the package of practices, (b) the relationship of yields to input, and (c) extension recommendations;

(5) Assisting in developing improved procedures and policies for the farmer to obtain (a) supervised credit, (b) seed of improved varieties, (c) fertilizer, and (d) pesticides.

d. The Cropping Systems Agronomist will have responsibility for working with the Coordinator and other disciplines of the multiple cropping programs to improve the productivity of traditional cropping systems, primarily in the Hills, working with farmers in their fields, by

(1) Studies of interrelationships of crops as related to their competitiveness in rotations and in intercropping patterns and mixtures;

(2) Studies of varieties of crops used in the cropping systems and the interrelationships of different varieties of the crops in the system;

(3) Evaluating varieties of various crops for characteristics of yield, maturity, disease and insect resistance, cold hardiness, drouth tolerance and tolerance to soil deficiencies or toxicities;

(4) Studies of systems with different major crops and the relationships of these to the minor crops in the systems;

(5) Evaluation of variety substitutions in the more promising of these systems;

(6) Studies of the effects of whole systems on productivity, economics, and land-water-cropping systems relationships in farmers' fields and at the research stations.

Peace Corps Volunteers serving with the Cropping Systems Program are:

(1) Mr. Mark W. Jenner
(2) Mr. David J. Mergen
(3) Mr. Keith R. Roesler
(4) Mr. John Wiseman
(5) Mr. David Lipinski

These PCVs will serve the full two year period.

2. Consultants

Consultants proposed for the two year period are listed in Table 19. These consultants will provide advice on the new areas for cropping system research and on crops that can be introduced in farmers' fields and in utilizing waste areas to provide fodder and fuel. A maize specialist will continue his two earlier consultancies to provide guidance to the overall breeding program. Dr. Neeley has been a consultant on three previous occasions and his services have proven of value to working scientists. His services are needed to assist in devising measures to determine benefits of production programs and in designing on-farm trials to measure performance of traditional practices and improved practices and patterns.

Utilizing women in extension to reach village women will require a consultant with special experience in working with predominately Hindu Village women of different ethnic backgrounds. Emphasis will be given to the considerations of Section III.A.9 of this Work Plan.

Table 19. Consultants for the Integrated Cereals Project, 1982-83 and 1983-84.

Consultant area	Person Months 1982 - 83	1983 - 84
Steve Breth Preparation of a Manuscript on Cropping Systems in Nepal.	1 month	-
Doug Neeley Experimental Design for Hill Stations, on-farm trials and uniform production programs.	1 month	
Jim Brewbaker Leucaena tree specialist to assist in identification of suitable species for fodder and fuel in Nepal.	2 weeks	2 weeks
Clyde E. Wassom Maize specialist to follow up earlier maize program planning.	2 weeks	-
Women Extension Training (to be identified)	1.5 mo.	1 mo.
Trainer Training & Evaluation (with GTZ) Fernando Del Rosario	1 month	-
Laboratory Equipment Installation (to be identified) with MUCIA)	1 month	-
Fred E. Nichols Seed plant equipment installation	1.5 mo.	-
Experiment Station Management for training farm managers	1 month	1 month
Total:-	9 months	2.5 months

F. Budgeting

Funding for the remaining two years of the contract has been increased by $350,000 making a total of $7,737,000 for the 8 year period. The budget in Amendment 7 of the HIC/IADS contract has been modified by Amendment 10 to reflect this additional funding. Table 20 shows the total budget for the life of the contract and also shows the line items where funds have been increased, reflecting a need for additional funding of these project activities. Greatest increases are in local support funding and in equipment. Details of this activity have been presented in the program of work in other sections of this Work Plan. The details of the local currency budget are presented in Table 21 which is the total shown in Line Item V of Table 20.

Table 20. Contract Budget, Integrated Cereals Project, 1 October 1976 through 30 September 1984.

(U.S. Dollars)

	Category	Budgeted 9/10/76 to 9/30/84	Actual 9/10/76 to 9/30/82	Estimated 10/1/82 to 9/30/84	Additional Funding 10/1/82 to 9/30/84	Total 10/1/76 to 9/30/84
I	Technical Personnel					
	A. Resident Specialist	2,658,562	1,946,793	731,769	20,000	2,678,562
	B. Consultants	364,000	288,012	75,988	-	364,000
	Sub-Total:-	3,022,562	2,234,805	807,757	20,000	3,042,562
II	International Training					
	A. Academic	661,692	519,966	161,663	19,937	681,629
	B. Non-academic	655,308	560,939	94,369	-	655,308
	Sub-Total:-	1,317,000	1,080,905	256,032	19,937	1,336,937
III	Equipment and Materials	726,000	613,199	187,801	75,000	801,000
IV	IADS Headquarters	175,000	114,061	60,939	-	175,000
V	Logistic Support	903,000	609,934	475,649	182,583	1,085,583
	Total Direct Costs:-	6,143,562	4,652,904	1,788,178	297,520	6,441,082
VI	IADS Mgt/overhead	1,223,438	910,401	375,517	62,480	1,285,918
VII	Precontract expenses	10,000	10,000	-	-	10,000
	Total:-	7,377,000	5,573,305	2,163,695	360,000	7,737,000

Table 21. Budget for Logistic Support and Special Production Program Activities, 1982-83 and 1983-84.

(N. Rs.)

Budget Line	Original 1981-82 Budget	Expended Oct. 1, '81 to Sept. 30, 1982	Budgets 1982-83	Budgets 1983-84
1. Local Staff	700,000	565,168	900,000	920,000
2. Vehicle Operation & Maint.	300,000	377,024	450,000	500,000
3. Local Travel & Per Diem	370,000	339,421	400,000	425,000
4. Language Instruction	20,000	-	20,000	-
5. Office Operations	376,600	343,897	390,000	425,000
6. Equipment and Supplies	225,000	220,742	240,000	250,000
7. Insurance	60,000	59,810	66,000	70,000
8. Local In Service Training	23,000	8,652	50,000	50,000
9. Housing	250,000	281,736	300,000	325,000
10. Contingencies	100,000	-	100,000	100,000
11. Minikits	-	-	-	50,000
12. Pre-Production Verification	-	-	50,000	50,000
13. Production Programs	-	170,000	50,000	50,000
Total:- N. Rs.	2,424,600	2,197,449	3,016,000	3,215,000
		$167,748	$230,229	$245,420
			$475,649	

Cropping Systems Pre-Production Verification Trials In Nepal

By: Shambhu L. Shrestha and David Lipinski

CROPPING SYSTEMS PRE-PRODUCTION VERIFICATION TRIALS IN NEPAL [1/]

By: Shambhu L. Shrestha [2/]
and David Lipinski

INTRODUCTION

Cropping systems research has been carried out at six different locations in Nepal; two sites in the Terai and four sites in the Hills. Several improved production technologies which can lead to substantial improvement in the cropping systems of small farmers have been identified at each location. Before any attempt can be made to apply these developed technologies in other locations and eventually to extend them to wide areas through full scale production programs, a verification of technologies needs to be carried out.

Successful extrapolation of the cropping systems technologies developed to other similar areas will largely depend upon the care given to the selection and description of areas for testing and the use of an efficient and reliable methodology to conduct the pre-production verification trials.

OBJECTIVES

1. To extra polate improved cropping systems technologies developed at six sites to other similar areas, thereby enhancing the transfer of technology and benefitting a larger number of farmers over a wider area.

2. To generate information on agricultural practices through cropping patterns which will allow a more thorough understanding of the cropping systems of Nepal.

3. To accelerate the implementation of larger area production programs which will be based on technology thoroughly tested within the area of impact.

1/ Paper presented at Cropping Systems Monitoring Tour in Bangladesh and Sri Lanka on November 12-25, 1983.

2/ Cropping Systems Agronomist and Economist, Cropping Systems Program, Khumaltar, Nepal.

PROCEDURES FOR THE ESTABLISHMENT OF PPVTs IN NEPAL

1. Location: Target areas identified by looking at secondary data on water availability, soil classification, accessibility, elevation, existing crop production and socio-economic factors. After selecting the panchayats a more detailed site description must be carried out to gather information on physical environment, present cropping practices and on the socio-economic environment. The trials could be clustered within one or two wards.

2. Selection of Cropping Patterns for Verification: The cropping patterns selected for testing should include those which have good prospects for improvement with respect to yields and net income but also those which are relatively predominant or common in the target areas.

3. Design: Both improved method and farmers' method are included for a reliable estimate of their differences. To have more confidence, PPVTs are conducted at least for 2 years using the same parcel.

4. Farmer Selection: The number of participant farmers to select depends mainly on the number of cropping patterns to test and the number of land types. It is desirable to involve as many farmers as practical as participants. Farmers should be fully cooperative for the program and their parcels should be suitable for the PPVT.

5. Parcel Selection: A most important step is parcel selection, identified with site description, PPVT plot size should be 500-1000 m^2 and the area devoted to local farmer practices should accupy 10-20% of the trial area.

6. Management: PPVTs are usually managed by trained extension or research workers. Objectives of testing are clearly explained to farmer cooperators. It is very important to adhere strictly to the specified cropping pattern management.

7. Data to be Collected: The local extension or research worker assigned to conduct PPVTs is fully responsible to fill out the required

information for each in each plot. These data are analysed to associate the performance of improved cropping patterns with agro-climatic conditions in order to clearly define target areas and recommendations. This information can be very useful in planning and successfully carrying out production programs.

8. Farmers' Field Days: To adopt new technology, farmers are involved in attending farmer field days by local agricultural staff.

9. Seed Distribution: In order to have high quality seeds for farmers it is advisable to try to sell or exchange the seed produced on PPVTs to interested farmers soon after harvesting. Thus, farmers can get quality seeds and have it when needed and at a reasonable price. All farmers with improved seed should be taught to protect their seed during storage to ensure good germination at planting time.

PPVT ACTIVITIES

The past year has seen a modification in the manner by which the Cropping Systems Program has been involved in pre-production verification trials (PPVTs). Initially, the Cropping Systems Program was involved in actually conducting the trials in the potential extrapolation areas for verifying cropping systems technology. Now the emphasis is being placed in assisting ADOs and others in certain districts or other defined development projects in developing their own abilities to conduct PPVTs in their area. The Cropping Systems Program provides training to the staff associated with these entities to give them the knowledge and methodology to conduct the trials.

During the year about 100 JTs, JTAs, AADOs and ADOs have received training in small, on-site, two-to-four-day seminars given by a team of a Cropping Systems agronomist and economist. Also, to-follow-up the training, repeated visits by Cropping Systems staff to areas where trials are being conducted help in supervising the trials to correct any problems.

Currently the Cropping Systems Program is working with the following group-in PPVTs: 1) Kaski ADO, 2) RCUP in Myagdi and Gorkha Districts, 3) Rapti IRDP, 4) AERP, 5) Pakribas - KHARDEP, 6) Lumbini Groundwater Project and 7) Sakhuwasabha ADO. Several other projects are interested and plan to utilize PPVTs in their adaptive research programs. Also during the last year, the ICP Socio-Economic staff have written "initial site description reports for pre-production verification trials" for 1) The Semari, Sundi and Belhiya Tubewell Command Area - Rupandehi District, 2) Mohammadpur Panchayat - Rautahat District, 3) Lipini Birta Panchayat-Parsa District, 4) Ranisware Panchayat - Gorkha District, 5) Jhee and Pattikhet Panchayats-Myagdi District, and 6) Narayanpur, Chailahi and Sishaniya Panchayats - Dang Deukhuri District. Trials are now ongoing in each of these areas.

As part of this modified, more localized approach the Cropping Systems staff have developed this year a simplified pre-PVT questionnaire designed for easy use by local HMG-ADO staff while conducting site reconnaisance and site description surveys. This questionnaire is written in Nepali, and asks for only the minimum amount of information necessary to compile an on-site date summary sheet (information on predominant cropping patterns, land types, seed varieties grown, yields and inputs used). This approach has worked successfully in several new PPVT areas, thus far most notably with RCUP in Myagdi District. With this information, preliminary work plans for PPVTs have been developed using local staff input, which better insures that DADOs assume primary responsibility for PPVT work, from beginning to end.

Along with this approach to develop a transferable Cropping Systems technology for use by local DADO staff, PPVT methodology instructions, training material and questionnaires have been written in simple Nepali and some of it has been tested with local JTs and AADOs, and has proven workable thus far.

Many of this year's new PPVTs have been concentrated in more remote, hill areas of Nepal were only a small amount of improved practices have been adopted by farmers. PPVTs are particularly useful in an undeveloped environment.

Rather striking success has already been achieved in some of these areas, especially in Gachok Panchayat, Kaski District, where after only one year of PPVTs with fifteen farmers, almost all of the farmers of Gachok and neighboring Machchapuchchrae Panchayat have started using the recommended varieties of seed along with more inorganic fertilizer. Also, in Gachok, a small K-39 rice production program has been conducted and farmers there have sold some of their PPVT-produced maize seed to other areas within a day's walk.

The three other panchayats in Kaski District where PPVTs have been conducted for several seasons are now scheduled for expansion into wheat production program. And as part of the Fewa Tal Watershed Project, five other Kaski District panchayats will begin PPVTs starting with the spring maize crop. The ICP Socio-Economic unit, working together with Kaski ADO staff, has assisted with the site survey work for the Fewa Tal project.

Results summarized in the report "Pre-Production Verification Trials, 1981/82 Winter, Spring & Summer Crops," plus recent results of the 1983 trials, demonstrated that in at least 80% of the trials, where the data were properly collected, the recommended practices have economically and agronomically outperformed the local practices. (For details reference is made to the report). However, PPVTs have also shown that even in instances where recommended practices have outyielded local practices by more than one ton per hectare, the farmers are still reluctant to adopt the new varieties and recommended rates of inorganic fertilizer application

Reasons given include the late maturity of new varieties such as Khumal Yellow, which causes disruption of panchayat-wide traditions of open grazing, adverse affects by Khumal Yellow's thick leaves on relayed finger millet, a preferred taste for local varieties and fear that chemical fertilizer will ruin the soil. Another constant reminder learned while working in Hill PPVT areas has been the need for conducting finger millet research since there are few, if any, recommendations for this important m major crop of Nepal.

Because PPVTs are midway between research and production programs, and smallscale, they have served also as a trial in extension methodology. Several ADOs, who have used PPVTs as part of their adaptive research program, have modified their extension approach to make better use of PPVTs results. These ADOs have targeted their farmers' field days in PPVT panchayats and are encouraging the storage of PPVT produced seed. One ADO has placed fairly large information signboards at each PPVT plot, presenting in Nepali the variety of seed used, the inorganic fertilizer application and the seed rate per ropani, etc. Another ADO and several other extension workers are considering placing one centrally located JT in charge of supervising all the PPVTs for one district. All these ADOs are also learning how to manage a small-scale production program by ensuring that inputs and other necessary operations are conducted on time for the PVTS. From the past two years' experience the utility of PPVTs has been clearly demonstrated in areas where there has been 1) a serious commitment to use PPVTs as a targeted part of adaptive research work, 2) the methodology as developed by the Cropping Systems Program has been followed in a stepwise manner and 3) permanent people have been assigned to follow through the trials. However, in many situations, where there has been little commitment or technical supervision of the trials, or where the people involved have been repeatedly transferred or are untrained, the usefulness of PPVTs has been very nearly nil.

PROBLEMS AND SUGGESTIONS

1. Training in PPVTs for field staff, i.e. ADO, JTA and Field Assistants should be strengthened to implement the program efficiently.

2. PPVTs should not be considered as an extra load for extension workers. This should be a part of their extension program.

3. Research and extension staff should be increased for PPVTs.

4. Financial management for PPVTs from the ADO office should not be the problem.

5. A good management information system is important to develop and manage the transfer and feed-back of technology.

6. The timely supply of agricultural inputs eg. seed, fertilizer, loans, etc . is a prerequisite to a successful program.

7. Frequent transfer of staff members is one major setback in the program.

8. Good evaluation of the program and staff is another important prerequisite to implement the program efficiently.

9. Good incentives for the staff are a must if the program is to be effective and run smoothly.

REFERENCES

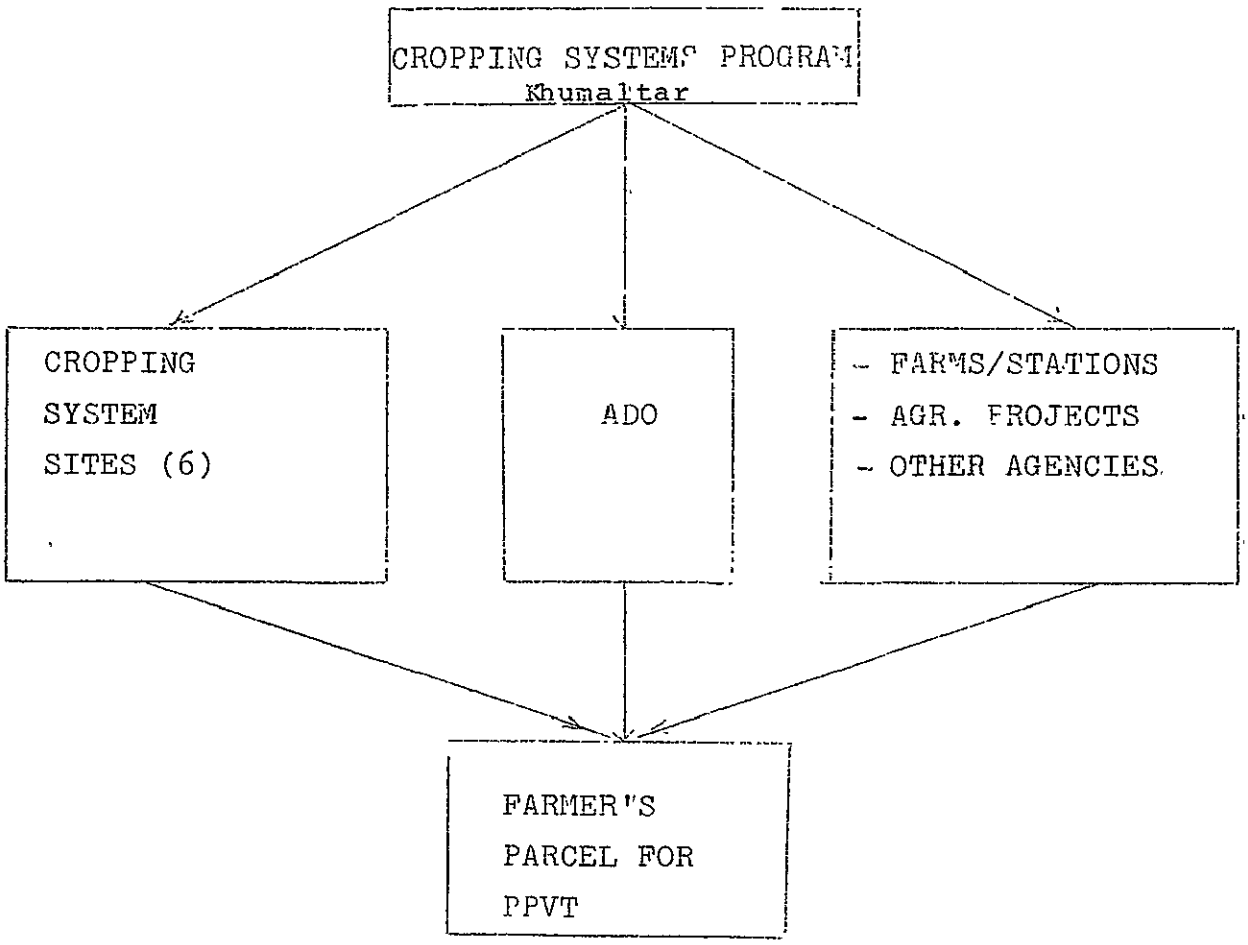
1. Zandstra, H.G., E.C. Price, J.A. Litosingere and R.A. Moris (1981). A Methodology for On-Farm Cropping Systems Research, IRRI.

2. Cropping Systems Program, Nepal (1982). Guidelines for Pre-Production Verification Trials of Cropping Systems Recommendations, Cropping Systems Report (HMG, MOA, DOA)

3. Cropping Systems Staff, Nepal (1983). Pre-Production Verification Trials, (Multilocation Tests) 1981/1982 Winter, Spring and Summer Crops.

4. Lipinski, David and P.M. Shrestha, Various Tour Reports CSP/ICP, Nepal.

ORGANIZATIONS FOR PPVTs IN NEPAL



An Inital Site Description Report for Pre-Production Verification Trials Mohammadpur Village Panchayat Rautahat District

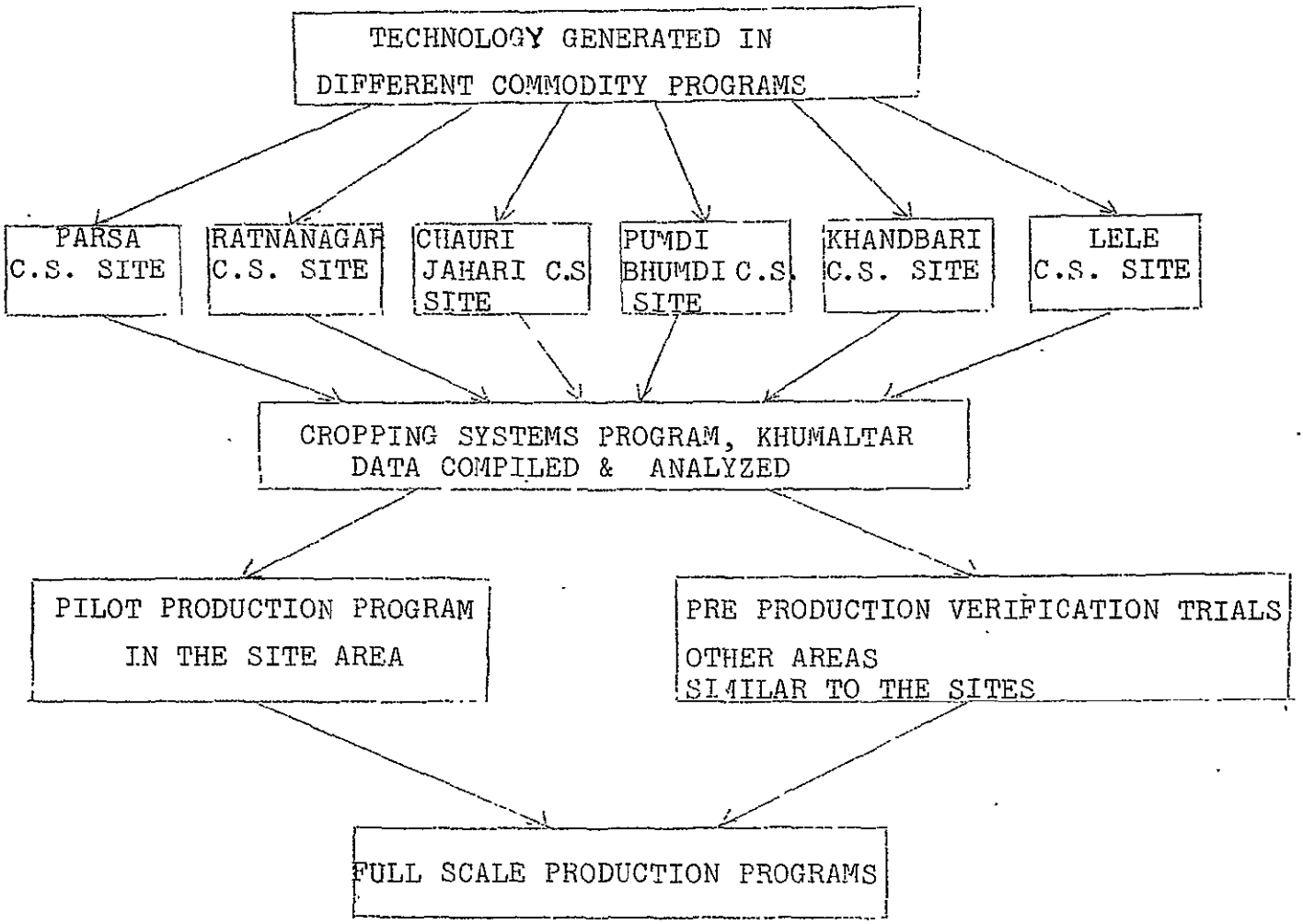
By: Babu Ram Gurung and David Lipinski

Cropping Systems Program Technical Report

December 1982

HIS MAJESTY'S GOVERNMENT
MINISTRY OF AGRICULTURE
DEPARTMENT OF AGRICULTURE
AGRONOMY DIVISION
CROPPING SYSTEMS PROGRAM
NEPAL

Flow of Technology From Research to Farmers' Fields



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SUMMARY DATA SHEET

Wards: 2, 6 and 7; Mohammadpur Village Panchayat; Rautahat District; Nepal.

GENERAL

(A) Rainfall: 1451 mm/yr.; (B) Altitude: 122 m.a.s.l.; (C) No. of Wet-Months: 5 (five); and (D) Hail: No

LAND TYPE, USE AND CROPPING PATTERNS

Land Type	% of Area	Main Cropping Patterns						MCI	LUI
		Pattern	%	Pattern	%	Pattern	%		
Irrigated Lowland	33	R-W	70	R-M	21	R-Mc*	9	2	68
Rainfed Lowland	67	R-Mc	64	Mi-Barley	5	M-SP**	5		
		R-F	8	SP-F.	5	SC+	11	1.64	62

* Mc = (Mix crops) Masuro + Mustard + Khesari; ** SP = Sweet Potato;
+ SC = Sugar- cane.

VARIETIES GROWN YIELDS AND INPUTS USED

Crop	Variety	% of Crop Variety Area	Mean Yield (T/ha)	% Using Fertilizer	Amount Used kg/ha* (N - P - K)	% Using Compost	Amount Used* (T/ha)*
Rice	Pankaj	2	2.3	48	26-6-0	87	1.8
	Taichung	7					
	Chandina	2					
	CH 45	3					
	Masuli	2					
	Local	84	2.1				
Total		100					
Wheat	RR 21	100	1.5	60	39-13-0	71	1.7
Maize	Rampur Y.	8	2.8	34	38-13-0	100	.7
	Ganga-2	13					
	Highstar	2					
	Shanker	4					
	Local	73	2				
Total		100					
Arhar*+	Local	100	.4	0	0	25	.6
Millet	Local	100	1	0	0	33	.6
Masuro	Local	100	.5	18	7-7-0	56	1
Khesari	Local	Mixed	1.1				
Mustard	Local	with Masuro	.2				
Barley	Local	100	.7	0	0	67	.8
Sweet Pot.	Local	100	3.4	0	0	33	.7
Sugarcane	Local	100	143	15	49-14-0	0	0

* Of those using; *+ Red gram.

SUGGESTED PRE-PRODUCTION VERIFICATION TRIALS

Land Type	Cropping Patterns	Farmer's Practice to Superimpose					
		Crop	Fertilizer	Compost t/h	Crop	Fertilizer	Compost t/h
Irrigated Lowland	R - W	R	25-5-0 or 0-0-0	1-3	W	40-15-0 or 0-0 -0	1-3
Irrigated Lowland	R - M	R	25-5-0 or 0-0-0	1.3	M	40-15-0	1-2
Rainfed Lowland	R-Mc*	R	0-0-0	1.3	Mc*	0- 0-0	0-2

* Mc (Mix crop) = Masuro, Khesari and Mustard.

ACKNOWLEDGEMENTS

We would like to acknowledge the cooperation of Mr. Rishi Neupane, Irrigation Engineer, Jhanj River Irrigation Project, Sub-Division, Mohammadpur, Rautahat district and his staff for providing us useful suggestions, introducing us to farmers and for increasing our general knowledge about the site.

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Mr. D.B. Shah, Secretary of Integrated Cereals Project, contributed with his excellent typing skills, Dr. Marlin G. Van Der Veen, our Supervisor, Agri. economist ICP with his constant guidance. and Mr. Devi Gurung, Sr. Supervisor socio economic group ICP for helping in writting a part of first draft.

Last but not the least, we like to express our thanks to the Pradhan Pancha and farmers of the Mohammadpur Village Panchayat for their full cooperation.

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and
David J. Lipinski

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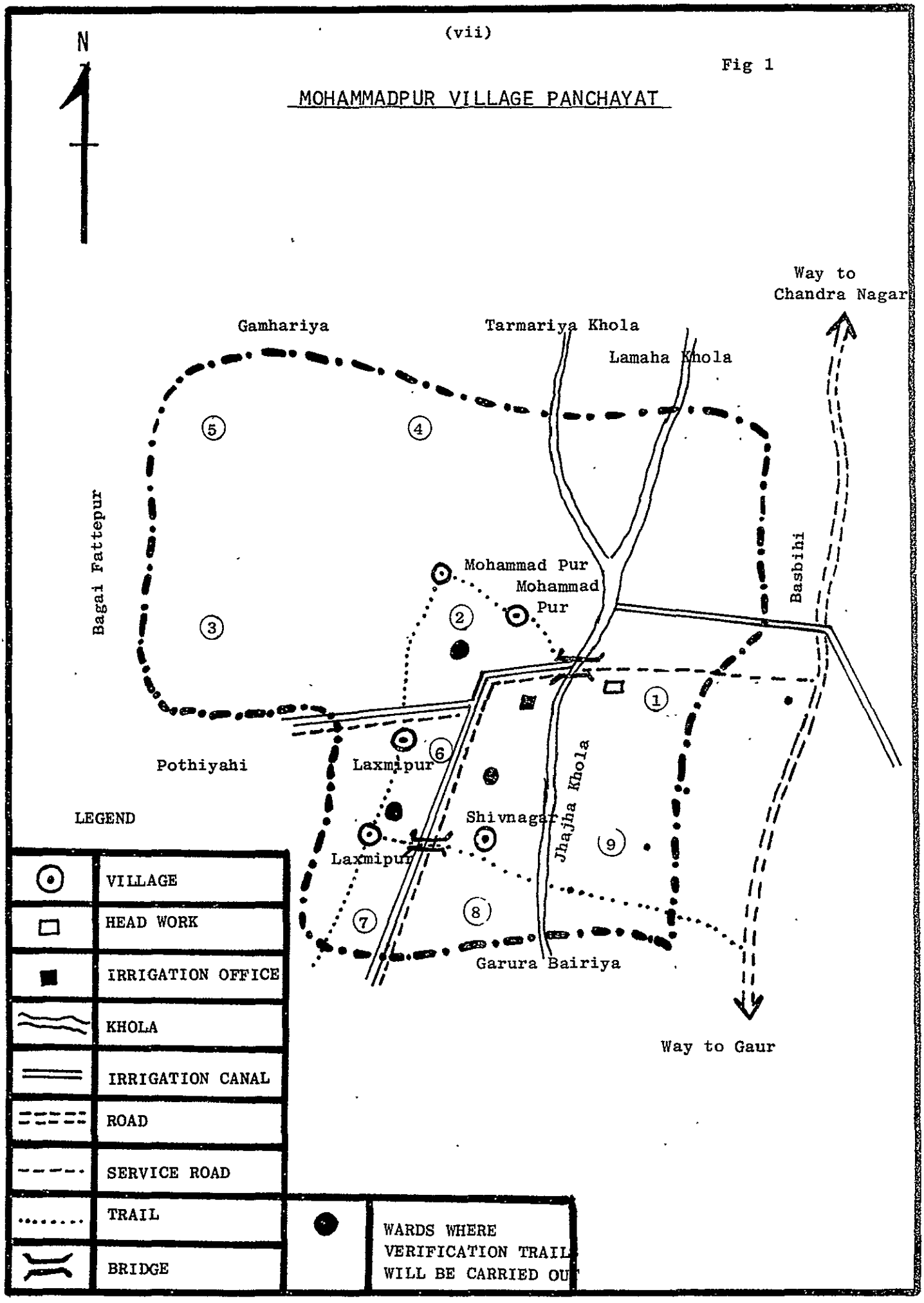
Fig 1

MOHAMMADPUR VILLAGE PANCHAYAT



SUMMARY AND CONCLUSIONS

Ward numbers 2, 6 and 7 of Mohammadpur Village Panchayat were selected as a site for pre-production verification trials. A site description survey was conducted in these wards to gain basic information for planning future work.

The following are the main findings of the site description survey:

The climate of the Panchayat is tropical monsoon. Average rainfall per year in the area is 1451 mm. Flooding and/or too much rain and hail is not a serious problem for the area. However, rainfall during the months of Ashadh and Shrawan (June/July and July/August) are enough for rice, and rainfall during the months of Poush and Magh (Dec./Jan. and Jan./Feb.) are enough for the wheat crop.

Land types can be classified into two main groups : i) Irrigated Lowland and ii) Rainfed Lowland. Total cultivated land in these wards is 425 hectares. Out of the total, 139.40 ha (33%) of the land is irrigated and 285.60 ha (67%) of the land is rainfed. The main source of irrigation is "Jhanj River Irrigation Project, Mohammadpur". It is estimated that about 40% of the total cultivated land is irrigated by the Jhanj irrigation. The water discharge capacity of the irrigation is 60 cubic feet to 150 cf. per second in summer and 20 to 25 cf. per second in winter.

The irrigated lowland is being effectively cultivated. One hundred percent of the land is devoted to double crops; i.e., rice followed by a winter crop of wheat (70%), maize (21%) and mixed crops (9%). The Multiple Cropping Index (MCI) was 2 and Land Utilization Index (LUI) was 68%.

The rainfed lowland is not intensively cultivated. Seventy-four percent of the land is devoted to a double crop and the rest of the land (26%) was devoted to a monocrop of rice, sweet potato, sugarcane and Arhar (red gram). The Multiple Cropping Index was 1.64 and the Land Utilization Index was 62%.

The reasons for leaving the lands fallow were: i) lack of water, ii) expensive while irrigating by pumpset and iii) infertile land.

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The farmers feel that wheat, mustard and vegetables could be grown in this land if the water is available.

Average land holding per household in these wards is 1.71 hectares.

Forty-nine percent of the households farm less than .68 hectare (1 bigha), 40% farm more than .68 ha and less than 2.72 ha (4 bighas), and 8% of the households farm more than 2.72 ha.

Sixty-nine percent of the households are too small to provide enough food grain for their families. 28% can provide just enough food grain for their families and only 3% of the households can provide enough food grain for their families.

Rice, wheat, lentil, sweet potato and sugarcane are the main crops of the area. Other minor crops are maize, millet, arhar and mustard. Sweet potato and sugarcane are planted as cash crops. Farmers are aware of improved varieties of crops, such as Pankaj, T-176, Chandina, CH 45 and Masuli (Rice), RR 21 (Wheat), Rampur Yellow, Ganga-2, Highstar and Shanker (Maize). Some of the improved varieties are Indian. Though the farmers are growing quite a few improved varieties of crops, still a large proportion of land is devoted to local varieties. Out of the total land devoted to rice, only 16% of land is devoted to improved varieties; similarly, 27% of maize land was devoted to improved maize. RR 21 is the only wheat variety grown in the area. The average yield of improved rice is 2.3 ton/ha and local rice is 2.1 ton/ha. Similarly, the average yield of RR 21 wheat is 1.5 ton/ha, of improved maize, 2.8 ton/h and of local maize is 2 ton/h, millet 1 ton/h and lentil, .47 tons/ha.

The major problems for the farmers of the area to increasing agriculture production are:

a) Lack of money,
b) Lack of water,
c) Lack of technical advise, and
d) Fertilizer not available in time.

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The farmers would like to have high yielding varieties and those which require less water.

Inorganic fertilizer was used by 48% of rice growing farmers, 60% of wheat growing farmers, 84% of maize growing farmers, 18% of lentil growing farmers and 15% of sugarcane growing farmers.

The explanations of the farmers about not using more fertilizer are : a) lack of water and b) lack of money to buy.

Eighty-seven percent of rice growing farmers, 71% of wheat growing farmers, 100% of maize growing farmers and 56% of lentil growing farmers used compost on their rice, wheat, maize and lentil crops.

Crops grown in the area, except sweet potato and sugarcane, which are cash crops, are mainly for family consumption.

All the farmers use bullocks for preparing their lands. However, bullock-power shortage does occur during the months of Jesth, Ashadh, Shrawan and Ashoj (May to August and Sep./Oct.). Most of the farmers have their own bullocks; just 3% of the households have to hire bullocks during busy times.

Both male and female laborers are hired on a daily wage basis. Labor shortages, however, do occur during the months of Jestha to Shrawan (May/June to July/August), Kartik to Poush (Oct/Nov. to Dec./Jan.) and Bhadra and Ashoj (Aug./Sep. & Sep./Oct.) because everyone is working on their own field.

Exchange labor is a common practice in the area.

Credit is provided to the farmers by the local Cooperative and Agricultural Development Bank. Besides, a Small Farmers Development Program run by the ADB started in 1980 and is playing a significant role in providing loans to the small farmers.

The Cooperative and Small Farmers Development Program also sell fertilizer, seeds and insecticides. Usually, inputs are not available at the cooperative in proper time.

CONCLUSIONS

Given the major considerations for conducting PPVT's in appropriate areas (see the introduction of this report) of Nepal, it appears, based on the data, that the Mohammadpur Village Panchayat is a good area to promote cropping systems technology. While some "improved technology" has already been introduced, local practices still predominate. Average yields are low and there should be good scope for increased production with the use of improved crop technology. Pre-Production Verification Trials could be initially implemented in one or more of the following patterns:

1) Rice - Wheat in irrigated lowland,
2) Rice - Maize in irrigated lowland, and
3) Rice - Mixed Pulse crops and Mustard in rainfed lowland.

Because the flow and supply of irrigation is limited during the winter and spring seasons, an early rice crop-based cropping pattern should not be recommended for trials since it could not be implemented on an eventual wider production program.

The farmer's mentioned that lack of money or credit is the number one limiting factor to increasing agricultural production. The relationship between farmers and the credit and input institutions like the Small Farmer's Development Project needs further examination.

The farmer's also stated that lack of technical advice and unavailability of fertilizer on time are major problems. Bearing in mind these problems and the relative potential to increasing agricultural production in this region, this is a very good site to extend cropping systems' technology.

INTRODUCTION

Cropping systems research, as a first phase, has completed five years of testing cropping patterns and corresponding component technologies at six different locations* in Nepal. In addition, more intensive pilot production activities were conducted at all the sites.

As a consequence, the cropping systems program has now moved into a pre-production verification testing phase with a view towards supporting a larger scale production program in Nepal.

In general, the objectives of pre-production verification testing is to evaluate the recommended cropping systems technologies tested in farmers' fields to observe whether or not they are technically and economically feasible and attractive to the farmers, to extrapolate the technologies to other similar areas and continuously refine the recommendations. To briefly summarize, the objectives of pre-production verification trials as pointed out in "Guidelines for Pre-Production Verification Trials of Cropping Systems" are as follows:

1. To extrapolate improved cropping systems technologies developed at cropping systems sites to other similar areas thereby enhancing the transfer of technology and benefitting a larger number of farmers over a wider area,
2. To generate information on agricultural practices through cropping pattern monitoring which will allow a more thorough understanding of the cropping systems of Nepal, and
3. To accelerate the implementation of larger area production programs which will be based on technology thoroughly tested within the area of impact.

OBJECTIVE OF THE SITE DESCRIPTION SURVEY

The objective of the "Site Description Survey" is to provide needed information required before initiating the pre-production verification trials. For

* For detailed information, See "Socio-Economic Research on Farming Systems in Nepal" By S.B. Mathema and Dr. Marlin G. Van Der Veen, Agronomy Division, Khumaltar, Nepal.

Contd../..

this purpose, target areas are identified by looking at secondary data, particularly on water availability, soil classification, accessibility, elevation, existing crop production, socio-economic factors and others.

After selecting the Panchayat a more detailed site description survey is conducted to collect information about the site where the pre-production verification trials will be carried out.

The information in this report will assist us to determine the following:

1. Which types of recommended practices are most appropriate and should be pre-tested,
2. Where should the trials be located,
3. Which agro-climatic conditions and socio-economic factors are more favorable for certain recommended practices,
4. Which farmers' local practices should be superimposed on the verification trials, and
5. What are the relative net benefits to the farmers of the recommended practices and the local farmers practices.

A detailed site description provides information to assess which cropping patterns are more predominant and have the most potential for improvement, and therefore which are to be included in the trials. This information also helps to determine which improved varieties are likely to be suited and what the chemical fertilizer dose should be.

This report is the result of the site description survey carried out by the socio-economic group of the cropping systems program in ward nos. 2, 6 and 7 of the Mohammadpur Village Panchayat, Rautahat District. These three wards were identified by extension personnel to conduct pre-production verification trials.

DATA COLLECTION METHODOLOGY

A number of methods are used for collecting the necessary data; they are:

1. Secondary Data,

Contd..../...

a. Published, and

b. Unpublished.

2. Site Reconnaissance, and

3. Key Informant Survey.

a. Secondary Data

Information that has already been collected about the site, such as, rainfall, temperature, copperative and Agricultural Development Bank records, etc.

b. Site Reconnaissance

As a map of the Panchayat was not available, most of the wards were visited to draw a map showing irrigation, roads, trials, rivers and ward boundaries. (see enclosed map.)

c. Key Informant Surveys

Most of the other information is collected by using this method. Key informant surveys are quick and inexpensive, yield accurate results and require minimal staff requirements**.

The Pradhan Pancha was asked for general information about the Panchayat. Generally two knowledgeable farmers from each ward and the ward representative, unless other more knowledgeable farmers are found in the ward, are asked pertinent information. In addition, local merchants are asked about price of their products, the cooperative manager is interviewed about the credit and the supply situation of agricultural inputs and the manager of the Agricultural Development Bank is asked about the credit situation of the Panchayat.

The key informants interviewed for the site were:

a) The Pradhan Pancha,

b) Two knowledgeable farmers from each ward where the pre-production

** The approach used in this study was similar to the one used in the key informant surveys of the Cropping Systems sites. See "Sccio-Economic Research on Farming Systems in Nepal"" "Data Collecting Methods for Initial Site Description" By S.B. Mathema and Dr. Marlin G. Van Der Veen, Nepal.

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verification trials will be carried out.

c) The grain sellers,

d) The manager of the Small Farmers Development Project run by Agricultural Development Bank.

e) The JTA

(The Manager of the coop. was posted at another place and the other staff were on leave, therefore, we could not get any data from the cooperative.)

Each of the above informants were interviewed with different sets of questions in interview schedule forms.

GENERAL INFORMATION OF THE MOHAMMADPUR VILLAGE PANCHAYAT WARD NOS. 2, 6 & 7:

Mohammadpur Village Panchayat is located about 20 km from Chandra Nagar; south of the Mahendra Raj Marg and about 28 km north of Gaur, the district headquarter of Rautahat district. There is an unmetalled motorable road (Chandra Nagar - Gaur road) from Chandra Nagar to Mohammadpur. There is no regular means of motorable transportation that covers this distance; bullock-carts are the only local means.

According to the Pradhan Pancha, 725 households are settled in the Panchayat and approximately 250 households live in wards 2, 6 and 7. Total population of the Panchayat is said to be 3560.

A number of ethnic groups live in the Panchayat, such as, Yadav, Muslim, Kahriya, Kayastha, Gwala, Brahmin, Kurmi, Barai, Dhobi and Kumhal; Yadav is the most dominant caste.

Most of the people speak their local language, as Nepali is considered a second language. The permanent market centre for the farmers of this Panchayat is the district headquarter of Rautahat. Besides, they have "Haat Bazaar" in Shiv Nagar, twice a week, where the farmers sell and buy their products.

PHYSICAL FEATURES:

The elevation of the Panchayat is about 122 metres (400') above sea level. All the cultivate land lies on the flat plain. Other surrounding Panchayats are Gamariya to the north, Bagai Phattepur to the west and Garura Bairiya to the

Contd..../....

south of Mohammadpur Village Panchayat. The Jhanjh river irrigation project, Mohammadpur, is the main source of irrigation for the Panchayat. It is estimated that about 40% of the cultivated land of the Panchayat is irrigated by the Jhanjh irrigation. The water discharge capacity of the irrigation is 60 cubic feet to 150 cubic feet per second in summer and 20 to 25 c bic feet per second in winter.

CLIMATE:

The climate of the Panchayat is tropical monsoon. According to the Pradhan Pancha, rainfall during the months of Ashadh and Shrawan (June/July and July/August) are enough for the rice crop and rainfall during the months of Poush and Magh (Dec./Jan. and Jan./Feb.) are enough for wheat planting. Flooding and/or too much rain is not a problem in the area.

According to the Pradhan Pancha frost occurs during some nights of Poush and Magh (Dec./Jan. and Jan./Feb.). Hail is not a serious problem for the area.

Rainfall and temperature data were not available from Rautahat so, we used data from the Parwanipur Agriculture Station (Parsa) because the climatical condition of Rautahat and Parsa districts are similar. (See table nos. 1 and 2.)

LAND USE:

The knowledgeable farmers reported that there is 425 ha of cultivated land in these three wards. Out of the total, 139.40 ha. (33%) of land is irrigated and the rest of the land, 285.60 ha. (67%), is rainfed.

The multiple cropping index (MCI) for irrigated land is 2 and the land utilization index (LUI) is 68%. Similarly, the multiple cropping index for rainfed land is 1.64 with a land utilization index of 62% (see table 3).

CROPPING PATTERNS:

Lowland is the only land type found in the area, and can be classified into two groups : i) irrigated lowland, and ii) rainfed lowland.

The cropping patterns are mainly determined by water availability. Cropping patterns between wards are not so different.

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Table No. 1: Monthly Precipitation and Number of Rainy Days: Parsa District; Station: Parwanipur

Months \ Year	1977		1978		1979		1980		1981		Average of five Years
	Rain in mm.	No.of Rainy Days	Rain in mm.	No.of Rainy Days	Rain in mm.	No.of Rainy Days	Rain in mm.	No.of Rainy Days	Rain in mm.	No.of Rainy Days	Rain in mm.
January	15	1	6.0	1	9.5	1	0	0	52.1	8	13.8
February	7.4	2	15.8	2	18.0	2	1.1	2	6.1	1	9.7
March	0	0	20.0	4	3.3	2	16	3	18	3	11.5
April	52.7	4	83.4	5	24.9	3	0.5	1	80	6	48.3
May	187.3	11	106.5	10	28.5	1	124.0	11	181.5	11	125.6
June	73.2	10	286.6	16	184.6	6	273.5	9	181.0	7	199.8
July	239.6	15	557.2	16	149.1	23	406.9	19	780.8	22	426.7
August	246.8	17	301.0	14	218.7	12	206.7	14	307.5	17	276.5
September	73.0	7	313.1	17	200.6	10	112.1	14	451.5	15	230.0
October	112.4	7	189.5	5	117.0	7	20.0	3	0	0	87.8
November	21.0	2	8.0	2	5.0	2	0.	0	14	1	9.6
December	27.5	2	4.5	2	24.7	4	3.0	2	0	0	11.9
Annual Total	1144.4	78	1891.6	94	983.9	73	1163.8	78	2072.5	91	1451.2

Source: Parwanipur Agriculture Station, Parsa district, Nepal.

Table No. 2: Average Air Temperature, District - Bara; Station: Parwanipur, Bara, Nepal.
(In Degrees °C)

Months \ Year	1977			1978			1979			1980			1981		
	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.
January	22.2	8.6	15.4	21.0	7.4	14.2	24.2	8.4	16.3	23.2	7.2	15.2	22.3	8.9	15.6
February	25.4	9.6	17.5	23.8	9.6	16.7	24.3	10.2	17.2	28.1	13.0	20.[illegible]	25.8	10.4	18.1
March	32.3	14.6	23.4	29.1	13.1	21.1	30.3	11.2	20.7	30.8	13.8	22.[illegible]	30.4	13.8	22.1
April	33.0	20.4	26.4	33.7	18.4	26.1	35.15	20.4	27.9	31.5	19.7	25.[illegible]	31.8	19.8	25.8
May	31.4	21.6	26.5	33.9	22.8	28.3	38.5	22.6	30.5	34.7	24.2	29.[illegible]	33.5	22.9	28.2
June	33.9	25.0	29.4	32.9	24.4	28.6	36.3	24.3	30.3	33.9	26.0	29.9	35.8	25.9	30.8
July	32.7	26.1	29.4	31.8	25.6	28.7	32.6	26.0	29.3	32.6	26.1	29.3	31.6	25.7	28.6
August	32.5	25.6	28.9	33.4	26.1	29.7	33.1	26.0	29.5	32.3	25.9	29.[illegible]	32.2	25.9	29.1
September	32.6	24.8	28.7	31.7	24.9	28.3	32.7	24.1	28.4	33.0	25.0	29.0	32.4	24.7	28.5
October	29.5	20.4	24.9	31.5	20.4	26.0	31.0	20.4	25.7	31.3	20.1	25.7	37.3	19.8	28.5
November	27.7	16.9	22.3	28.3	15.6	22.6	29.9	17.0	23.4	30.0	13.2	21.6	29.1	13.1	42.1
December	24.4	10.3	17.3	25.3	8.3	17.6	24.8	10.1	17.4	26.1	9.7	18.3	25.3	7.7	16.5
Annual Mean			24.1			23.9			24.7			24.6			26.1

Source: Parwanipur Agriculture Station, Bara, Nepal.

The cropping patterns followed in wards 2, 6 and 7 are as follows:

i) Irrigated Lowland

The irrigated lowland is effectively being utilized during 1981/1982. One hundred percent of the irrigated land was devoted to double crops; i.e., rice followed by winter crops (mostly wheat). Rice followed by wheat was devoted to 70% of the land, 21% to maize and 9% to mixed crops (lentil, mustard and khesari).

ii) Rainfed Lowland

The rainfed lowland of the three wards are less intensively cultivated; about 74% of the land was devoted to double crops; i.e., rice followed by mix crops (lentil, mustard and khesari) was devoted to 64%, millet followed by barley 5% and maize followed by sweet potato was devoted to 5%.

Table No.3: Distribution and Land Utilization of Lowland Irrigated and Lowland Rainfed of Ward Nos. 2, 6 & 7 of Mohammadpur Village Panchayat (Rautahat)

Wards	Land Type	%	MCI *	LUI **
2	Irrigated Lowland	27	2	72
	Rainfed Lowland	73	1.33	63
6	Irrigated Lowland	24	2	63
	Rainfed Lowland	76	1.60	61
7	Irrigated Lowland	60	2	69
	Rainfed Lowland	40	2	61
Average of Wards 2, 6 & 7	Irrigated Lowland	37	2	68
	Rainfed Lowland	63	1.64	62

* MCI = Multiple Cropping Index - Sum of areas planted to different crops and harvested during a year divided by total cultivated area (mix crops were counted as one crop and rel y crops were counted as two)

**

** LUI = Land Utilization Index - The number of days times 100 during which crops occupy the land during the year, divided by 365.

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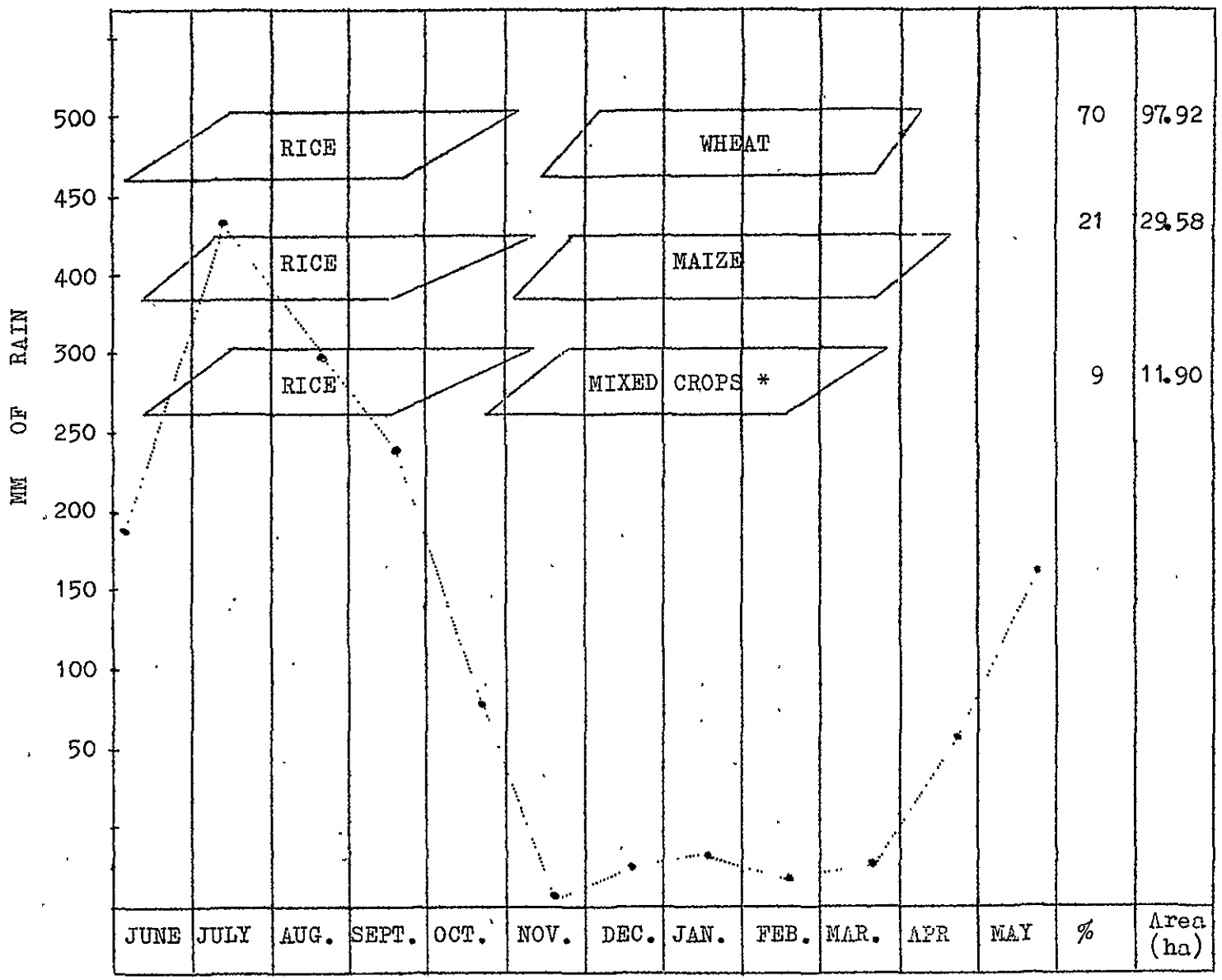
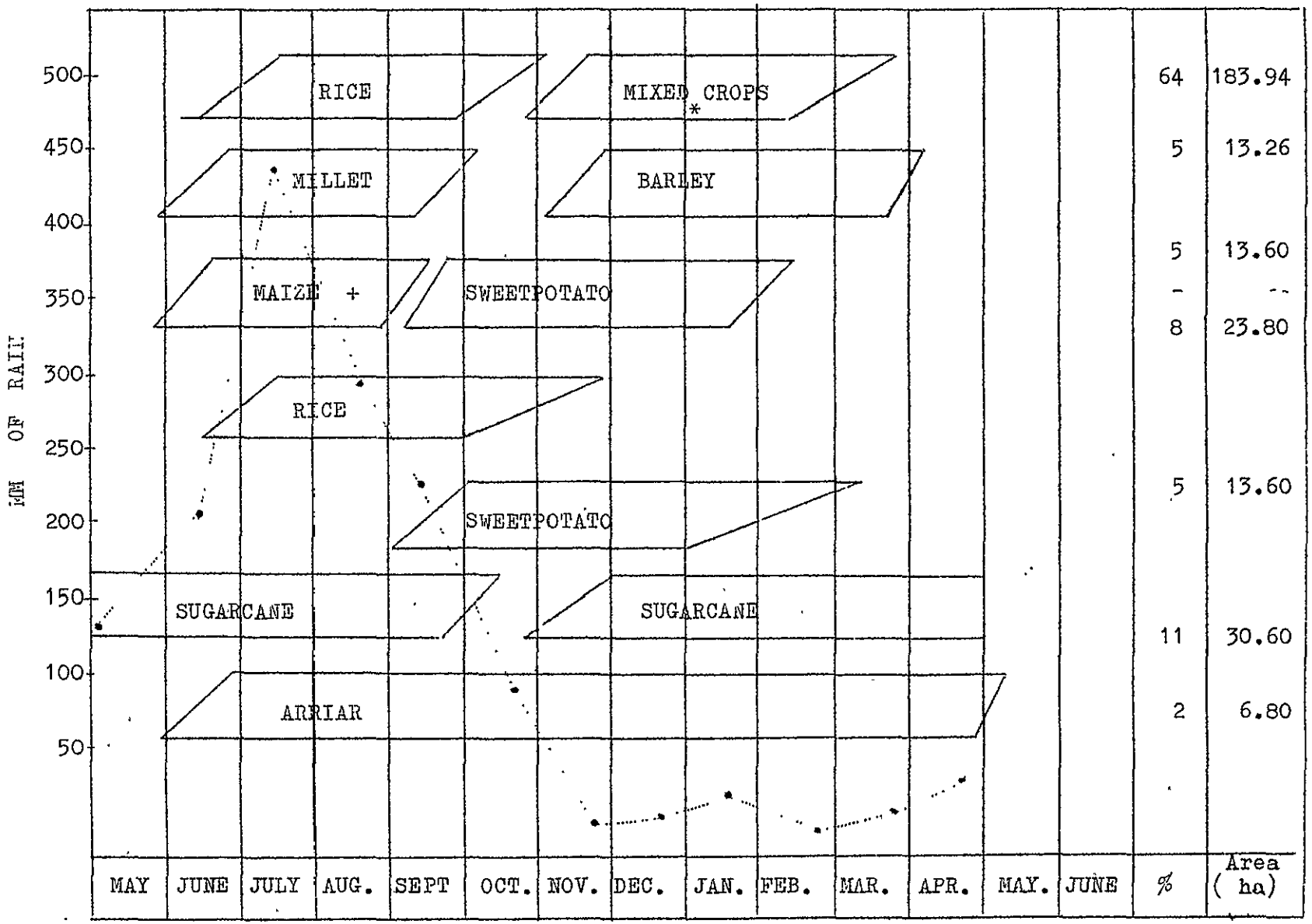
FIGURE: 2 PERDOMINANT CROPPING PATTERNS OF WARD NOS. 2, 6 AND 7 OF MOHAMMADPUR VILLAGE PANCHAYAT IRRIGATED LOW LAND 1981/82



* Mixed crops = Masuro + Mustard + Khesari

Figure: 3 PERDOMINANT CROPPING PATTERNS OF WARD NOS 2, 6 AND 7 OF MOHAMMADPUR VILLAGE PANCHAYAT

RAINFED LOW LAND 1981/82



* Mixed crops = Masuro + Mustar + Khesari (Oilseed and Broadbeans are planted in a nominal (amount of land)

\+ Ashar is also planted as a boarder Crop.

Table No. 4: Predominant Cropping Patterns of Ward Nos. 2, 6 and 7 of Mohammadpur Village Panchayat, Irrigated Lowland 1981/1982.

1st Crop (1)	Planting or T.P.* Dates From (2)	Planting or T.P.* Dates To (3)	Harvesting Date From (4)	Harvesting Date To (5)	2nd Crop (6)	Planting Date From (7)	Planting Date To (8)	Harvesting Date From (9)	Harvesting Date To (10)	% of Land (11)	Land Area (Ha.) (12)
Rice	Jun 4	Jul 8	Sep. 19	Nov. 12	Wheat	Nov. 6	Dec. 3	Mar. 22	Apr. 9	70	97.92
Rice	"	"	"	"	Maize	Nov. 2	Nov.30	Mar. 16	Apr.19	21	29.58
Rice	"	"	"	"	Mixed-Crops**	Oct.29	Nov.23	Feb. 8	Mar.28	9	11.90

* T.P. = Transplanting
** Mixed Crops = Masuro + Mustard and Khesari,

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Table No. 5: Predominant Cropping Patterns of Ward Nos. 2, 6 and 7 of Mohammadpur Village Panchayat, Rainfed Lowland, 1981/1982

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Rice	Jun 6	Jul 12	Sep.28	Nov. 3	Mixed* Crops	Oct.25	Nov.20	Feb. 7	Mar. 23	64	183.94
Mil.	May28	Jun.27	Sep.16	Oct. 9	Barley	Nov. 4	Nov.28	Mar.19	Apr. 7	5	13.26
Maize+	"	Jun.18	Aug.31	Sep.15	S.P.x	Sep. 5	Sep.23	Jan.14	Feb. 10	5	13.60
Rice	Jun 7	Jul.15	Sep.29	Nov.28						8	23.80
S.P.x	Aug31	Oct. 1	Dec.30	Mar.13						5	13.60
S.C.xx	Oct27	Nov.30	Sep.26	Oct.22						11	30.60
Arhar	May28	Jun.29	Apr.28	May 13						2	6.80

* Mixed Crops = Masuro + Mustard + Khesari (Oilseed and Broadbeans are planted in a nominal amount of land)
\+ Arhar is also planted as a boarder crop.
x S.P. = Sweet Potato
xx S.C. = Sugar Cane.

The rest of the land (26%) was devoted to a monocrop of rice, sweet potato, sugarcane or aehar. Eight percent was devoted to rice, 5% to sweet potato, 11% to sugarcane and 2% to arhar. Arhar was also planted mixed with lentil and mustard. Sugarcane, a ratoon crop, and arhar take almost a year to harvest. (see figure 3.)

FALLOW LAND

As mentioned above, a significant part of the rainfed lowland in the wards was devoted to monocrop. As sugarcane and arhar take almost a year to harvest, no other crops could be grown in this area; however, the land devoted to monocrops of rice and sweet potato remains fallow for seven to eight months of the year. The farmers gave explanations of why this land remains fallow:

1. Lack of water, 2. Expensive while irrigated by pumpset, and 3. Infertile land. The farmers feel that wheat, mustard and vegetables could be grown in this land if the water is available.

FARM SIZE:

The knowledgeable farmers reported that there are 250 households living in ward nos. 2, 6 and 7. The average farm size of the three wards of Mohammadpur Village Panchayat is 1.70 hectares, ranging from 1.06 ha in ward no. 7 to 2.19 ha in ward no. 6.

Forty-nine percent of the households farm less than .68 ha (1 bigha), 40% farm more than .68 ha and less than 2.72 ha (4 bigha) and 8% of the households farm more than 2.72 hectares. Three percent of the households do not own and do not even farm any land; they work on other farms for daily wages during cropping seasons and engage in other off-farm jobs during the slack seasons. (see table 6.)

Table no. 6 shows that a large proportion of households farm more than 0.34 ha and less or equal to 2.72 ha of land in these wards (66%).

Farmers who leased land have to pay half of the production of that particular land as a wage payment. The land owners provide inorganic fertilizer for the land but the farmers have to pay back half of the cost of the fertilizer either in cash or in kind.

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Table No. 6: Size Distribution of Farms of Households Who Live in Ward Nos. 2, 6 & 7 of Mohammadpur Village Panchayat (Rautahat), 1982.

Farm Size in Hectare	Total No. of Households		+ %of H.H. Mainly Farming Khet		+% of HH Farming Mainly Pakho		+% of HH Farming Mainly Tar.		+ % of HH Farming Mainly Mixed Khet		% of H.H. Who Have Leased in Land*	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Less or equal to 0.17	9(x)	4	9	4	0	0	0	0	0	0	6	67
More than 0.17 but less than or equal to 0.34	47	19	47	19	0	0	0	0	0	0	13	28
More than 0.34 but less or equal to 0.68	66	26	66	26	0	0	0	0	0	0	10	15
More than 0.68 but less or equal to 2.72	99	40	99	40	0	0	0	0	0	0	13	13
More than 2.72 but less or equal to 6.8	16	6	16	6	0	0	0	0	0	0	0	0
More than 6.8 ha	6	2	6	2	0	0	0	0	0	0	0	0

\+ Less than 20% of the other land type

* More than 20% of each land type.

(x) 7 households do not own land nor do they lease land. They work on other farms for daily wages or engage in other off-farm work during slack farming periods.

H.H. = Households.

The information supplied in the interviews indicate that 69% of the households are too small to provide enough food grains to their families, 28% can provide just enough food grains for their families, and 3% of the households can provide enough food grains for their families. Thus, the majority of the farmers in these wards have very little or no margin over and above their families basic subsistence needs.

MAIN CROPS, VARIETIES, YIELDS AND PRICES:

Rice, wheat, lentil, sweet potato and sugarcane are the main crops of the area; minor crops are maize, millet, arhar, barley and mustard. Rice grows on 82% of the summer crop land; millet, maize and sweet potato each 3%, and wheat grows on 23% of the winter crop land. Mixed crops (lentil+mustard and Khesri) grown 46%, barley 3%, maize 7% and sweet potato 3% of the land during winter. Sugarcane and arhar, which take almost a year to harvest, grows on 7% and 2% of the land, respectively. Sugarcane and sweet potato, the cash crops, are planted especially for cash income.

Farmers are aware of improved varieties of crops, such as Pankaj, T-176, Chandina, CH 45 and Mansuli (Rice), RR 21 (Wheat), Rampur Yellow, Ganga-2, Highstar and Shankar (Maize). Some of the improved varieties are Indian, although farmers are growing many improved varieties of crops, still the large proportion of the lands were devoted to local varieties. Out of the total rice planting land, only 16% is devoted to improved rice. Similarly, 27% of the maize land was devoted to improved maize. (see table 7). RR 21 is the only wheat variety grown in the area.

Average yields of improved rice varieties are 2.3 tons/ha and average yields of local rice are 2.1 tons/ha; similarly, the average yields of RR 21 wheat, improved maize, local maize, millet and lentil are 1.5 tons, 2.8 tons, 2 tons, 1 ton and .47 tons/ha respectively. (Detailed information on percentage of land devoted to each crop by variety, average yields and average prices per kg are cited in table no. 7.)

The major problems for the farmers of the area to increase production are as follows:

a) lack of money,

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Table No. 7: Main Varieties of Crops Grown, Average Yields, Selling Prices and Percent of Households Using All the Production for Household Consumption of Ward Nos. 2, 6 & 7, Mohammadpur V.P., 1981/1982.

Crop	Variety	Land Type	% of Crop Variety Area %	Average Yield (T./ha)	Average Selling Price (Rs./kg.)	% of Households Using all for H.H.* Consumption
Rice	Pankaj	Lowland	2	2.3	2.50	98
	Taichun	"	7			
	Chandina	"	2			
	CH 45	"	3			
	Mansuli	"	2			
	Local	"	84	2118		
Total:			100			
Wheat	RR 21	"	100	1535	2.41	91
Maize	Rampur Y.	"	8	2.8	1.94	98
	Ganga-2	"	13			
	Highstar	"	2			
	Shankar	"	4			
	Local	"	73	2000		
Total:			100			
Linseed	Local	Mixed With Masuro				
Mustard	Local	Lowland	100	.162	N.A.	100
Soybean	X	X	X	X	X	X
Millet	Local	Lowland	100	1002	1.38	98
Pulses	Masuro	"	100	.470	3.43	80
	Khesari	"		1176	0	100
	Arhar	"		.441	0	100
Potato	Local	"	100	Planted on a nominal amount of land.		
Barley	Local	"	100	.729	0	100
Sweet-Potato	Local	"	100	3353	0.52	53
Sugar-Cane	Local	"	100	14338	0.25	50

* H.H. = Households.

N.A. = Not Applicable.

Table No. 8: Percentage of Land Area Devoted to Each Main Crop by Season : Ward Nos. 2, 6 & 7, Mohammadpur Village Panchayat, 1981/1982.

Crops	SUMMER Lowland		Crops	WINTER Lowland	
	Rainfed	Irrigated		Rainfed	Irrigated
Rice	72	100	Wheat	0	70
Millet	5	0	Maize	0	21
Maize	5	0	Mixed* Crop	64	9
Sweet Pot.	5	0	Barley	5	0
Sugarcane	11	0			
Arhar	2	0			
Fallow	0	0	Fallow	31	0
Total:	100	100		100	100

Source: Farmers Interview; * Mixed Crops = Masuro + Mustard + Khesari.

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Table No. 9: Levels of Seed, Inorganic Fertilizer and Compost Used by Crop, By the Farmers of Ward Nos. 2, 6 & 7 of Mohammadpur Village Panchayat (Rautahat), 1981/1982

Crop	Ave. Seed Rate (kg./ha.)	% of Farmers Using Chemical Fert.	Ave. Amount of Fert. Used (kg./ha.)			% of Farmers Using Compost	Ave. Amount of Compost* Used (T/ha)
			N	P_2O_5	K_2O		
Rice	66	48	26	6	0	87	1.8
Wheat	88	60	39	13	0	71	1.7
Maize	34	84	38	13	0	100	.7
Arhar	11	0	0	0	0	25	.6
Millet	14	0	0	0	0	33	.6
Barley	50	0	0	0	0	67	.8
Masuro	32	18	7	7	0	56	1
Khesari	59	-- Mixed With Masuro --					
Potato	20	0	0	0	0	27	1.1
Sweet Pot.	NA**	0	0	0	0	33	.7
Sugarcane	2647	15	49	14	0	0	0
Mustard	5	-- Mixed With Masuro --					

* Of those using.

** NA = Not Available (They leave some seed at harvesting time.)

b) lack of water,

c) lack of technical advice, and

d) fertilizer not available in time.

The farmers would like to have high yielding varieties and all varieties which requires less water.

SEED, FERTILIZER AND CROP USE:

The average amount of seed for rice was 66 kg per ha, 88 kg per ha for wheat, 34 kg per ha for maize, 32 kg for lentil and 59 kg for khesari. (For detailed information, see table no. 9.)

Only 48% of the farmers applied chemical fertilizer to their rice, 60% to their wheat, 84% to their maize, 18% to their lentil and 15% of the farmers to their sugarcane. However, the average rate of nitrogen and phosphorus applied by the farmers is quite low; of nitrogen for rice it was 26 kg/ha, for wheat 39 kg per hectare, for maize 38 kg/ha and for sugarcane 49 kg/ha. Similarly, the average rates of phosphorus for rice, wheat, maize and sugarcane were 6 kg, 13 kg, 13 kg and 14 kg per hectare respectively. (See table no. 9.)

Besides, 87% of rice growing farmers, 71% of wheat growing, 100% of maize growing and 56% of lentil growing farmers used compost, though, the rate of compost application is very low; ranging from .7 ton/ha for maize to 1.8 tons/ha for rice.

The explanations given by the knowledgeable farmers about not using more inorganic fertilizer were:

a) lack of water, and

b) lack of purchasing power.

Crops grown in the area, except sweet potato and sugarcane (cash crops), are mainly for family consumption. Very few farmers sell their rice and wheat crop. (See table no. 9.)

POWER:

According to the knowledgeable farmers all of the farmers in the three wards use bullocks for preparing their lands. Ninety-seven percent of the

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households either use their own bullocks or practice exchange labor for bullock power. However, 3% of the households have to hire bullocks to get their work done. Bullock power shortages do occur during the busiest times of the year; i.e., Jestha, Ashadh, Shrawan and Ashoj (May/June to July/August and Sep./Oct.) because every one needs them at the same time. The cost of hiring bullocks is 22.00 Rs./day with plow-man (with meals and tiffin during Ashadh, Srawan (June/July) and only tiffin in other seasons). (See table no. 13.)

LABOR:

Peak labor demands in Mohammadpur Village Panchayat occur during the months of (a) Jestha to Shrawan (May/June to July/August), (b) Kartik to Poush (Oct./Nov. to Dec./Jan.) and (c) Bhadra, Ashoj (Aug./Sep. and Sep./Oct.) because every one is working on their own field.

The farmers are doing the following works during these months:

(A) Jestha to Shrawan (May/June to July/August) = preparing rice field and transplanting rice.

(B) Kartik to Poush (Oct./Nov. to Dec./Jan.) = Rice harvesting, wheat and other winter crops planting

(C) Bhadra, Ashoj (Aug./Sep. & Sep./Oct.) = Harvesting early rice.

Both male and female laborers are hired on daily wage basis at a cost of generally Rs. 10.00 with tiffin or 3 kg of grains with tiffin for both male and female laborers. The tasks undertaken include plowing, up-rooting, seedings, transplanting, weeding, harvesting and threshing. (See table nos. 10 and 11.)

Exchange labor is practiced by the farmers of the wards for all kinds of farm work.

The slack months for the farmers occur in Magh and Falgoon (Jan./Feb. and Feb./Mar.). Some households engage in other off-farm jobs (laboring) during these months.

OFF-FARM EMPLOYMENT:

Seventeen percent of the households are engaged in working for other farms on a daily wage basis during the crop seasons. Only 1% of the households are engaged in servicing in different offices and 1% are engaged in laboring

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Table No. 10: Male Labor Hired on a Daily Wage Basis of Ward Nos. 2, 6 & 7 of Mohammadpur Village Panchayat (Rautahat), 1981 / 1982.

Types of Works	% of Households Hiring	How many days in a year in Average	Which Months	Wage Per Day in Kind (Include meals)
Plowing	3	25	Jesth, Ashadh, Kartik, Mangsir.	Rs. 10/- or 3 kg grain (with tiffin)
Uprooting Seeding	8	12	Jesth, Ashadh Shrawan	"
Weeding	8	13	Shrawan	"
Harvesting	8	12	Ashoj, Kartik, Mangsir	"
Threshing	11	10		"
Spademan	5	10	Jesth & Ashadh	"

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Table No. 11: Female Labor Hired on a Wage Basis of Ward Nos. 2, 6 & 7 of Mohammadpur Village Panchayat (Rautahat), 1981 / 1982.

Types of Works	% of Households Hiring	How Many Days in a Year in Average	Which Months	Wage Per Day in Kind or Cash (Including Meals)
Transplanting	8	13	Jesth, Ashadh and Shrawan	Rs. 10/- or 3 kg of grain (With tiffin)
Weeding	6	10	Shrawan	"

during the slack period. (See table no. 12.)

No one is going to India for one month or more for employment or marketing from these wards.

CREDIT AND INPUT SUPPLY:

Institutional credit is available to the farmers from the local cooperative and Small Farmers Development Project run by the Agricultural Development Bank (started in 2037 (1980)) located in ward no. 6.

The Small Farmers Development Project is playing a significant role in providing credit to the small farmers. The Bank provides loans directly to the farmers. Besides, the project is also providing agricultural inputs such as fertilizer, seed and insecticides to the farmers.

The cooperative manager was transferred to another location and the new manager had not yet reported to work; therefore, we could not get any data and information from the cooperative.

Table No. 12: Off-Farm Employment of Mohammadpur Village Panchayat, Ward Nos. 2, 6 and 7, Rautahat District, 1981 / 1982

Types of Works	Which member of the family is engaged	% of Households doing this short of work	Which Months	Ave. work days in a year	Ave. work hours in a day
Farm labor	Working member of the house	17	All Cropping Seasons	93	8
Laboring	Household head & Sons	1	Magh & Bhadra	30	8
Service	"	1	Throughout the year	300	8

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Table No. 13: Percentage of Households Hiring Bullocks in Ward Nos. 2, 6 & 7 of Mohammadpur Village Panchayat, Rautahat District, 1981/1982

Types of Works	% of Households Hiring	How many days in a year in average.	Which Months	Wage per day in kind or cash(including plowman and meals)
Plowing	3	22	Jesth, Ashadh, Shrawan, Ashoj, Kartik & Mangsir	Rs. 22/day(with meals + tiffin)

LADS/C.S.P. STAFF: ds
Dec. 13, 1982.