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Consulting Agronomist, ARS-Gao, Dat Van Tran

Primary report on the activities of
Action Riz-Sorgho, Gao

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The primary report on Action Riz-Sorgho (ARS) is prepared for a period from 2/12/1981 to 3/20/1981 based on field trips, discussions with persons, and ARS reports.

Following are the observations and suggestions on:

1. Achievement of the Project
2. Tacharane and Gargouna cases
3. Crop situation
4. Extension works
5. Agricultural research station

I. ACHIEVEMENT OF THE PROJECT:

According to the original project paper, by 1979 total annual cereal production in Gao area would increase to about 3,750 MT/yr and new varieties improved practices would be introduced to 10,000 farmers by (1) completely protecting from flood 5,000 ha. of rice by insubmersible dikes and using improved seeds, culturrl practices with a yield of 1,300 kg/ha. (2) partially protecting from flood 5,000 ha. of rice and increasing yield by 900 kg/ha., and (3) increasing to 3,300 ha. of sorghum and using tre seeds with yield of 600 kg/ha.

Although the construction works were delayed more than 2 years, about 2,600 ha. of land at Tacharane and Gargouna (52% area target) are protected by 17km insersible dikes. The cleaning work for canals has not been completed until July 1981. Agricultural Research station has been built (dikes and canal systems only).

The goals of the Project were partly attained. According to the reports of ARS, grain yields of rice reached 1,338 kg/ha. in 1979-1980 crop and 1,865 kg/ha. in 1980-1981 crop (due to good rainfall). For sorghum, the

plantoi hectarage occupied 3,676 ha. in 1980-1981. However, the objective verifiable indicators did not go along very well: (a) the amount of annual cereal production d'. not increase as much as 3,750 MT/yr (except for the last year crop). (b) 18% rice land was planted with improved varieties in 1980-1981, (c) average grain yield of sorghum did not change at all (428 kg/ha in 1980-1981 crop), and (d) rice production was greatly fluctuated from 6,1'3 MT of rice (1978-1979), 2,828 MT (1979-1980) to 10,596 MT (1980-1981). Even at Tacharane and Gargouna where dikes and canal systems were installed, the crop successfulness still relies on rainfall and flood conditions.

In general, the project has not achieved completely its planned purposes, it has made some contribution to the regional development yet; but the efficiency of the Project is not greatly satisfactory. The main reason for that is the works required to meet the goals have not been completed yet.

It is possible to satisfy the entire project goal and improve project efficiency for flooded area by completing the following 2 steps:

(1) control flood and supply water efficiently (constructing dikes is mainly for flood control).

(2) change crop system.

The project is now being in the first step.

Suggestions: The project would be continued with new directions:

(A) concentrate works on the pilot project (a part of Tacharane proposed) in which the above steps have to be completed (see below - Tacharane and Gargouna cases). Then the project will expand to another area, step by step with experiences gained from the previous work.

(B) Strengthen the extension system of ARS, expand their works to more farming, and choose priority related to the important local constraints which are faced by the more average small farmers in the intervention area.

II. TACHARANE AND GARGOUNA CASES

Dike construction was started at Tacharane in March 1979, at Gargouna 3 months later and was terminated in August 1979. The system of canals has not been finished until July 1981. The total cultivated area protected by these dikes is about 2,600 ha., with 1,285 ha. of rice and 850 ha. of sorghum cultivated in 1980-1981. Although rice production was not stable due to unusual climate, local farmers received some benefits from the construction works in the last two years:

1. The cultivated area of sorghum increased from 411 to 902 ha.
2. The flood speed and rizophage fish species were mostly controlled.

These two factors only could not contribute to the significant increase in the cereal production, since (1) farmers still practice the same cropping pattern, i.e. floating rice at the low land and sorghum at higher land; therefore (2) they grow one crop a year, (3) crop success is still determined mainly by the unpredictable factors--rainfall, flood-- and (4) cultural methods are not changed much, except for selected varieties and treated seeds.

If the objectives of dike construction were to regulate the flood speed and control rice, eating fish, the project were achieved. Many people have such thought. Local farmers at Tacharane and Gargouna are really happy with new dikes that are bigger than the old ones. Consequently, it is snot surprising that all canals in the project go from highest land to the lowest land (or basin) aiming at the conduction of water from the Niger river to the field and/or from the basin to other parts of the field under flooded condition (not for irrigated crops). Under such a situation the exploitation in dikes and canal systems for increased production of floating rice crop could not obtain great efficiency.

SUGGESTIONS:

- Method 1: Pilot Project

It is necessary to have a small pilot project to prove the maximum benefit that could be gained from investment in dikes and canals.

Actually, with the existence of dikes, canals and inexhaustible source of water, farmers still grow floating rice. Why? The only answer from everyone is because of the unfavorable topography of plains or uneven soil surface which is a common characteristic of annually flooded area at anywhere in the world. In South-east Asia, farmers have strived to level their land individually along both sides of Mekong river by using draft animals however, land is not truly even.

An ambitious exploitation on flooded area in Niger costs its country 6,000,000 MF/ha. for the whole operation including levelling work according to the report of Mr. Housseyni Konaré dated January 28, 1981 (Mr. Konaré is a staff member of Action Riz-Sorgho). At this moment, such an investment would not be practical for the region such as Gao.

After a series of discussions with the ARS STAFf members and a few local people, solution may practically be found for the problem of levelling of flooded area. The idea of the solution is based on (1) using system of gravity irrigation and (2) mobilizing the participation of individual farmers.

Therefore, a small pilot project is proposed at the plain of Tacharane where 376 farmers exploit on 892 ha. with rice and sorghum crop in 1980-81.

Objectives: The pilot project consists of 3 interventions:

1. Increasing cereal production at the intervention area by eliminating floating rice crop and introducing double irrigated rice crop or rice-other crops.

2. Increasing crop production by increasing area cultivated by supplying water in dry season.

3. Introducing new crops and modern techniques to the farmers.

Proposed solution: The pilot project has to pass through the following steps:

1. Control flood and supply water efficiently: Controlling flood was already done by dike construction. Now the system of water supply from the river to field has to be appropriate to the topography of field. Two kinds of work may be executed:

   a) Constructing of a "floating canal": a proper floating canal could be installed on land along the existing dikes where the highest soil level is found. This type of canal has two advantages: (i) no water pump is required to bring water from main or secondary canals to the field, (ii) an amount of water needed can go into individual fields even when soil surface is not levelled. Concurrently, farmers are obligated to build or repair their own small dikes which can hold just enough water in the field for rice planting (i.e. water is not allowed to overflow into surrounding fields). As a result, farmers would gradually level their land by themselves in order to have water evenly cover the whole field and obtain a good crop. The existing canals and basins can be used or modified for the drainage system.

   b) Pump station: To assure the first crop during early flood season and to help farmers to grow two or more crops on the same land, after flood season a water pump station may be set up. A good site of river with water available all year round and close to the dike was found in the plain of Tacharane.

The pump station would function only for 3-4 months a year, thereby gasoline (or diesel) consumption and pump maintenance would not be a big problem for farmers.

In the first step, a major work (dikes and canals) has been done and additional construction (floatant canal and pump station) if any, would increase significantly the success possibility of the original project.

2. Change Crop System:

After completing the first step, the present cropping pattern -floating rice crop- has no reason to be existant. Two irrigated rice crops or rice followed by other crops, combined with modern techniques will be introduced to farmers to maximize crop production in the pilot project.

In the second step, ARS would concentrate its work for the pilot project, as follows:

a) Explain the idea and concept of pilot project to exploitants. Mobilize the participation and consultation of farmers from beginning to the end of the project.

b) Concurrent to construction work, ARS would carry out the training sessions for cadres, farmers: (i) how level land (thank to soil properties at Gao characterized by sandy loam or/and sandy clay, dry land preparation as well as levelling could be done by animal such as oxen, donkeys), (ii) how to grow high yielding varieties of rice and other crops.

c) Test locally new varieties, new crops and prepare seed source available for farmers right after construction work is done.

d) Organize farmers to manage water use in the project

e) ARS may cooperate with local cooperatives in the supply of inputs for crops because of great needs from farmers predicted.

Implementation Plan: The pilot project may be executed for 4 years.

Step 1: control flood and supply water efficiently: It would be completed with system of floating canal and pump station in the first year [illegible]

Step 2: Change Crop System: The effort of ARS may concentrate on a limited area of intervention or about 50 ha. during the first year. The work will then be expanded to a larger area during the second year and completed during the 5th year.

- Method 2: Using improved varieties and proper cultural practices for the present conditions.

This method would moderately increase crop production at Tacharane and Gargouna while looking for a good solution. With the existing dikes, canals, and uneven land the production is still limited by rainfall and flood. The lack of rainfall and late flood arrival may cause the loss of seeds and seedlings. Transplanting method and late opening of water gates may avoid the above problems.

Due to topography, field may be classified in 3 categories: lowland middle land and high land by water levels.

a) Lowland and middle land: (water level above 1m and 0.50 to 1m respectively): This zone may be used for floating rice crop while improved varieties combined with 2 obligatory measures:

(i) Late opening of the water gates: Based on the flood history of intervention area, the latest arrival of flood may be used for the date of gate opening every year to assure farmers in preparing nursery ahead in time.

(ii) Transplanting: Method 2 can be applied when most farmers in the zone agree to accept transplanting method for growing floating rice. With the fixed date of gate opening, farmers would be aware of when water comes to their terrace, and thereby when the nursery must be started. Different terraces have to be transplanted with young rice plants at 7 to 15 days intervals which give plants enough time to restore the growth and survive after transplanting. ARS may help farmers to classify terraces and give them recommendations on dates of nursery preparation and transplanting. This year, therefore, ARS would notice the calender of water arrival and identify different terraces in the plain of Tacharane and Gargouna in order to be ready for next year campaign.

b) High land (water level below 0.5m): At this terrace, (about 20-30% of total area) high yielding variation of rice or new crops may be introduced to farmers with 3 conditions: (1) farmers have to make small dikes around their field, (2) level field by themselves with labor or animal, and (3) use early maturing varieties.

It is hopeful that ARS may set up a demonstration plot of 1/4 to 1/2 ha. with high yielding varieties of rice for this type of terrace at Tacharane and Gargouna this year.

The method 2 would be a good preparation for the implementation of method 1 if the latter is carried out.

III. THE CROP SITUATION

At present, sorghum crop was completely transplanted and directly seeded while rice crop does not start yet. In general, some progresses were made in seed treatment and improved varieties of rice in the intervention areas.

Sorgho: In 1980-1981, sorghum was planted on 3,676 ha. with grain yield of 428 kg/ha. Some characteristics of sorghum crop are noticed:

- No improved varieties introduced
- Local varieties have long growth duration (8-10 months)
- No use of fertilizers and pesticides.
- Lack of land preparation (92% of cultivated area)
- 98% transplanted and 2% seeded.
- Very large spacing (more or less 1m). No row planting
- Amount and distribution of rainfall and flood determine crop success.

Rice: In 1980-1981, rice was grown on 7,523 ha. with average grain yield of 1,856 t/ha. Some characteristics of rice crop are known as follows:

- Improved varieties (O. Sativa) occupy 18%; some of them have long growth duration that farmers do not like.
- Improved seeds are permanently insufficient.
- Land preparation by labor or none.
- Little use of inputs (fertilizers, pesticides).
- Transplanting 18% and direct seeding 82%.
- Problem of birds, rice-eating fish.
- Crop success is completely controlled by pluviometry and flood.

For cropping pattern, as mentioned earlier, rice crop is always planted on low land while sorghum crop is reserved for high-lying area. In the other countries, farmers can grow two crops on the flooded area without dikes by using water pumps. So, the precondition to change cropping system in the region, such as Gao for increased production is how to bring water efficiently to fields when needed. Some attempts to use the Pakistan type of pumps was not successful. The Egyptian type-ox-drawn water-lifting wheel (noria) has not been conclusively tested. It seems that while looking for the cheap and reasonable way to supply water to crops, motor pumps are still a possible solution for increasing production in the region although some effects may be encountered.

Suggestions: With many unfavorable aspects of crop cultivation to be improved and with the actual capacity of ARS, it is recommended to give priority to the plan of implementation. The following works are suggested:

1) Testing noria pump: It is necessary to assign a person from ARS to take care of noria test and evaluation (choosing location, schedule, installation, testing, evaluation and report). The work would be carried out as soon as possible.

2) Supplying rice seeds sufficiently and in time: Seed supply becomes a permanent concern to ARS. Seed source never meets the requirements of farmers and its distribution is usually late for planting. This problem can be found in any annual report of ARS. Therefore, a program of seed multiplication for Gao is proposed (see Appendix I). However, the proposal may have an institutional problem with O.P.S. (Operation Production Semences). An agreement between ARS and OPS is required before executing the program.

3) Adaptive research: The program of adaptive research would be carried out at two levels: Agricultural research station and farmer fields. The research undertaken would be of an immediately applicable nature and concentrate on the following aspects:

a) Varietal test: to test and identify suitable floating and low-land rice varieties and sorghum varieties. This year, a program of varietal test for rice is proposed to carry out at 4 locations of Gao: Magnadoue Gargouna, Bara, and research station (see Appendix II). Sorghum crop was already planted in February.

b) Cultural practices: seedling ages, plant density, fertilizer rates (chemical, organic manure, compost), pesticides, water management would be considered.

c) Cropping patterns: Crop rotation among rice, sorghum legumes, and other crops could be tested whenever water supply for crop is available.

IV. EXTENSION WORK

The cultural method in this region is relatively primitive, i.e. less labor, less inputs and thereby less production. Normally, the effects of extension work are slowly accepted by farmers, except for some interesting motives, such as attractive profits from changes in cropping patterns. Therefore, the role of extension work becomes indispensable in the scheme of rural development. The hard and durable works are expected to get good outcomes. From this, the extension system deserves to be consolidated and expanded to the whole intervention area.

Some characteristics of the current situation of extension system in ARS are noted:

(1) A limited number of technicians and "cadres" cover a large number of farmers ("cadres" to farmers ratio: 214).

(2) "Cadres" who work directly with farmers receive a short training and they lack experiences acquired by practice in the intensive production methods.

(3) Shortage of place, teaching aids, and documents for training and materials required for demonstration.

Suggestions: To form the technological basis at rural area the following works are suggested:

1. Increase the number of qualified technicians and "cadres" to meet the requirement.

2. Establish a training and demonstration center which may be located in the agricultural research station. The center will provide a basic training for all levels of local personnels learning by practices. The "Cadres" have to be self-confident in their knowledges before convincing farmers.

3. Supply sufficient materials, equipments, documents required for training and demonstration.

4. ARS may concentrate much more work on special problems such as: animal traction, noria pump, improved varieties, fertilizer use, thresher.

V. AGRICULTURAL RESEARCH STATION

It may be necessary to establish an agricultural research station at Gao because:

1. Gao is an isolated and remote area which has extremely local conditions distinct from other regions.

2. The improved varieties of rice imported from WARDA are not widely accepted by farmers because of their inadaptability and long growth cycle.

3. The agricultural research station will be a good start of the program of seed multiplication, if any, and may become a center of training and demonstration.

4. Seed supply is permanently insufficient.

5. No agricultural research station exists in Gao.

Current situation:

The agricultural research station has been carried out on 20 ha. of the plain of Tacharane since May 1980, with 4 major works planned:

(a) A surrounding insubmersible dike and a longitudinal dike dividing the station into 2 sections (6 has used for floating rice tests and 14 ha. reserved for irrigated crop test) was finished.

(b) A system of floating canal with main, secondary and tertiary has been built.

(c) It is expected to receive motor-pumps from USAID

(d) Office, storage and others (equipments, material) are not started yet.

Because of the lack in technical assistance, the works done at the research station (a, b) were found with 2 defects: (i) land was not levelled before installing canal system even when the area is small, resulting in sinuous shapes of canals, and some difficulties for future experiments, (ii) the existing canals (except for the main canal) are planned for overflow irrigation which narrows opened canals made by ciment, instead of a series of valve-controlled pipes. Consequently, water cannot be controlled for each field as desired; hot weather may cause great water loss, and over-flowing water may erode the base of canals.

Suggestion: The agricultural research station deserves to be supported because of its multi-purposes: adaptive research, seed production, and training and demonstration.

SUMMARY

1) Although the construction works began late, the area target of PP was reached about 53%. Some progress were made in seed treatment, improved varieties, increased hectarage of sorghum and cereal production. So, the overall goals were partly achieved. However, the efficiency of project seems relatively low regarding investment in the construction.

2) A small pilot project is proposed to show the improved efficiency of project. With reasonably additional works in plain of Tacharane, crop production may increase greatly as compared to actual situation by changes in cropping pattern, improved crop yields, and increased area cultivated.

Alternatively, to improve the present production At Tacharane and Gargouna an improvement of cultural methods and introducing of high yielding varieties of rice to a part of the plain have to be done.

3) The program of seed multiplication is proposed to solve permanent problems of seed supply for ARS.

4) A program of adaptive research is suggested to identify suitable improved varieties for farmers.

5) To establish the technological bases for future rural development, extension systemshas to be intensified with enough staff members, sufficient equipments, materials, documents, and a suitable place for training and demonstration works.

6) An agricultural research station in Gao is needed for adaptive research, seed multiplication and perhaps training and demonstration.

With many separate plains along both sides of Niger river, Gao really has a potential to be self-supporting in their staple foods. Some modifications and redesign of the original project will promote substantially increased production of crop in the intervention area.

APPENDIX I : Program of Seed Multiplication at the 7th Region.

I - Reasons for seed multiplication program at the 7th Region

The situation of seed supply at the Region has become a permanent concern to the Action Riz-Sorgho because of the following reasons:

1) the sources of supply (Mopti and Ségou) are remote from area cultivated (500 km or more) and costly due to transportation;

2) seeds are always insufficient and the supply is too late every year;

3) improved varieties imported are not adapted to local conditions;

4) farmers usually lose their seeds due to the irregular pluviometry.

II - Objective

The program of seed multiplication will provide 220 tons of selected seeds to farmers each year. This amount of seeds will satisfy only one fourth of the area cultivated a year, i.e. 2,500 ha. After 4 years the improved seeds would cover major area cultivated; then the new source of selected seeds will be introduced to farmers.

III - Implementation of the seed multiplication program

In general, seed multiplication consists of four phases:

1) Breeder seeds are produced at Central Research Station such as Mopti or others;

2) Foundation seeds are produced at Regional Agricultural Research Station of the 7th Region (RARS) with 1,6 ton at 2,7 ha;

3) Registered seeds are produced at RARS and contract farmer fields with 16 tons at 20 ha;

4) Certified seeds are produced at contract farmers' fields with 200 tons of seeds on 200 ha.

Summary of seed multiplication program for floating rice at the 7th Region

Years	Phase	Yield Tons/ha	Area Ha.	production Tons	Locations
	Breeder seeds	-	-	0,216	Wards or others
1981-82	Foundation seeds	0.6	2.7	1.6	RARS
1982-83	Registered seeds	0.8	20.0	16.0	RARS - Farmer fields
1983-84	Certified seeds	1.0	200.0	200.0	Farmer fields

Phase III or Certified seeds becomes the most crucial among the phases since it will increase a tremendous amount of seeds available for the farmers' needs. In order to achieve the above goal two important aspects must be considered:

a) Technical aspect

The program requires at least one seed specialist at each section to follow-up the conditions of seed fields and advise the growers to maintain the quality of seeds. A short term training on seed production would be provided for the section chiefs who will become field controllers.

A small size of seed laboratory with a minimum equipments such as, seed germinator, moisture tester, purity determining instrument, seed separator, plastic trays, paper towels, cotton... should be set up at the RARS to test the quality of seeds. And the criteria for seed quality would be established by the local government.

b) Financial aspect

A revolving fund would be available to buy 220 tons of registered and certified seeds from contract farmers. Then seeds will be loaned to other farmers for planting next year. This procedure will save a lot of expenses from transportation and avoid the lateness of seed supply happening every year.

The revolving fund would be MF 36,000,000 to collect 200 tons of registered and certified seeds at the price of MF 180/kg. A part of the fund will come from seeds collected from previous years.

APPENDIX II : Program of adaptive research at the 7th Region, 1981-82.

VARIETAL TEST

I - Objectives

There are some different comments on the performance of selected cultivars imported from WARDA, Mopti. Also, annual reports of Action Riz-Sorgho (ARS) did not show the superiority in grain yield of selected cultivars over the local ones. Therefore, the objective of this experiment is to test the adaptability of selected cultivars as compared with local cultivars at the 7th Region.

II - Locations

The experiment will be carried out at Agricultural research station and farmer fields at Maynadoue, Gargouna, and Bara.

III - Cultivars

The ten cultivars will be used at seeding rate of 80kg/ha:

Local:	Moberi	Selected	Mali Sava
	Kossa		DF 52 - 37
	Loubi		Nang Tien
	Sabaria		IR[illegible]
	Tétéra [illegible]		Milo Grand [illegible]

IV - Experimental design

The design of completely randonized block will be supplied with four replications and ten cultivars. Plot dimension will be of 3 x 5m (Table 1)

V - Cultural practices (Table 2)

Land preparation: soil will be plowed once after water recession and harrowed twice before sowing.

Fertilization : the formula 64 - 4[illegible] - 0 will be applied under the form of ammonium phosphate (35%) and urea (46%). All ammonium phosphate will be incorporated into soil during land preparation. Urea will be applied a week before flood arrival.

Weeding: Hand weeding will be done at the seedling stage and flodd arrival, if necessary.

Insecticide: HCH (25%) will be applied at 2.5 kg a.i/ha at 4-week intervals starting one month after flooding.

VI - Data collection

- date of land preparation
- date of fertilizer application
- date of sowing and germination
- date of first flood arrival
- elongation and water level at 3-day intervals (Research Station only)
- date of 50% heading
- date of harvest
- grain yield (cut 5 rows of 13 rows at the center of the plot and discard two border rows at each side; thresh them and take the wright 3 days after drying in the field)
- record all incidences and estimate damages during growing season
- grain yield components (research station only) taken by using iron frame of 30 x 66 cm
- grain - straw ratio (research station only).

VII - Materials (4 locations)

- 10 cultivars	: 4kg/variety	
- fertilizer	: urea (46%)	: 39 kg
	ammonium (35%)	. 37 kg
- thiural	. 3 sachs	
- HCH (25%)	: 2.4 kg	
- stakes	: 22	
- strings	: 506 m/experiment	
- row maker	: 2	
- measurement stakes	: 4	
- land	: 23 x 34 m/experiment	
- labor	: cadres and farmers.	

VARIETAL COLLECTION

I - Objectives

Local varieties and promissing varieties (or lines) will be collected from different sources and evaluated for their performance under local conditions. Hopefully, some of them may be suitable to the environment of the 7th Region.

The varieties collected will include both floating rice and irrigated rice.

II - Experimental methods

1. Seeds of each variety are sown on the three 3-m rows with 25 cm between rows;
2. land preparation is done by plowing once and harrowing twice:
3. fertilizer formula used is 64 -45 - 0;
4. hand weeding twice: one and two months after sowing;
5. no insecticide and fungicide treatment is required.

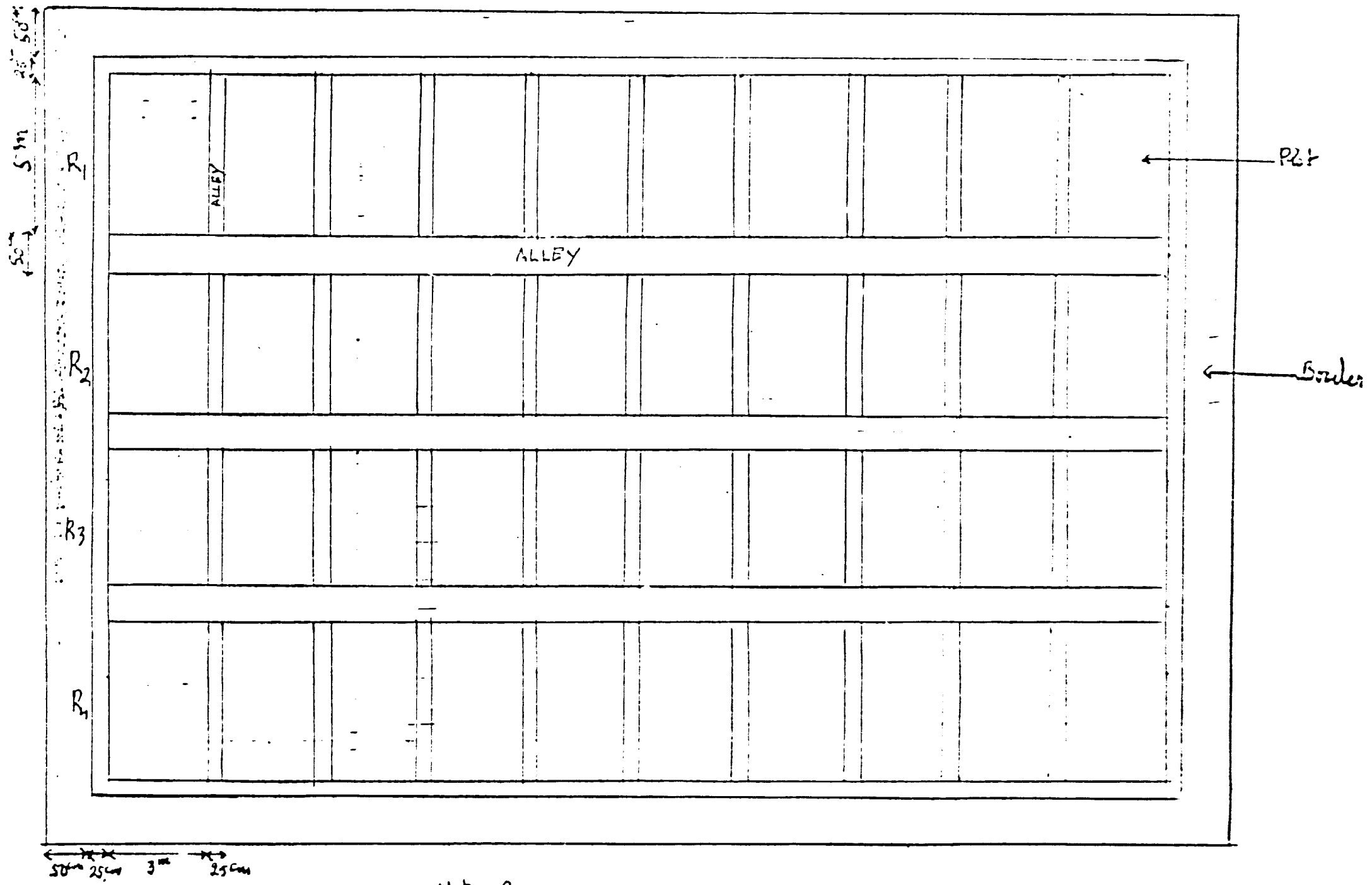
III - Data collection

1. Date of sowing
2. Date of 50% flowering
3. Date of first and last flowering
4. Plant height
5. Date of harvest
6. Degree of resistance to pests
7. Panicle weight (10 panicles taken at random for each variety)
8. Grain number/panicle
9. Sterility percentage.

IV - Material preparation

1. Varieties (or lines): collect from different sources
2. Fertilizer: 64-45-0
3. Stakes, tags, sacks, envelops,...

Table 1 = EXPERIMENTAL DESIGN OF VARIETAL TEST (1951-52)



Note : R = Replication

Table 2: Tentative work schedule (Varietal test (1981-1982

Work items	February			March			April			May			June			July			August			Sept.			October			November			December			January		
	1	15	28	1	15	31	1	15	30	1	15	31	1	15	30	1	15	31	1	15	31	1	15	30	1	15	31	1	15	30	1	15	31	1	15	31
Program discussion	—	—	—	—	—	—																														
Material prep	—	—	—	—	—	—	—	—	—																											
Meeting with zone and secteur chiefs				—	—	—	—	—	—																											
Selection for locations				—	—	—	—	—	—																											
Land preparation										—	—	—	—	—	—	—	—	—																		
Fertilization										—	—	—	—	—	—	—	—	—																		
Weeding																			—	—	—														
Insecticide application							—	—	—													—	—	—	—	—	—	—	—	—						
Harvest							—	—	—																—	—	—	—	—	—	—	—	—			
Data collection							—	—	—				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
Report							—	—	—																									—	—	—