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INSTITUTE OF AGRICULTURAL RESEARCH

IAR/EPID COOPERATIVE PROGRAMME

WORETTA

RESEARCH PROJECTS

1977/78

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IAR/EPID COOPERATIVE RESEARCH

PROGRAMME

PROJECTS FOR WORRETTA, IAR/EPID, SITE, 1977/78 (W)

Team Leader: Mr. F. Pinto, IAR - HQ

RICE (Rc)

- W(Rc) 1 Sowing Date Investigations on Rice, 1977/78
- W(Rc) 2 Fertilizer Trial on Rice, 1977/78
- W(Rc) 3 Variety Observations on Rice, 1977/78

TEF (Tf)

- W(Tf) 4 Teff Variety Trial, 1977/78
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OTHER CROPS

- W 6 Chickpea, Lentil, Safflower, Lupin, Wheat Variety Observations, 1977/78
- W 7 Investigations on Forage Crops

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PROJECTS FOR WORETTA, IAR/EPID SITE, 1977-781. BACKGROUND:

The Woretta site is typical of the Fogerra plains which are inundated from July to September and parts continuing into December. The area invariably suffers from food shortages. The main field crops are teff, dagussa and noug grown in June-July and some chickpea, safflower and wheat grown in September/December. The garden crops include maize, mustard and red pepper. Area and production of these crops is low due to problems with drainage, diseases and pest.

There is scope for improving the situation of the traditional crops. Better teff and dagussa can be grown on oxen and hand-made 1 m raised beds along the contour (some seen locally), using fertilizer. Teff smudge may be reduced by using uncontaminated seed and a seed dressing but more research is needed. The use of residual moisture for increasing production of crops like chickpea, wheat, safflower, lentil and lupins needs investigation.

Over the past two years, because of the difficulty in obtaining staff, the programme has focussed on rice i.e. highland, rainfed rice (grown in banded beds on natural rainfall). If its introduction were successful it could provide a highly-productive main crop during the rainy season and offer possibilities for double cropping.

2. BRIEF REVIEW OF PAST WORK ON RICE:

In 1975-76, some 22 varieties were tested, originating in the cold highlands of Nepal and N. Italy. Four varieties Allorio, Pierrot and RM (Italy) and Madise (Nepal) were selected, giving paddy yields of 13 to 36 q/ha. The major problems were the high amount of unfilled grains, high incidence of brown pannicle, some bacterial streak and some damage from the stalk-eyed shootfly. As the rains had terminated by end August that year, it was not clear if the sterility was due to moisture stress or caused by low temperatures.

In 1976-77, three tests were conducted. The first was a simple screening of 37 special varieties, obtained with assistance of IITA, from IRRI, Sierre-Leone, India, Nigeria and including the previous best from Italy and Nepal. Unfortunately the plots were deep-flooded (50-70 cm) for 2-3 weeks soon after sowing and poor stands resulted. However, the old varieties from Italy and Nepal gave good stands and were by far the more promising, especially Pierrot and Allorio.

The second test was a time and method of sowing using the four best varieties of 1975, with the prime objective of checking on the cause of the sterility. Treatments were (1) dry sowing in rows by mid-June; (2) sown in rows end-June early July; (3) transplanted (July) in rows using 20 days old seedling; (4) transplanted (July in rows using 30 day old seedlings). One such experiment could be irrigated to remove water stress at end of season.

Treatments 1 was not sown till 21 June; treatments 2 and 3 were not possible as the area was under deep flood in early July and treatment 4, received the flood after 4 days of transplanting and stands were badly affected. Treatment 1 was not affected by the floods and looked well. Notes were taken on dates of primordia initiation, 50% heading, diseases panicle analysis for disease and sterility and all harvest data.

The main conclusions are:

- a) The prospects for direct seeding (broadcast/oxen) seem good. It may therefore not be necessary to adapt a transplant culture.
- b) The sterility is caused by low temperatures before or during anthesis, (not at any other stage) and not by lack of moisture.
- c) Sterility ranged from 25 to 64% in treatment 1 and 39 to 76% in treatment 4. The variety (R.M.) recorded 45% mean sterility but was susceptible to bacterial streak. The variety Pierrot recorded 41% and Allorio 48%. (IRRI reports 9-29% as general in the tropics; Japan 10-20%; California 3-35%).
- d) The two better varieties on all counts were Pierrot and Allorio; they took on average 84 and 72 DAS to panicle initiation, 118 and 97 DAS to 50% heading and 148 and 130 DAS to maturity, respectively.
- e) Data suggests that sterility may be lowest when either:
  - a) mean min. temps at primordia initiation are  $> 10.8^{\circ}\text{C}$ . (before 18 Aug.).
  - b) mean daily min. temps between PI and 50% heading  $> 10.4^{\circ}\text{C}$ .
  - c) mean daily min. temps from 8-12 days before 50% heading  $> 10.3^{\circ}\text{C}$ .

Data suggests better results would be obtained if flowering occurs before 10 September - (min. temps  $> 10.5^{\circ}\text{C}$ ).

This suggests that under Woretta conditions optimum results would be obtained if sowings can take place before 6 June (say end May early June) for the better early varieties.

- f) Incidence of brown panicle ranged from 2% to 49% for various treatments. The mean for varieties were: All'orio 8%; Pierrot 16%; RM 24% and Madise 27%. Levels were generally lower in the transplanted plots. Cause of the problem was not identified but may be physiological.
- g) Bacterial streak was high in variety RM and lowest in Madise. The local wild rice shows susceptibility. Resistance to this disease would be important in future.

Projects Suggested for 1977:

1. Staff:

One new F/A is available and also some local supervision from the EPID co-ordinator at Woretta. The programme to be handled is shown under "standard projects" below. Should additional facilities be made available, "extra projects" listed below can be developed. It is hoped that the extension agent at Hamusit can be recruited to supervise the programme.

RICE (Rc): Three investigations are proposed as follows:

Wo Rc.1 Sowing Date Investigations on Rice, 1977/78

Objective: To relate date of sowing with minimum temperatures at critical growth stages and study the effect on spikelet sterility, incidence of brown panicle and yield components.

Duration: 1 year

Treatments: -SD 1 - 16 May using pre-germinated seed if soil wet or dry seed if soil dry.  
 -SD 1A - 16 May - establish nursery using pre-germinate seed and transplant 20 day seedling on 6 June.  
 -SD 2 - 26 May - pre-germinated seed.  
 -SD 2A - 26 May - establish nursery as for 1A and transplant 20 day seedlings on 16 June.  
 -SD 3 - 6 June - pre-germinated seeds.  
 -SD 4 - 16 June - " "  
 -SD 5 - 27 June - " "

Design: RCB, 3 reps.

- Plot Size: 2 m (8 rows, spacing 25 cm x 25 cm) x 5 m.  
Net 1.5 m x 4 m. Use 3.4 seeds/hill, sow 5 cm deep. Final stand 2 plants/hill.
- Area needed: 3 beds, 6 m x 20 m each. Bunds prepared for each bed before seeding. Bunds 20 cm high and to be raised to 40 cm high on 1 September.
- Fertilizer: Basal 46/50 kg/ha ( $P_2O_5$ ,  $K_2O$  incorporate.  
46 N kg/ha applied 6 days after emergence, and again at tillering (30 days later) i.e. soon after 1st weeding.
- Weeding: 4 weeks after emergence and then as necessary
- Variety: Pierrot
- Records:
1. Daily meteorological records (rainfall 9 a.m.), maximum (6 p.m.), minimum (9 a.m.). Have spare min. thermometer in stock, calibrate.
  2. Dates of primordia initiation, 1st ear emergence, 50% flowering, 85% maturity, actual harvest
  3. Depth of standing water at 3 first stages indicated above.
  4. Panicle analysis for sterility/brown panicle at seed setting (2 wks after flowering or so).
  5. Score for lodging, disease, pest and height at maturity.
  6. Take total tiller and seed bearing tillers count per 4 hills in central row, without cutting plants.
  7. Mark net plot, harvest panicles as they ripen in 2-3 stages. Cut net plot and obtain straw and grain weights separately. Record 100 grain weights per plots later or send samples to Holetta of about 50 grams.

Wo Rc 2. Fertilizer Trial on Rice, 1977/78

The chromic vertisol soil at Woretta is excellent for growing rice. Analytical results indicate low total nitrogen (0.10 - 0.13%), moderately high available  $P_2O_5$  (50-55 ppm) and medium K at 200-250 ppm, being just over 1% of CEC. As the variety, Pierrot, has shown satisfactory adaptation in the area it is proposed to conduct a simple trial, using NPK on this variety to obtain some base data for possible demonstration use.

Design: RCB, 2 replications.

Treatments:	<u>N</u>	<u>P<sub>2</sub>O<sub>5</sub></u>	<u>K<sub>2</sub>O</u>
A =	0	0	0
B =	46	0	0
C =	46	46	0
D =	46	0	50
E =	46	46	50
F =	92	0	0
G =	46 + 46 <sup>T</sup>	46	50
H =	46 + 46 <sup>T</sup> + 46 <sup>PI</sup>	46	50

N as Urea:  $P_2O_5$  as TSP and  $K_2O$  as Pot. Sulphate. First dose, N or  $P_2O_5$  or  $K_2O$  to be incorporated into soil before planting. Second N dose given at tillering (30 days after emergence); third N dose at primordia initiation (80 days after emergence).

Plot Size: 6 m x 8 m each. Each plot banded separately to avoid mixtures after flooding. Net plot 3 m x 6 m.

Variety, etc.: Pierrot, 40 kg/ha seed rate. Seed sown at 3 seeds/hill after pre-germination, spacing 25 cm x 25 cm. Thin to 2 plants per hill later.

Sowing Date: 1st week of June.

Records: As for Rc1

W Wo Rc 3. Variety Observations on Rice, 1977/78

The better varieties tested so far plus new varieties received will be sown for observations:

Sowing Date: Late May.

Plot Size: 3 m x 4 rows at 25 cm. Sow pre-germinated seed at 3/hill, 25 cm x 25 cm. Thin to 2 plants/hill later.

Material:	A. Varieties from N. Italy	=	3
	B. " " Obs./76-77	=	5
	C. " " IRCTN/76-77	=	7
	D. New Accessions	=	6+

Fertilizer: Basal 46/46/50 (N/P<sub>2</sub>O<sub>5</sub>/K<sub>2</sub>O) kg/ha incorporate. Apply 46 N kg/ha at tillering, soon after 1st weeding.

Records: As for 'Re. for the better varieties only.

Harvest: Better varieties, whole plot to be maintained.

Extra Projects: These may be carried out if extra staff/supervision is made available.

Tf 4. Teff Variety Trial:

As provided by Debre Zeit and based on results of 1976-77 trial at Gumerra. The trial will be grown on 1 m wide raised beds, made on the contour using the local plough. Fertilizer (1 q/ha Urea) to be used.

Tf 3. Chemical Control of Smudge Disease in Teff

A similar trial to that carried out in 1974 (Woretta Projects - 2.2.3) using seed and spray treatments should be repeated, using local infested seed. The trial will be done on flat land either at Woretta or Gumarra.

Other Crops:.01. Chickpea, Lentil, Safflower, Lupin, Wheat Variety Observations

These crops could be tested during the winter season on residual moisture. It would be useful to time their planting after the rice crop is harvested to provide for possibilities for double cropping.



02. Investigations on Forage Crops:

Local species of forage crops do well given deep ploughing and little fertilizer. Introduced species of *Echinochloa* with good forage value would be worth testing.

Wc. 4 Co-operation

To undertake even this small programme, the cooperation of EPID staff and the national coordinators as well as the field crops and crop protection departments of IAR will be necessary.

If the rice plots grow well, it may be profitable to call in Dr. I. Buddenhagen, rice specialist, IITA to pass judgement on its' future possibilities for this problem area.