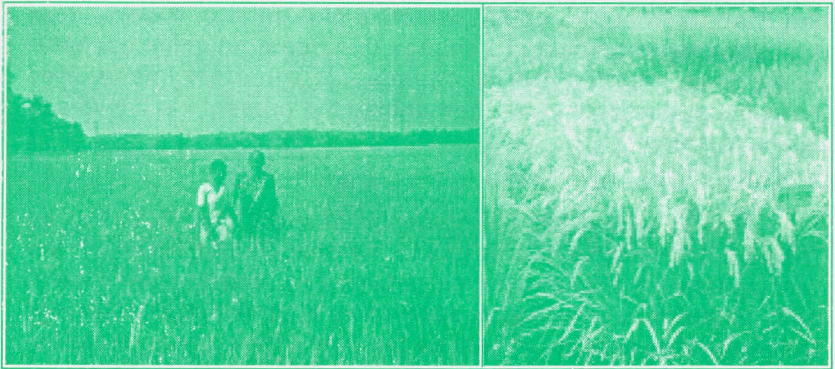


Technology for



HYBRID RICE CULTIVATION



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Technology for Hybrid Rice

INTRODUCTION :

In Goa, rice cultivation is proving to be a non-remunerative enterprise because of several reasons like the increasing cost of cultivation and fragmentation of land etc. It takes approximately Rs. 3.50 to 4 to produce 1kg of paddy. The average net income from one hectare of paddy works out to Rs. 8,044/- This profit margin is further decimated due to small land holding since majority of tillers own hardly half to one acre of land. The average rice productivity in the state is 3,984kg/ha. {3829kg/ha in Kharif and 4225kg/ha in rabi} incidentally is much higher than the average national productivity of 1,920kg. The present rice deficit in the State is about 35,000mt. which is met through imports from the neighbouring states. To change this rice production scenario in the state, the rice hybrids can play an important role as they have the potential to more than double the present yield levels in farmer's fields.

WHAT IS RICE HYBRID?

Hybrid exploit the phenomenon of hybrid vigour called as "heterosis". Hybrid vigour refers to the phenomenon in which the first generation (F1) population obtained by crossing two genetically different parents, show superiority in growth and yield over the respective parents as well as the best of the ruling varieties.

The development of hybrid rice, involve the use of an effective male sterile system. Hybrid rice is developed utilising male sterility system by using

- "A" line or the male sterile line.
- "B" line or the maintainer line.
- "R" line or the fertility restorer line.

SUPERIORITY OF HYBRID

A hybrid performs better because of its inherent heterotic vigour. This is due to:

- Higher physiological efficiency such as higher photosynthetic function, root activity etc.
- Multiple resistance to major insect pests and diseases.
- Wider adaptability to varied environments like drought tolerance, salinity etc.. and
- Increase in yield of 15-20 per cent over pureline rice varieties.

RESEARCH ACCOMPLISHMENTS

The ICAR Research Complex for Goa has evaluated the performance of eleven rice hybrids from various sources along with

two national check varieties and three local checks during 1998-99. The results have been found to be very promising and are reproduced in the table.

Table : Performance of rice hybrids in Goa during 1998-99

National Check varieties: Jaya and Rasi Local Check varieties : Jyoti, Indrayani and Vytilla-1									
Entry	Yield Kg/ha	Advantage (Kg) over				% Increase over			
		1	2	3	4	1	2	3	4
KJTH -	7600	884	940	2200	2540	13.2	14.1	40.7	50.1
PHB-71	7400	684	740	2000	2340	10.2	11.1	37.0	46.4
DRR1	7233	517	573	1833	2173	7.69	8.6	33.9	42.9
APHR	6830	114	170	1430	1770	1.69	2.5	26.5	34.9
PA-	6800	84	140	1400	1740	1.25	2.0	44.5	34.4
1= Jaya		2= Rasi		3= Jyoti		4= Indrayani			
* Average Rice productivity of Goa									
Kharif 3829kg			Rabi 4225kg			Average 3984kg			

The results indicate that the variety "Sahyadri" (Karjat hybrid) has outyielded all the other hybrids tested, yielding 7,600kg/ha followed by PHB-71(7,400kg/ha) and DRRH-1 (7,233kg/ha)

If we take into account the average rice productivity of Goa which is roughly 3984 kg/ha, the yield advantage by use of hybrid rice would be a staggering 3616 kg/ha for Sahyadri, 3416kg/ha for PHB 71 and 3249kg/ha for DRR-1 respectively, corresponding to a percent yield increase of 90.76%, 85.74% and 81.55% for the best three varieties. However, if we take into account the low yield of about 3000 to 3200kg/ha which is normally realised by most of the farmers in Goa, the advantage of Sahyadri would be more than 4000kg/ha.

THE INPUT PACKAGE

Variety : Use genuine seed of Sahyadri, PHB-71 or DRRH-1

Seed rate : 20kg/ha (8kg/acre)

Manures : Add 8-10t of FYM or Green leaf manure.

Fertilizers: 100: 50:50kg NPK/ha.

- Basal : 50:50:50kg NPK/ha.
- Top dressing I : 25kg N/ha. 25-30 days after transplanting
- Top dressing II : 25kg N/ha. 75-80 days after transplanting

Weedicide : 15 kg Benthocarb G/ha.

Pesticides : Need based with Carbofuran 1kg a.i. Monocrotophos or Endosulphan and Carbendazim.

NURSERY MANAGEMENT :

The nursery area is 10% of the main field. i.e. for one hectare main field, the nursery area should be 1000m². Plough the area and add 0.5 to 1 kg N₂ and 0.5 kg P₂O₅ and K₂O for 1000 m² of nursery area. Level the field and prepare seedbeds of 1.5m width and of convenient length having 30cm channels between.

Select the seed for sowing using the common salt solution technique. (1.65kg salt in 10lit. water) Treat seed with fungicides like pyroquilon (Fongorene 50WP) or Tricyclazole (Beam 75WP) @ 1g/kg seed or with Carbendazim @ 2g/kg seed. Soak the seed for 24h in water and incubate them in gunny cloth for 48h with occasional sprinkling of water. Sow thinly over the nursery beds in lines and cover with soil and irrigate.

MAIN FIELD PREPARATION

Plough the field three weeks before planting and submerge with 5-10cm of standing water. Add 10t of FYM or 10-15t of green manure and incorporate by puddling. Apply the basal dose of fertilizer and incorporate in soil. Ensure proper levelling of the field.

Transplanting : When the seedlings in the nursery area are 21-25days old, they are to be carefully uprooted to avoid root injury. Transplant 21-25 day old seedling (4-5 leaf stage) at a depth of 3-4cm at a spacing of 20X15 cm.

Only one seedling has to be planted per hill in case of hybrid rice, unlike 2-3 in case of other rice varieties. Gap filling is done twice first after a week of planting and again after 15 days.

INTERCULTURE :

Weeds are the main enemy which reduce the yield substantially. Hand weed once after 20 days of planting before the first top dressing of urea. Wherever weed problem is severe, apply weedicides like such as Anilophos or Butachlor 1.5kg a.i. or Benthocarb 1.5 kg a.i./ha. The granular form is convenient to apply than the liquid. Mix equal quantities of weedicide and sand and broadcast in the field uniformly and maintain the water level to 3-4 cm for 3-4days. The weedicide application must be done within 3-5 days of transplanting. Weedicide application may be done under the guidance of experts.

WATER MANGEMENT :

Proper water management facilitates good tillering, increases the efficiency of nitrogen use and helps to reduce weed population. Uniform levelling of field and providing proper drainage are most essential for effective water management.

- Always drain out water before nitrogen (Urea) application and let in water 24 h later.

- Depending on the soil type, drain out water 15-20 days after 50% flowering. This ensures fast ripening of grains and quick hardening of soil for harvesting.

NEEM COATED UREA

The losses of nitrogen applied in form of Urea are many and it results in loss to the farmer. Blending urea with neem cake is an effective technology which can be easily practiced.

MATERIALS :

- Coal tar used for road surfacing (3kg/100kg Urea)
- Powdered neem cake (30kg/100kg Urea)
- Kerosene oil (approximately twice the weight of coal tar)

METHOD :

Heat the coal tar to dissolve in a metal container. After slight cooling, add kerosene slowly in the container with constant stirring until a solution is obtained. Pour the coal tar solution over the heaped urea and mix thoroughly. The finely powdered neem cake is then added to the urea and the contents are mixed again so as to get uniform coating of neem cake over urea granules. The material is then ready for application. This will avoid nitrogen losses.

PLANT PROTECTION :

Like other rice crops the hybrid rice is also attacked by certain insect pests and diseases though the severity is less due to the inherent character of the hybrids. The important insect pests and diseases of hybrid rice in Goa alongwith their suggested control are listed below

Name of Pest/disease	Control Measure
Leaf folder	Spray monocrotophos, Chlorpyrifos, Quinalphos, Phosphamidon @ 0.5kg a.i./ha.
Case worm	Drain water. Spray Endosulfan/Monocrotophos or Carbaryl @ 0.5kg a.i./ha. Or carbofuran @30kg/ha
Brown Plant Hopper	Spray Carbaryl 0.75kg a.i./ha, Monocrotophos, Phosphomindon @0.5kg a.i./ha. or apply Carbofuran granules @ 0.75kg a.i./ha.
Gall Midge	Apply Carbofuran or Phorate granules @ 1 to 1.5kg a.i./ha or spray Monocrotophos @ 0.5 kg a.i./ha. In endemic areas, adopt seedling root dip with Chlorpyrifos before planting.
Stem Borer	Apply Phorate or Carbofuran granules @ 1-1.25kg. a.i./ha Adopt seedling root dip method. Spray Quinalphos, Phosalon Monocrotophos, Chlorpyrifos or Endosulphon @ 0.5kg a.i./ha.

Diseases

Blast	Adopt seed dressing with Pyroquilon (Fongorene 50wv) or Tricyclazole (Beam 75WP) @ 1g/kg seed. Spray Carbendazim or Ediphenphos @ 01%
Bacterial Leaf Blight	Reduce nitrogen application & apply in split doses. Skip top dressing of urea.
Stem Rot	Drain fields. Spray mancozeb (Dithane M-45) @ 0.1% and addition of organic manure.
Sheath Blight	Apply Carbendazim or hexaconazole (contaf 5EC) @ 2ml litre water. Reduce or delay top dressing with urea. apply in split doses.

Economics of Hybrid rice in Goa

Parameters	Traditional variety	Hybrid
1. Yield		
Grain	4.5t/ha	7.6t/ha.
straw	3.0t/ha	3.5t/ha.
2. Income		
Grain	@ Rs. 4.50/kg+	4.50/kg+
Straw	@ Re. 1/kg.	@ Re.1/kg
3. Gross income	= Rs.23,250/-	= Rs.37,700/-
4. Cultivation cost	= Rs.15,206/-*	= Rs.15,796/-*
7. Net income	= Rs.8,044/-*	= Rs.21,904/-*
8. Benefit Cost ratio	1:1.52	1:2.70

* The cost of cultivation of one hectare paddy could further be reduced substantially if efforts to introduce and popularize mechanisation of rice farming with some useful implements and machinery like rice transplanter, rice seeder, use of chemical weedicides, rice harvester, winnower, thresher etc..., are made available to the farmers. Similarly trainings and demonstration on use of these implements and also it's upkeep and maintenance at field conditions is required to effectively popularize this technology which can be bring down the cost of cultivation to about 30-45 percent from the present level.

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