

Estimating varietal adoption patterns and investment in rice research in Orissa

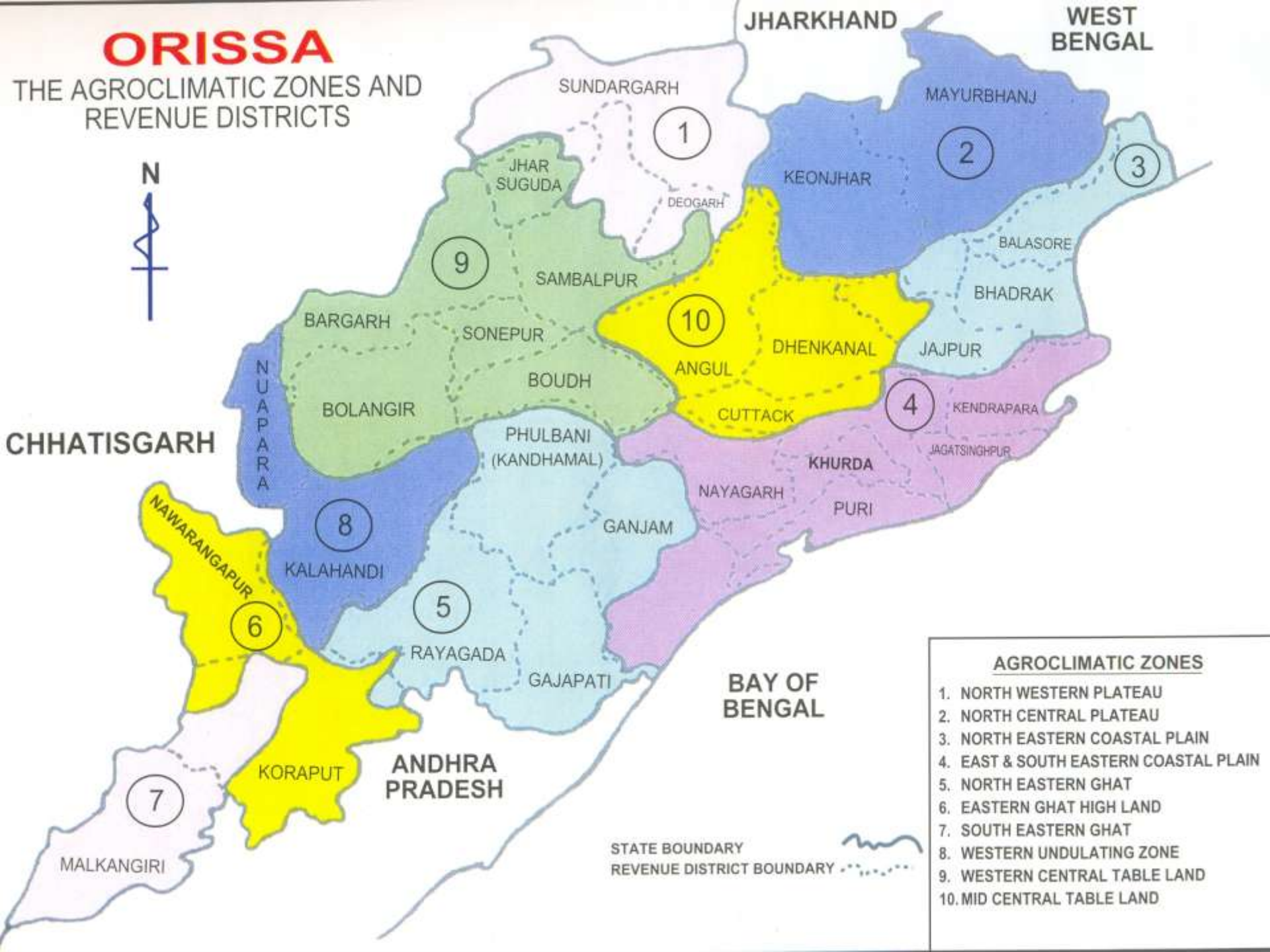
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ORISSA

THE AGROCLIMATIC ZONES AND REVENUE DISTRICTS



AGROCLIMATIC ZONES

1. NORTH WESTERN PLATEAU
2. NORTH CENTRAL PLATEAU
3. NORTH EASTERN COASTAL PLAIN
4. EAST & SOUTH EASTERN COASTAL PLAIN
5. NORTH EASTERN GHAT
6. EASTERN GHAT HIGH LAND
7. SOUTH EASTERN GHAT
8. WESTERN UNDULATING ZONE
9. WESTERN CENTRAL TABLE LAND
10. MID CENTRAL TABLE LAND

STATE BOUNDARY
REVENUE DISTRICT BOUNDARY

SUNDARGARH

1

MAYURBHANJ

2

3

JHAR SUGUDA

DEOGARH

KEONJHAR

BALASORE

9

SAMBALPUR

BHADRAK

BARGARH

SONEPUR

10

DHENKANAL

JAJPUR

N
U
A
P
A
R
A

BOUDH

ANGUL

CUTTACK

4

KENDRAPARA

BOLANGIR

PHULBANI
(KANDHAMAL)

KHURDA

JAGATSIINGPUR

8

GANJAM

NAYAGARH

PURI

N
A
W
A
R
A
N
G
A
P
U
R

KALAHANDI

5

RAYAGADA

GAJAPATI

BAY OF
BENGAL

6

KORAPUT

ANDHRA
PRADESH

7

MALKANGIRI

In general, the objective is to provide up-to-date information on research investment in rice varietal output and cultivar-specific adoption patterns in Orissa.

The specific objectives are:

- 1. To examine the varietal outputs of rice research institutes,**
- 2. To examine adoption pattern of modern rice varieties,**
- 3. To investigate the level of investment in rice varietal improvement and research allocation to the different rice ecosystems,**
- 4. To explore, develop and test new and fast methods for updating cultivar-specific adoption level in the future, and**
- 5. To validate estimates of varietal adoption from this method.**

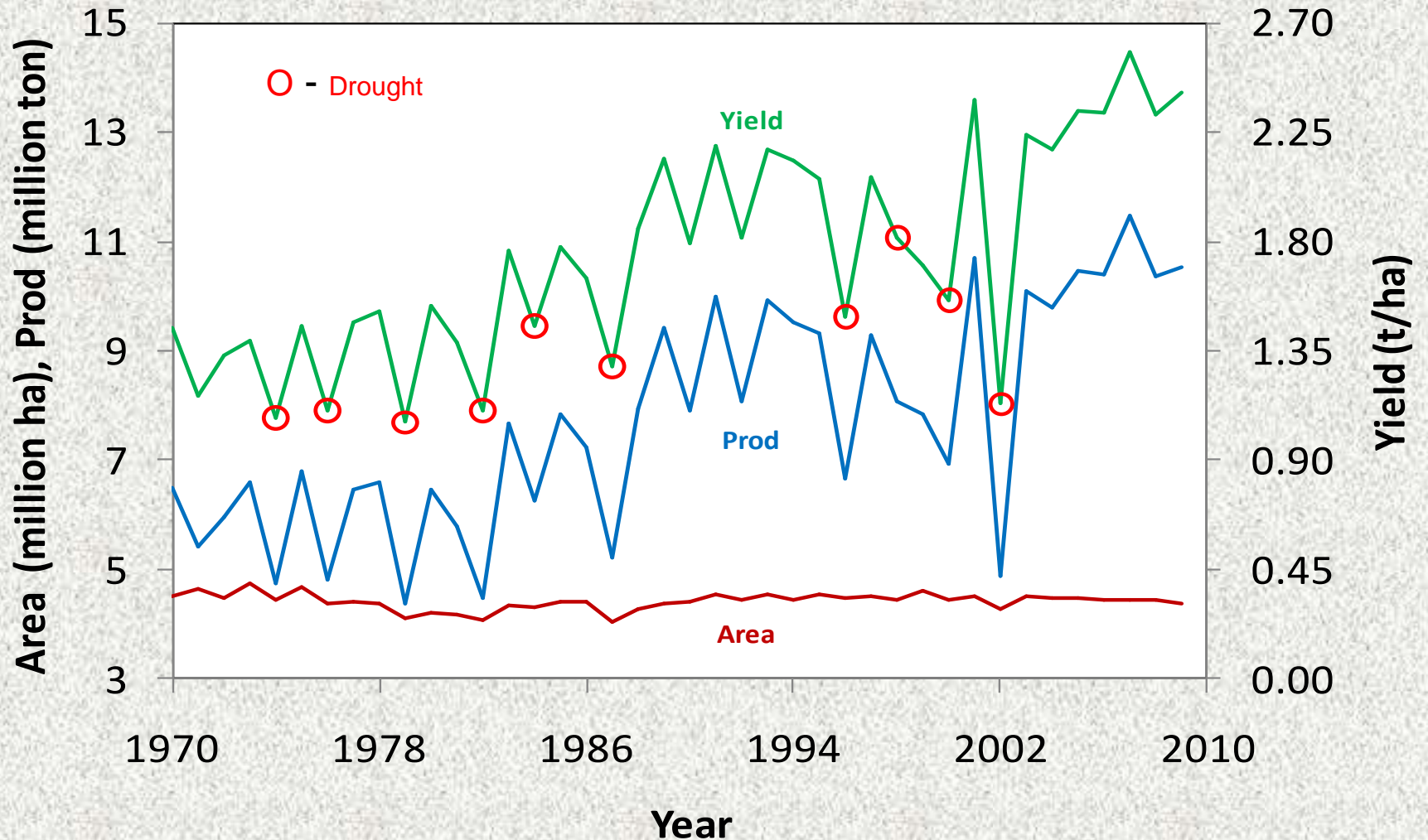
Methodology

- Estimating varietal release patterns & FTEs by ecosystem

Evaluating the following methods for updating the cultivar specific adoption level

- Harvest Plus Household Survey
- Expert Estimates at state and district level
- Information collected from Cost of cultivation of rice in Orissa by Commission for Agricultural Cost and Prices, Government of India
- Seed Replacement Rate of rice varieties

Trend in area, prod and yield of rough rice in Orissa



Number of rice varieties released in Orissa

Period	Number	%
1970 & earlier	6	4
1971-1980	22	15
1981-1990	42	29
1991-2000	36	25
2001-2010	38	27
Total	144	100
Rice area('000 ha) in 2009	4414	
Rice area/Number of varieties (per '000ha)	31	

Rice Growing Environment in Orissa, 1991

Rice environment	%Share
Irrigated	23
Upland	15
Rainfed lowland (RL)	39
<i>RL-Shallow favorable</i>	<i>6</i>
<i>RL- Shallow drought prone</i>	<i>16</i>
<i>RL-Submergence prone</i>	<i>17</i>
RL-Medium deep (25-50 cm)	11
Deep water (50-100 cm)	9
Floating rice (>100 cm)	3
Total rice area (m ha)	4460

Source: IRRI(1992) Annual Report for 1991, p. 201-202,
Revised: Singh, B.N. (2000)

Number of rice varieties released in Orissa

Ecosystem/Agroecology	No. of varieties			Percentage		
	1968-2010	1968-2007	2008-2010	1968-2010	1968-2007	2008-2010
Irrigated	54	49	5	37	39	25
Rainfed shallow lowlands	40	31	9	28	25	45
Upland	37	35	2	26	28	10
Semi-deepwater	9	7	2	6	6	10
Deepwater	1	1	0	1	1	0
Coastal saline area	3	1	2	2	1	10
Total	144	124	20	144	124	20

Time allocation of rice scientists (FTE)

Ecosystem	FTE	%
Irrigated	13.8	35
Rainfed	6.2	16
Upland	4.6	12
Deep lowland	2.8	7
Deepwater	1.2	3
Saline-affected areas	0.7	2
Shallow lowland	0.8	2
Unfavourable land	2.2	6
Across ecosystems	6.7	17
Total	38.9	100

No. of scientists in rice research and FTE

Discipline	No. of scientists		FTE	
	Number	%	Number	%
Plant breeding & genetics	19	44	18	45
Plant pathology	4	9	4	10
Plant Physiology	11	26	10	26
Entomology	6	14	5	12
Agronomy	1	2	1	3
Biotechnology	2	5	2	4
All disciplines	43		39	

Rice research investment per FTE in Orissa (Rs)

Institution	2000-01 to 2002-03	2003-04 to 2005-06	2007-08 to 2009-10
CRRI	182792	229045	526872
OUAT	56271	90600	113103

Area under MVs in Orissa (Harvest Plus survey, 2008)

Ecosystems	%Area	Major MVs (% Area)
All	76	Swarna(39), Lalat(10), Pooja(9), MTU-1001(6), Khandagiri(4), CR-1018(4), CR-1009(2), Others(26)
Irrigated	91	Swarna(35), Pooja(11), MTU-1001(7), CR-1018(7), Lalat(5), CR-1009(4), Others(31)
Partly irrigated & partly drought prone	64	Swarna(52), Sarala(8), T-141(8), Ranjit(7), CR-1014(7), Lalat(6), CR-1018(4), Pooja(3), Others(5)
Drought-prone	76	Swarna(38), Lalat(14), Pooja(8), MTU-1001(8), Khandagiri(5), Konark(3), Others(24)
Submergence prone	17	Swarna(45), T-141(11), CR-1030(10), Anada(7), Pooja(6), Sarala(5), CR-1018(4), Others(12)
Flood- prone	48	Swarna(44), CR-1018(13), Lalat(7), Khandagiri(6), Pooja(4), CR-1014(4), Others(22)
Flood & drought prone	73	Swarna(56), CR-1018(12), Pooja(8), Khandagiri(5), Sarala(3), Lalat(3), Others(13)
Coastal saline-drought & flood prone	48	Swarna(49), CR-1018(24), Khandagiri(12), Chakaakhi(5), CR-1009(4), Sarala(3), Others(3)

Area under MVs in Orissa (Cost of Cultivation survey, 2009-10)

%MV area in Orissa = 86

Varieties	%Area	Varieties	%Area
Swarna	24	Khandagiri	3
Pooja	13	CR-1009	3
MTU-1001	12	BPT-5204	3
MTU-1010	9	HMT Sona	2
Lalat	7	Sarala	2
CR-1018	3	Pratikshya	2
Khandagiri	3	Other MVs	16

Expert elicitation process

A. Process done at state-level

1. Assembled experts from different fields who are known to be knowledgeable in rice varietal adoption (Economists from OUAT, CRRI), Joint Director Information (Department of Agriculture, Orissa), representatives from seed certification agency and seed corporation and expert from district level (Deputy Director of Agriculture) .
2. Obtained experts' perception of cultivar-specific adoption in several rounds:
 - Round 1 – Initial estimates were made
 - Round 2 – Revised estimates after providing background information on rice varieties like varietal releases, seed distribution, etc.
3. Form experts into discussion groups with varying expertise in each group. Obtained estimates in several rounds:
 - Round 3 – Initial group estimates
 - Round 4 – Estimates by ecosystem
4. Combined groups for discussion. Obtained final estimates based on group consensus.

B. Expert Opinion at the district-level.

- Efforts were made to visit the experts (Assistant Agricultural Officers) at the block level of all the 314 blocks of 30 districts during the monthly review meetings at district headquarters.
- Variety specific adoption level at block level could be ascertained but no consensus could be arrived for the district level (Cuttack)
- Then officials at the districts level were approached for the exercises and whoever was approached, hesitated to do the exercise complaining about lack of time and ignorance. However the information was gathered from the district offices (DDAs) of 29 districts which did the estimates by calculating the Seed Replacement Rate of respective varieties for the year 2010 wet season rice. However, this did not reflect the varieties with the farmers who use their own seeds.
- District officials are highly obsessed with estimating their modern rice area coverage at higher percentage scale than that of the traditional landraces.
- Expert estimates at district level may not be an accurate method in estimating variety specific adoption level excepting in cases where SRR has crossed more than 50%. There exists some degree of error in estimating the variety specific adoption level through Expert Estimates, if the estimates are purely based on SRR without assessing the field level situations.

%Area under MVs in Orissa (Expert elicitation, 2010)

Ecosystems	%MV Area	Major MVs (%Area)
All MV	85	Swarna(30), Pooja(12), MTU-1001(9), Lalat(6), Pratikshya (6), CR-1009(4), Khandagiri(3), Others(30)
Irrigated coastal	90	Swarna(23), Lalat(12), Pooja(12), Pratikdhya(10), CR-1009(9), Naveen(8), Khandagiri(7), CR-1018(6), Others(13)
Irrigated inland	91	Swarna(38), MTU-1001(11), Pooja(10), Lalat(7), Pratikshya(7), MTU-1010(6), Khandagiri(4), Others(17)
Rainfed	77	Swarna(32), Pooja(13), Pratikshya(10), MTU-1001(9), Naveen (6), Khandagiri(6), Lalat(6), CR-1018(5), Others(13)

Comparison of %MV area by source of estimates

Districts	Expert Estimates 2011	Harvest Plus 2008	Official statistics 2006-08	Districts	Expert Estimates 2011	Harvest Plus 2008	Official statistics 2006-08
Balasore	80	73	80	Koraput	90	77	80
Bhadrak	84	80	84	Malkangiri	80	69	70
Bolangir	97	96	80	Nawarangpur	88	58	55
Sonepur	91	100	96	Rayagada	98.5	78	76
Cuttack	92	63	82	Mayurbhanj	83	69	68
Jagatsinghpur	98	78	90	Kandhamal	90	46	62
Jajpur	92	72	79	Boudh	99	83	76
Kendrapara	76	38	78	Puri	83	59	88
Dhenkanal	93	71	78	Khurda	91	70	80
Angul	94	76	84	Nayagarh	88	63	80
Ganjam	90	98	87	Sambalpur	95	93	88
Gajapati	99	95	76	Bargarh	99	97	92
Kalahandi	99	93	83	Deogarh	100	81	81
Nawapara	-	78	67	Jharsuguda	100	97	87
Keonjhar	83	77	73	Sundargarh	74	47	62
ORISSA					85	76	79

Seed Replacement Ratio (SRR, %) in Orissa

Year	Wet Season	Dry Season	Total
2000-01	8.50	3.75	8.28
2005-06	5.81	7.87	5.96
2009-10	18.33	30.47	19.07

Seed distribution by major rice varieties in Orissa, 2007-09

Varieties	Wet Season (Percentage)	Dry Season (Percentage)
Khandagiri	5	17
Lalat	7	42
MTU-1001	19	16
MTU-1010	2	18
Surendra	2	
Swarna	37	
CR-1018	3	
Pratikhya	3	
Pooja	11	
Rest	11	7
Total	100	100

Comparison of %MV area by source of estimates

Varieties	Expert Estimates 2011	Harvest Plus 2008	Cost of Cultivation 2009-10	SRR 2007-09
All MVs	85	76	86	80
Swarna	30	39	24	37
Pooja	12	9	13	11
MTU-1001	9	6	12	19
Lalat	6	10	7	7
Pratikshya	6	0	2	3
CR-1009 (Savitri)	4	2	3	1
Khandagiri	3	4	3	5
Samba Mahsuri	2	0	3	1
Naveen	2	0	0	0.6
Moti	1	2	1	0.4
CR-1018(Gayatri)	0	4	3	3
MTU-1010	0	2	9	2
Rests of MVs	25	23	20	10

Conclusions

1. 1980s showed a surge in rice production mainly due to promising rice varieties released.
2. 1990s showed a decline in rice production of rice mainly due to occurrence of abiotic stresses.
3. Research output suggests that, varietal outputs were heavily skewed towards irrigated environment during the beginning of the Green Revolution Era, and then slowly drifted towards the challenged ecosystem. However, still there are quite a less number of varieties for the fragile and underprivileged farming situations viz., deep water and saline prone areas.
4. Reallocation of research focus in recent years from irrigated and upland to rainfed and fragile ecosystems.
5. Despite release of 150 varieties, around 60% of the area is restricted to less than 15 varieties based on all sources of estimates (EE, HP, COC, and SRR).

Conclusions

6. Expansion of MV adoption did not bring about increase in rice yield.
7. Access to newer modern varieties and better crop management practices suitable to local conditions need to be made available to farmers.
8. FTEs of rice researchers indicate larger allocation of time to irrigated ecosystem than rainfed ecosystem.
9. State-level estimates obtained through expert elicitation method are close to other sources of information but this method is highly dependent on the willingness of the expert to participate in the process
10. Experts invited in district-level expert elicitation tend to rely heavily on information on seed distribution under the SRR program rather than putting their wisdom to arrive at the varietal level adoption. It is very difficult to coordinate large number of field experts at districts level to arrive at panel consensus and found to be highly time consuming.



Thank

You !!!