



Hybrid Rice Seed Production Scenario in India



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Global Rice

Rice is life – slogan for international year of rice (UN, 2004)

It is not just a simple food but, an element common to different cultures across world

The might of rice – truly a wonder crop

- ❑ **Cultivated in around 113 countries**
- ❑ **Staple food for over half the world's population**

Challenges ahead:



- Rapidly increasing population 1.47 billion by the year 2030
- Food requirement - 345 million tons
- Declining resources (Land and Water)
- Decreasing Labour availability
- Plateauing trend in the yield of HYV's
- Above all **adverse impact of climate change**



Ecosystem diversity in Rice



Irrigated 25m.ha -3.13t/ha



Rainfed uplands 5m.ha-0.8t



Rainfed lowlands 12m.ha-1.66t



Saline



Hill Rice

Average Paddy Yields (t/ha)

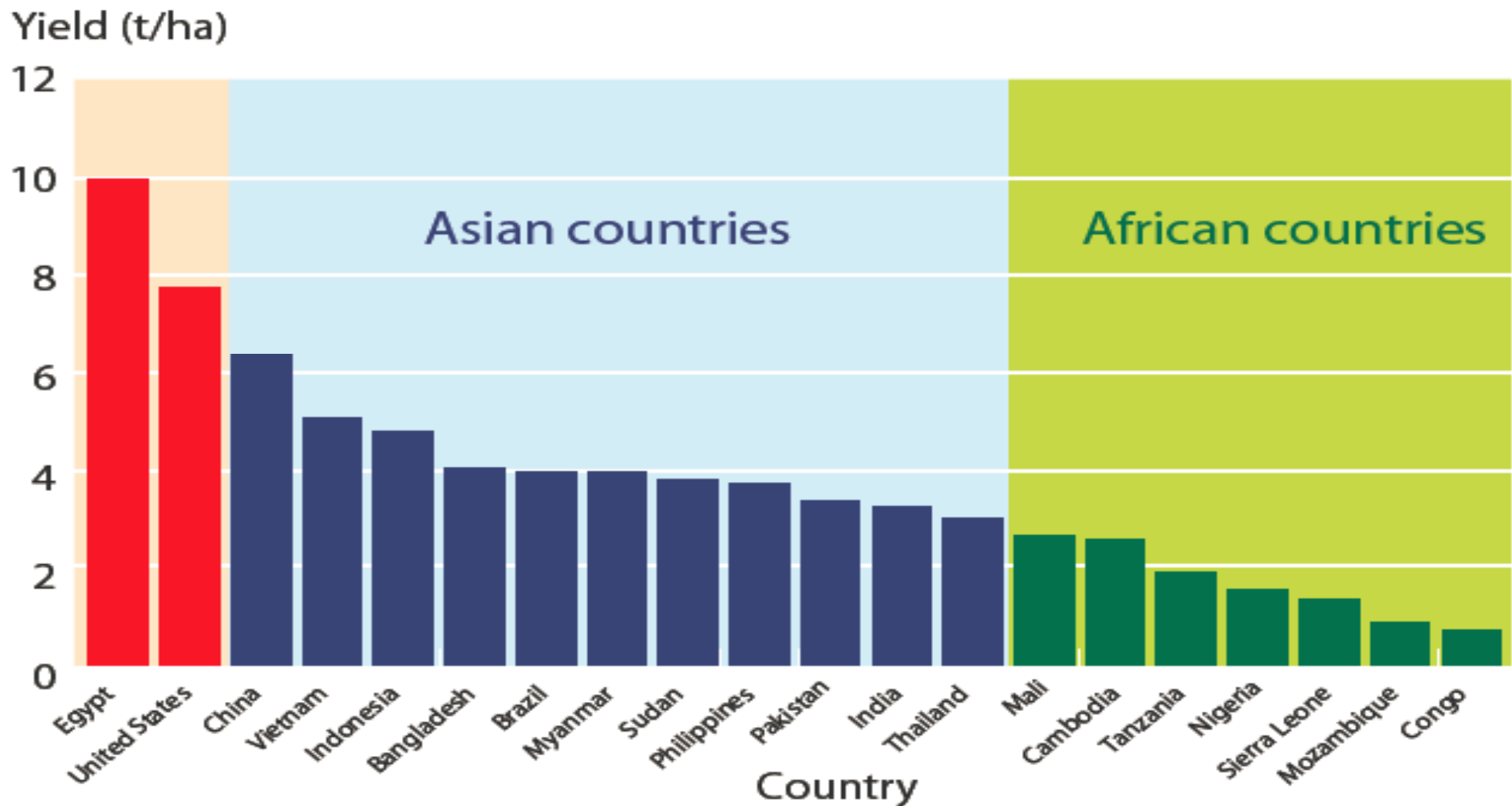


Fig. 2. Average paddy yields (2005–06–2009–10).
Data source: FAOSTAT (2011).

Hybrid Rice – Key to Food Security



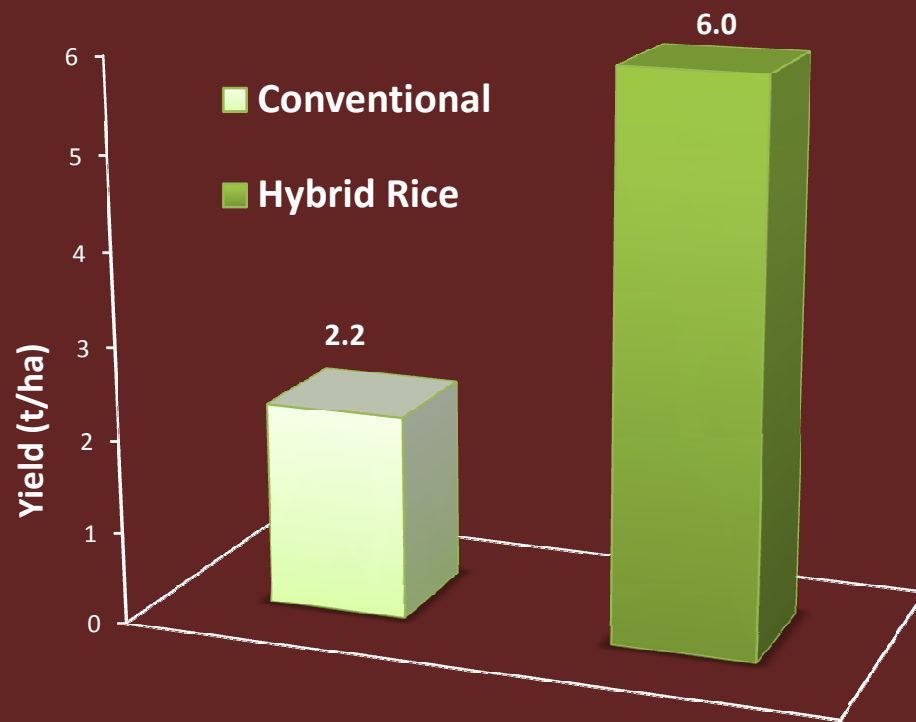
Yield advantage of hybrids (15-20%) over varieties

It is one of the practically feasible and readily adoptable technologies to enhance productivity of rice in the country.

Possibility under Indian circumstances –

Around 58 % rice area (24.68 m. ha) is under irrigation, which is potential for hybrid rice cultivation

Relative advantage →



Where do we stand ?

% of Hybrid Rice Status to total area in major Hybrid Rice countries (IRRI, 2009; * 2010-11)

China	Bangladesh	India	Indonesia	Philippines	Vietnam	USA	Myanmar
52.1	7.0	*4.0	5.0	4.4	10.1	15.9	1.0

% area in India is 4 % i.e. approx. 2 million hectares, If we compare the same with china, hybrid rice contributes to 52.1 % of 29.9 m.ha area

Initiative:

ICAR initiated a national program for development and large scale adoption of hybrid rice in the country in 1989

= Research + Seed Production +
Extension Networks

UNDP/FAO supported during 1991-2002 & ICAR supported NATP till 2005

Positives:

India developed a hybrid seed sector with public and private contribution

Average seed yields 1.5 to 2.5 t/ha

Hybrids Released in India

- **Total No. Of Hybrids :59**
- **Public Sector :31**
- **Private Sector :28**



Few Promising Released Hybrids Include

KRH 2	PHB 71	Pusa RH 10
HRI 120	NSD 2	DRRH 3
Sahyadri	PA 6201	PA 6444
JKRH 401	PSD 1	VNR 2245
VNR 2355	CO (R) H-4	

Status of Seed Trade in India

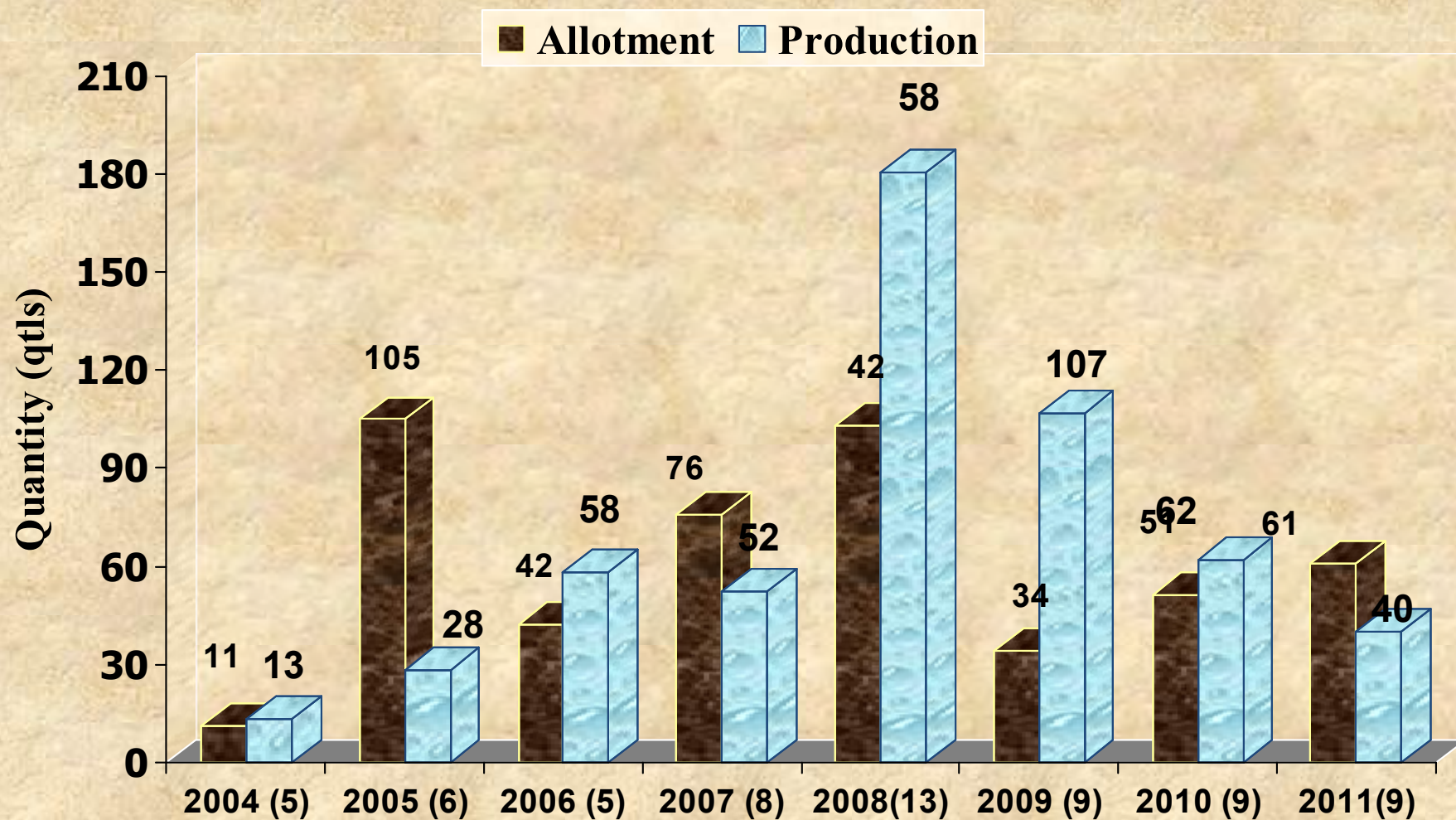
- ❖ The estimated value of the World seed market is **\$ 42 billion**.
- ❖ USA stands first with **12000 million USD**.
- ❖ Indian domestic seed sector ranks **fifth in the World** with a turnover of **3000 million USD**.
- ❖ India's share in global seed export is less than **2 percent**.
- ❖ As per the International Seed Federation's estimate of 2011, India exports the seeds of field crops worth of **19 million USD**.

Bottlenecks in spread of hybrid rice

Seed Production is the foremost and the single most important component

- ❑ Ideal and suitable areas
- ❑ Non nicking of parents due to vagaries of weather
- ❑ Production cost and availability at the reasonable price
- ❑ Yield levels of seed
- ❑ Quality and purity of the seed
- ❑ Large-scale hybrid rice seed production remains out of reach of the pockets of small and marginal farmers.
- ❑ Extension activities

BREEDER SEED PRODUCTION OF PARENTAL LINES (2003-2011)



Figures in parenthesis = No. of Hybrids

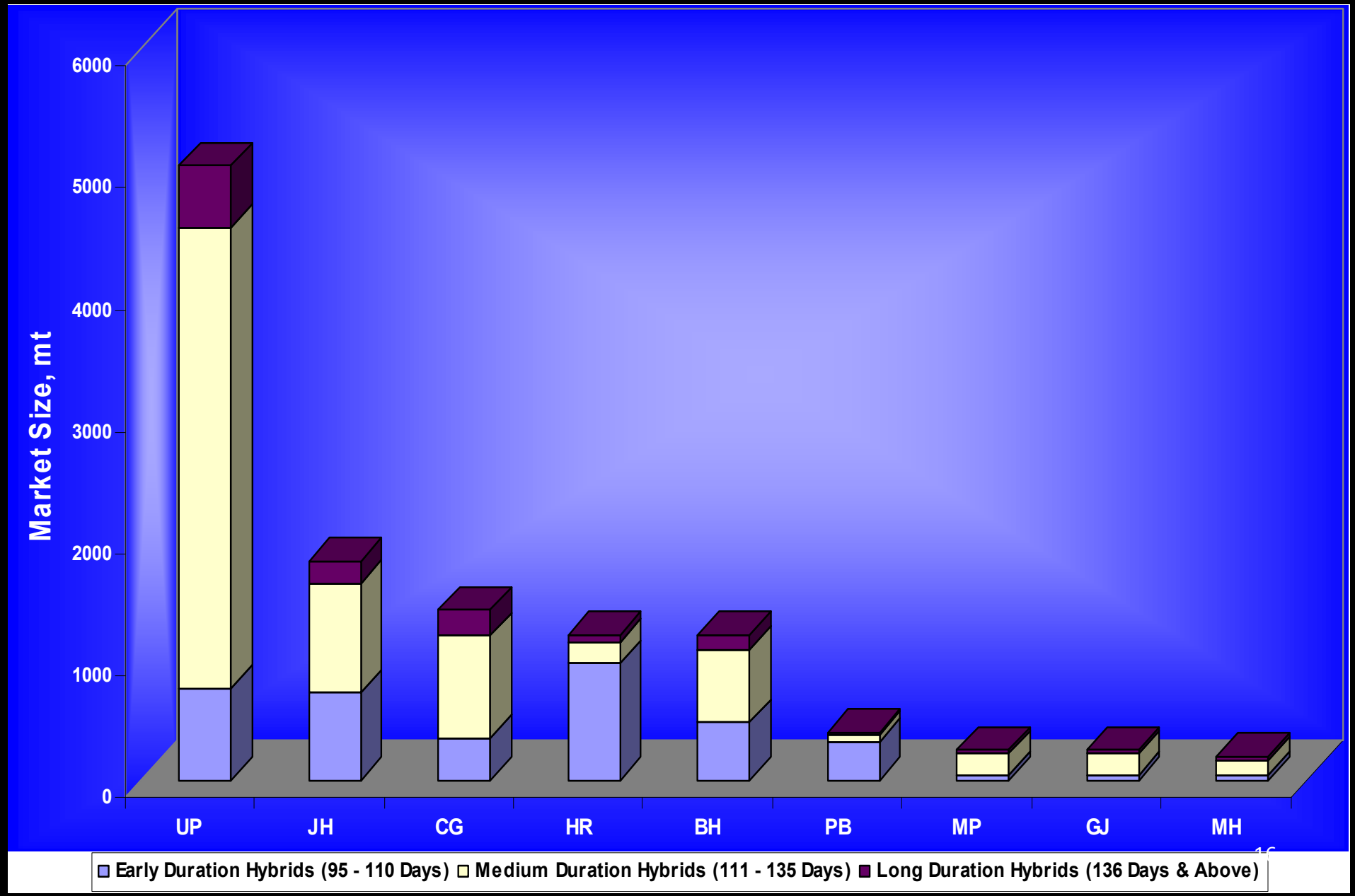
Package of practices of Hybrid Rice seed production

Activity	Particulars
Seed rate	"A" line or female Parent : 15 kg/ha "B" or "R" line or male parent : 5 kg/ha
Nursery	Sparse seeding (20 g/m ²) to ensure multi-tillered (4-5) seedlings in 25 days
Row ratio	2B: 6A for CMS multiplication 2R : 8A for hybrid seed production
Number of seedlings/hill	2 seedlings/hill for female parent 3 seedlings/hill for male parent
Spacing	Male : Male = 20cm Male : Female = 20 cm Female : Female = 15 cm Plant : Plant = 15 cm
GA ₃ application	60-90 g/ha in 500 litres of water at 5-10% heading in two split doses on consecutive days
Supplementary pollination	Three to four times a day at peak anthesis with 30 minutes interval during flowering phase
Roguing	At vegetative phase, flowering and maturity
Seed yield	1.5 to 2.5 t/ha

Area under hybrid rice seed production & quantity of seed produced (1996-2011)

Year	Area (ha)	Seed produced(t)
1996	1075	1200
1997	1485	1800
1998	1630	2200
1999	1660	2500
2000	1630	2700
2001	1625	2900
2002	1635	3100
2003	2865	4000
2004	4350	8600
2005	6800	12500
2006	12000	18000
2007	13000	19500
2008	14000	21000
2009	18000	27000
2010	20000	30000
2011	18000	26000

HYBRID RICE MARKET SEGMENTATION



GREY AREAS:

- 95% of hybrid seed produced is from private seed sector
- Lopsided distribution of areas of cultivation: 80 % of the total area is in eastern Indian states like UP, Jharkhand, Bihar & Chhattisgarh
- Perusal of the area covered under hybrids indicates that hybrids have not made a dent in the southern region
- Restricted areas of seed production:
 - Karimnagar, Warangal, Nizamabad, Kurnool and Nandyal districts -- AP
 - Tumkur, Mandya and Mysore districts -- Karnataka
 - Kolhapur district -- Maharashtra
 - Erode and Bhavanisagar districts -- TN etc.

Identified locations of MP suitable for hybrid rice seed production

Kharif - Rewa, Katni, Jabalpur, Seoni and Balaghat



Rabi - Seoni and Balaghat



Alternative areas in Karnataka:



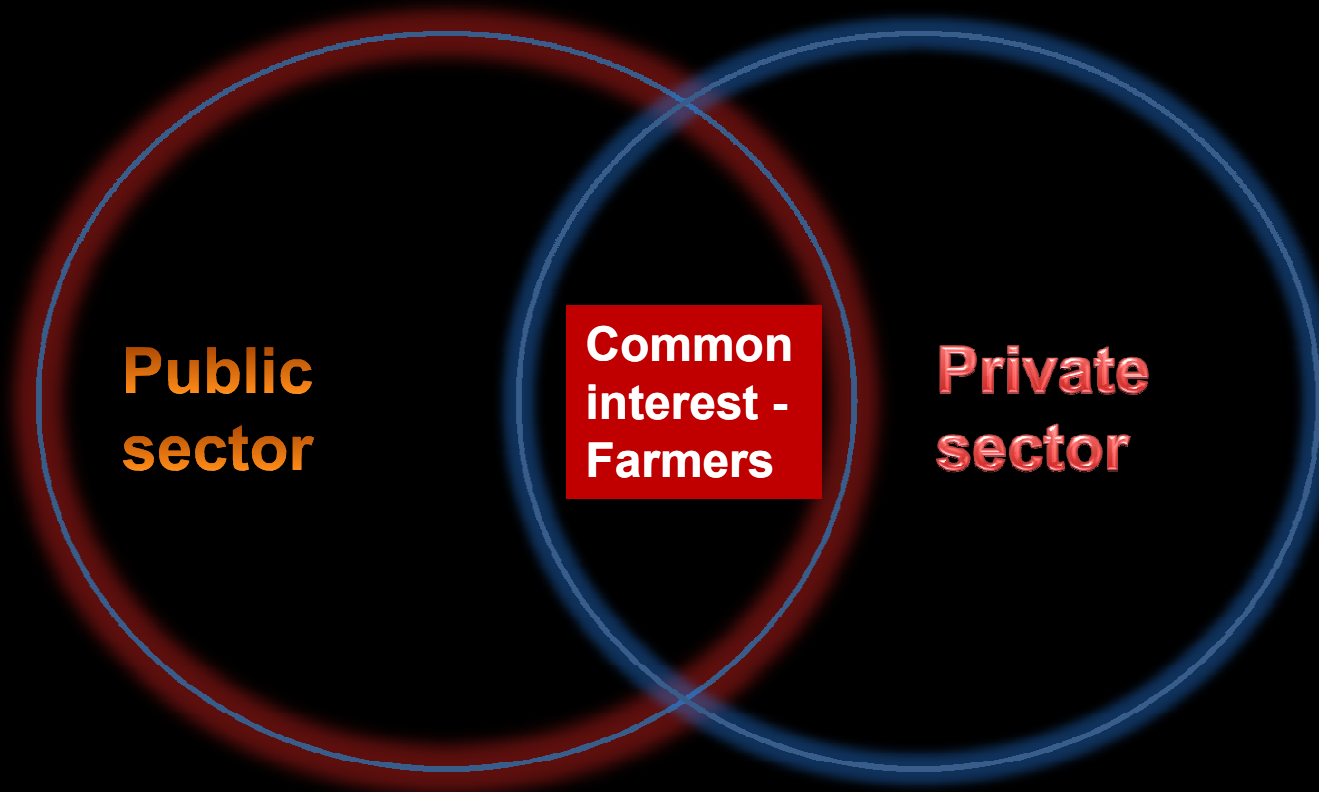
SOLUTION:



Public Private Partnership

- Past experience has shown that **healthy competition** brings the best out of the public Sectors ---
 - **Banking Telecom Airline**
- ✓ Globally sustainable food and Nutritional security - resources in both public and private are pooled and synergised
- ✓ change the mindset : The perceived threat can become an opportunity
- ✓ enough space for both public and private seed industries
- ✓ Joint planning & execution of activities ----- while sharing the costs risks and benefits.
- ✓ Public sector: Strong in technology generation (in terms of releasing hybrids and optimizing the technologies for seed production)
- ✓ private sector is quite strong in large scale seed production and marketing

PPP



PPP --- Pooling of Public and private resources with the aim of providing value addition to both parties.

How to catch up ?

- ❑ India is contemplating to increase its food grain production to 270 million tons by 2030, the yield per ha of India in rice is around 2.2 tons /ha as compared to 6 to 7 tons/ ha in china and other neighboring countries.
- ❑ The reason is large scale saturation and spread of hybrids exceeding 50% of the rice area due to very strong public-private-farmer partnership in these countries.
- ❑ Is it not possible in India ?, **YES**. It is possible, if PPP is made very strong in India also . The target can be achieved by 5 % growth rate in replacement through high yielding paddy hybrids alone.

Strengths of Public and private sector at different stages of cultivar development -

Activity	Period	Relative strengths		Combined strengths
		Public	Private	
Pre- breeding	2-3 y	+++++	+	+++++
Line breeding	2-3 Y	++++	++	+++++
Hybrid breeding	1-2 Y	++++	+++	+++++
Product development	2-3 Y	++	++++	+++++
Large scale seed production	1-2 Y	+	+++++	+++++
Product deployment	1-2 Y	+	+++++	+++++
Technology dissemination		+	++	NGOs & farmer's co-operatives

Source: Dravid, 2008; J K agrigenetics pvt ltd.

Some of the leading private sector seed companies dealing Hybrid Rice are:

- ✓ *Hybrid Rice International (Bayer Bio Science)*
- ✓ *PHI Seeds Ltd.*
- ✓ *Mahyco*
- ✓ *Syngenta India Ltd.*
- ✓ *Nath Biogene Ltd.*
- ✓ *Advanta India Ltd.*
- ✓ *Sri Ram Bio-seed India Ltd.*
- ✓ *Indo-American Hybrid Seeds*
- ✓ *J.K. Agri. Genetics*
- ✓ *Metahelics Life Sciences Pvt. Ltd.*
- ✓ *Ganga Kaveri Seeds Ltd.*
- ✓ *US Agri. Genetics Ltd. etc.*

Some of the rice hybrids under MOU with private

DRRH-2	DRR, Hyderabad	Sampoorna Seeds, Pratham Biotech Limited, Neo Seeds, Vicky's Agri Sciences Pvt. Ltd., Charoen Pokphand Seeds (INDIA) Private Limited., Bioseed Research India Pvt. Ltd.
DRRH-3	DRR, Hyderabad	DevGen Seeds & Crop Technology Pvt. Ltd., Kaveri Seeds, Indian Foundation Seed and Services Association, Ankur Seeds Pvt. Ltd, Ganga Kaveri Seeds Pvt. Ltd
Pusa RH-10	IARI, New Delhi	Indian Foundation Seed and Services Association, J.K. Agri Genetics, Nath Biogene (I) Ltd., Devgen Seed and Crop Technology Pvt. Ltd., Zuari Seeds Limited, Advanta India Limited, Yashoda Seeds Pvt. Ltd., Namdhari Seeds Pvt. Ltd., Amareshwara Agri. Tech Ltd., Bhavani Seeds Pvt. Ltd.
PSD-1 & PSD-3	GBPUAT, Pantnagar	Syngenta India Ltd., Pune.
CORH – 3	TNAU, Coimbatore	Rasi Seeds (P) Ltd, Attur, T.N.
Ajaya, Rajalakshmi	CRRI, Cuttack	Annapurna Seeds, Vikky's Agri Sciences Pvt. Ltd., Hyderabad
KRH-2	UAS, Mandya	Namdhari Seeds Pvt., Ltd., Bidadi, Bangalore
Sahyadri-1	BSKCV, Karjat	Syngenta India Ltd., Pune
JRH-4, JRH-5	JNKV, Jabalpur	Vikky's Agri Sciences Pvt. Ltd., Hyderabad

IARI-IFSSA model:

The effective public-private partnership between IARI, New Delhi and Indian Foundation Seed and Services Association, Hyderabad resulted in faster spread of the first aromatic rice hybrid PRH-10 in the country.

Private 90 % + Public 10 % (Pusa RH 10; KRH 2 and Pant dhan 1 & 3)

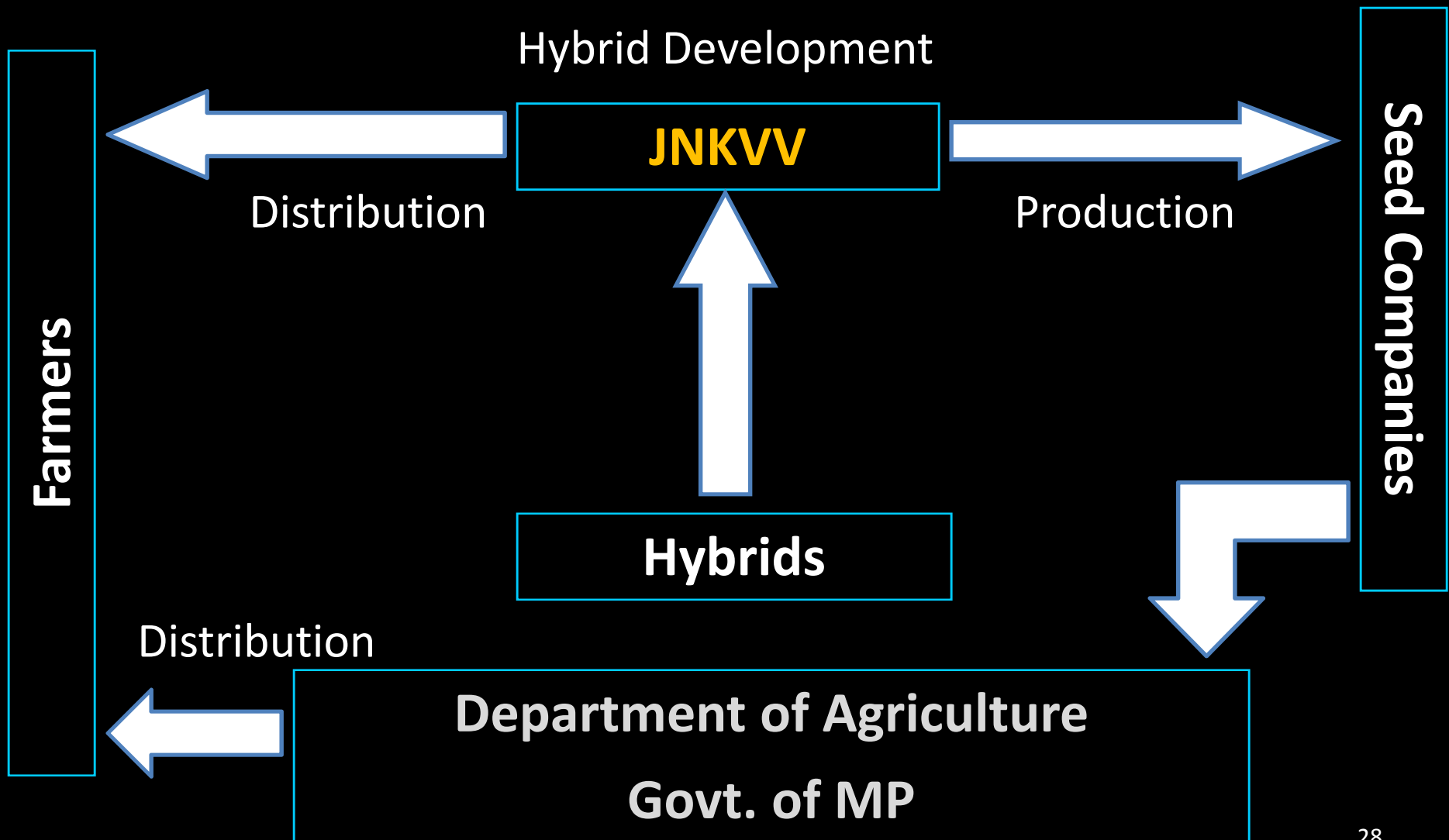
PPP = A Win-Win Situation

Case Study – JNKVV (Jabalpur)

JNKVV – Seed Consortium:

- **Seed companies become members of the Consortium**
- **Members eligible for taking licensing of hybrids and improved varieties developed by JNKVV**
- **Twelve Indian companies have become members**
- **Joint research Projects can be taken up for hybrid or variety development in important crops**

Promotion of Hybrid Technologies



Results of Seed Consortium

Company Name	Hybrid Seed Technology Commercialized	Seeds produced in 2011-12 (q)
Vibha Agrotech Limited	JRH-5, JRH-8	5000
Dantewada Seeds Pvt. Ltd	JRH-5	50
Trimurti Plant Sciences Ltd.	JRH-5	100
Ajeet Seeds	JRH-5	50

**Promotion of Early Hybrids in Rice Fallow Area --
Advantage of second crop (chickpea) under rain fed situation**

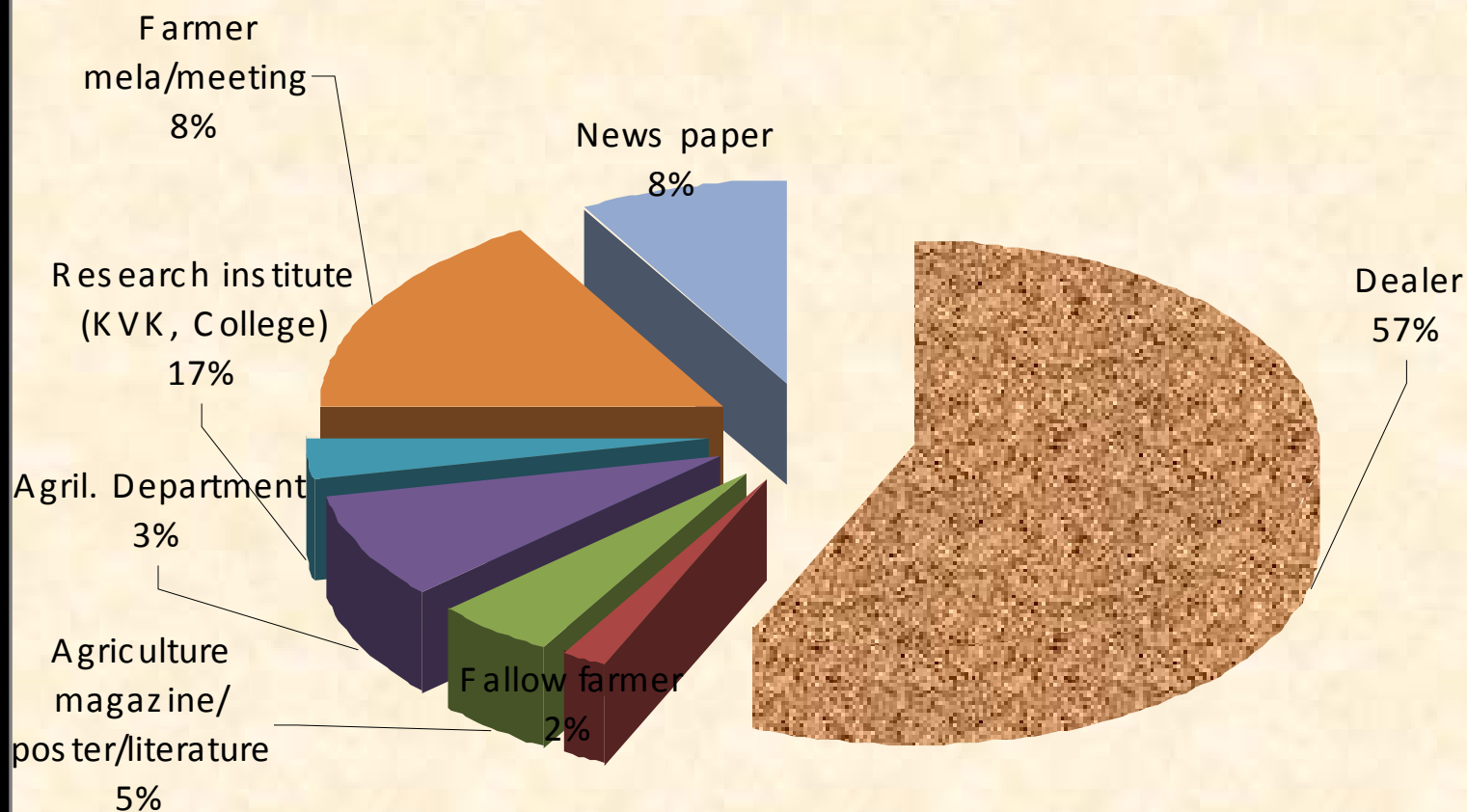


Transplanting dt-10.02.2011

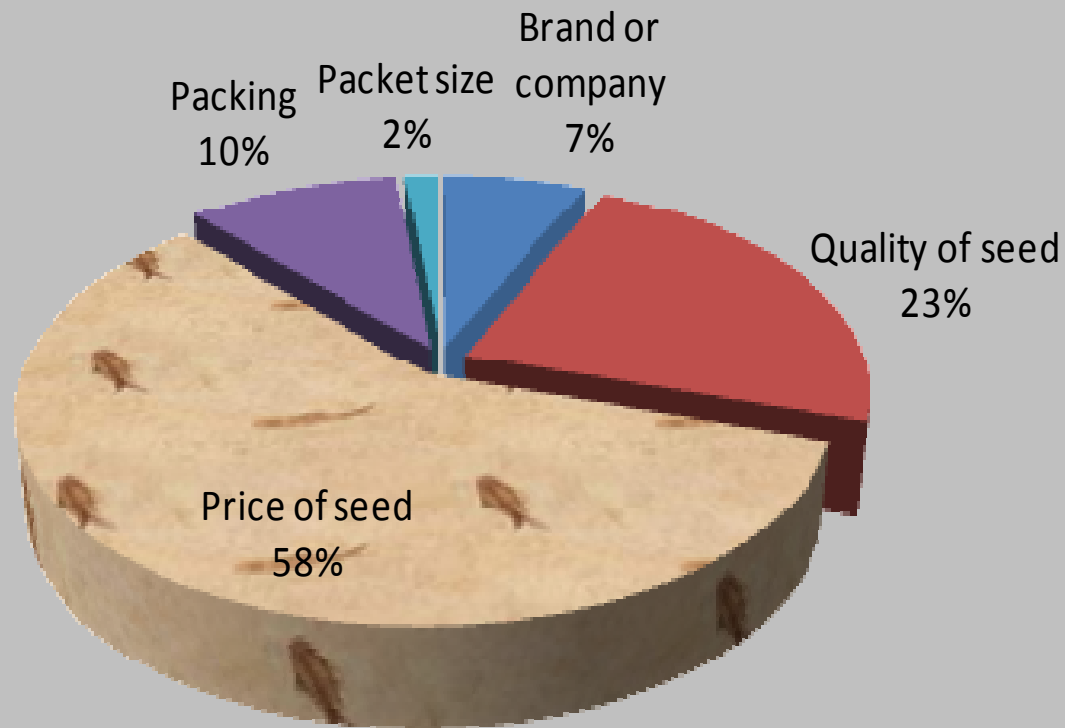
Source of information for hybrid rice seed .

A case Study: Rewa division

Source of information for rice hybrid

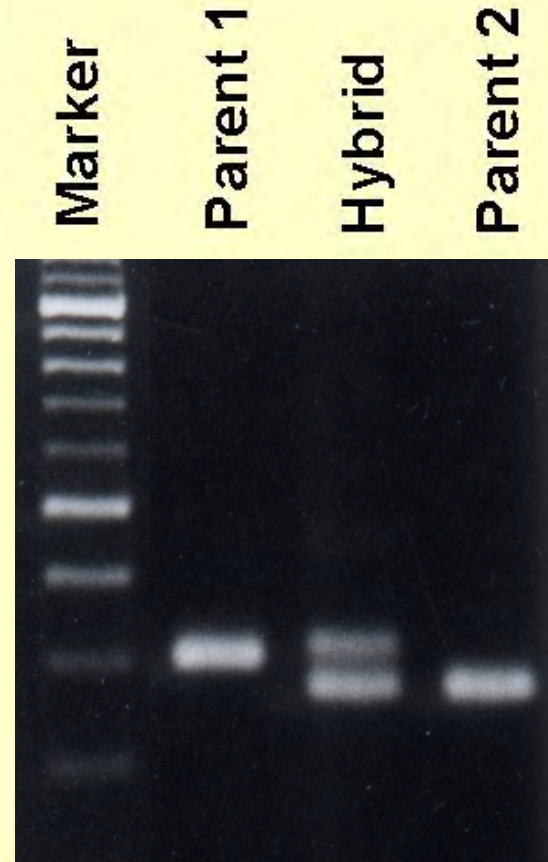


Farmer preference while purchasing rice hybrids (A case Study – Rewa division)



Farmer preference while purchasing of rice hybrid seed

THE DNA TEST



Purity of the hybrid seed is confirmed by the presence of both parental alleles

Molecular approach for genetic purity in hybrid rice

- **Identified markers for**

JRH-8 :RM 6100, ,208,19,164,234

JRH-12 :RM 6100, 171, 202,234

JRH-5 :RM423, 19 and 202

KRH-2 :RM490,223,317,21



NEED OF THE HOUR

- Seed production technology has to be further refined to obtain average seed yields of 2.5 to 3.0 t/ha
- Additional areas are required for seed production in meeting growing demand
- Policy decisions of providing subsidy to meet the higher seed cost and giving minimum support price for rice hybrids



- ❏ **Organized seed industry at grass-root to provincial levels in joint public-private sector.**
- ❏ **Very close link between R&D , seed industry and extension network on hybrid rice.**

Lessons from the success of china and Vietnam

- ❏ **Introduction of seed crop insurance scheme to cover the risk of seed growing farmers taking into considerations various aspect of seed production**
- ❏ **Availability of soft loan for capital investment and working capital to seed industries**

Food for the poor; food for the
rich; feeding the people in the
world

Thanking you all

