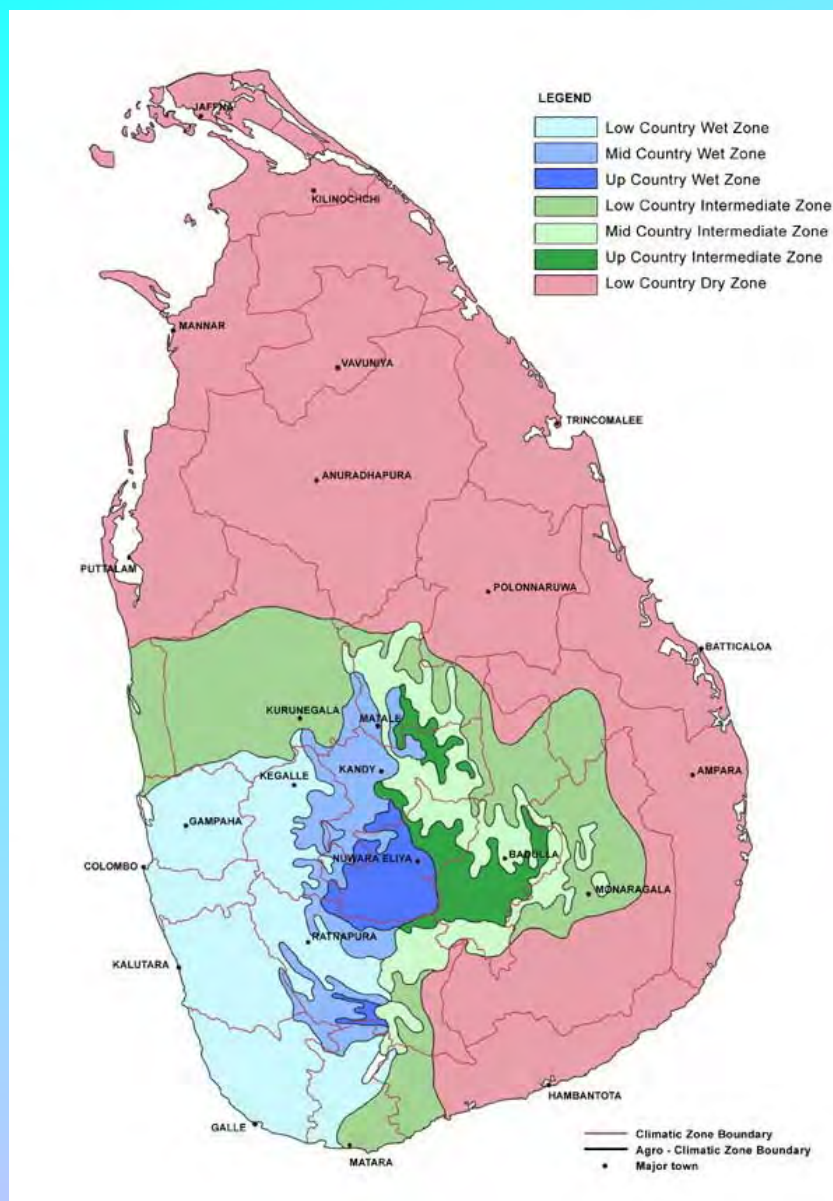


The background of the slide is a composite image. The top half shows a close-up of a pile of white, polished rice grains next to a bundle of green rice stalks. The bottom half shows a close-up of golden-brown rice panicles. A horizontal band with a rainbow gradient is overlaid across the middle of the image, containing the title text.

# Potentials & limitations of Hybrid Rice production in Sri Lanka

**S.W. Abeysekera**  
**RRDI - Sri Lanka**

# Country profile – Sri Lanka



- **Population (million)** 20.869
- **Population density (per sq. km)** 333
- **Rural population (%)** 77
- **Agriculture labor force (% of total)** 32.9
- **GDP (US\$ billion) -** 59.21
- **GDP per capita (US \$) -** 2836
- **Agriculture share of GDP (%) -** 11.9

## Trends of Rice Extent, Annual Production, Average Yield, Rice Imports and Population Growth over past Six decades (1940 – 2010) in Sri Lanka



Decade	Population (millions)	Production (ton. millions)	Asweddumize d Extent (ha. millions)	Yield (t./ha) National Average	Rice Imports as a % of Requirement
1940	6.0	0.26	0.39	0.65	60
1950	7.5	0.60	0.41	1.56	50
1960	9.9	0.90	0.51	1.86	40
1970	12.5	1.62	0.61	2.63	25
1980	14.7	2.13	0.70	2.94	10
1990	16.3	2.50	0.70	3.18	5
2000	18.5	2.86	0.72	3.86	<1
2010	20.2	4.10	0.72	4.21	<1
Increase over 1940 decade	3.36 fold	15.76 fold	1.84 fold	6.47 fold	

# Paddy statistics - 2011

- GDP share by paddy – 1.5 %
- Gross extent sown – 1.22 Million ha
- Annual Production – 3.87 Million ton
- Annual average yield – 3.9 tons/ha
- Average consumption – 120 kg/head/year

# Rice export avenue

- achieved self sufficiency by 2011
- 15% production in past 6 years
- estimated excess supply by 2020 – 4 Mn tons
- export projection 10,000 t/annum
- Establishment of four export zones in high potential areas

## Future rice requirement at 115 kg per capita per year



Year	Population (000')	Requirement (000't)
2010	20675	2378
2011	20902	2404
2012	21132	2430
2013	21365	2457
2014	21600	2484
2015	21837	2511
2016	22078	2539
2017	22320	2567
2018	22566	2595
2019	22814	2624
2020	23065	2652

## Main Problems facing the rice sector

- Low yield and marginal rate of yield increase
- Low or no profits in rice cultivation
- Abandoning marginal rice lands
- High cost of production

However, many people are engaged in rice cultivation

# Solution is to increase productivity

- Present level of 4.3 t/ha to 5.0 t/ha immediately
- One of the major options is to increase yield potential of varieties
- One of the possible options is to develop hybrid rice
- yield potential 12 t/ha

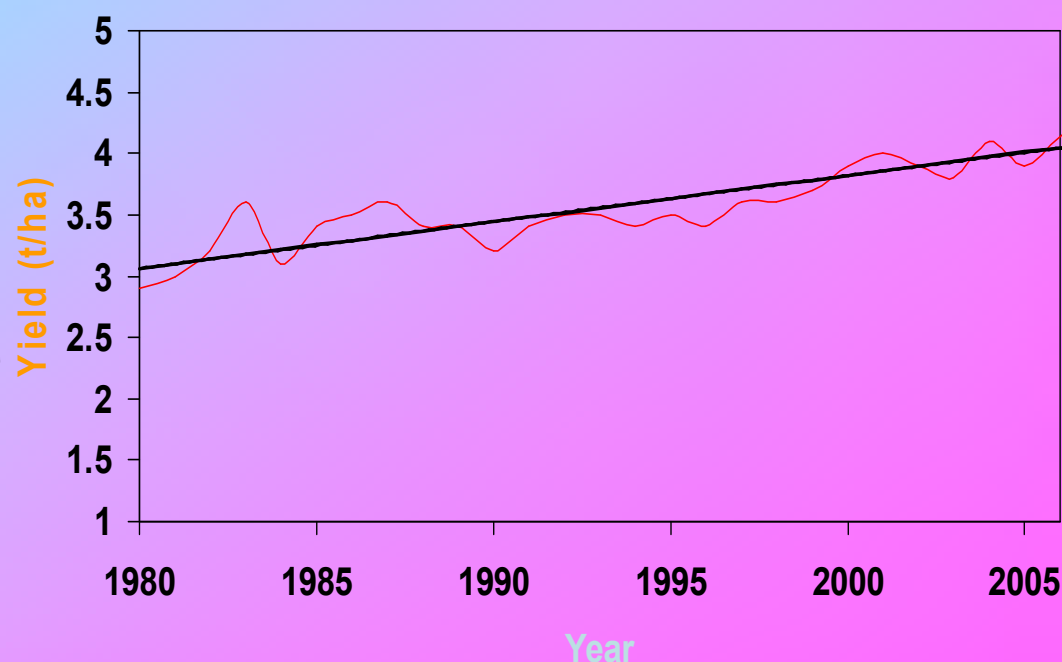


# Why do we need hybrid rice

- Present national average yield 4.2 t/ha need to be increased to 5.1 /ha in 2020
- However, it has taken 25 years to increase national average rice yield by 1 t/ha
- One of the possible options is to develop & use hybrid rice. Hybrid rice has ability to produce around 20% more yield than the inbred rice.

Yield of 13 t/ha recorded from Murukkan - (2009)

Trends in Rice Yield in Sri Lanka(1980-2008)



# HR R & D Program

## Goal:

- Sustain food security in Sri Lanka through sustainable increase in rice production using hybrid rice technology

Long term objectives are coming under three major areas;

1. Technology generation
2. Seed production
3. Technology transfer



# Hybrid Rice R & D program in SL

## Objectives of the RRDI program

- Evaluation of genetic material from IRRI and other countries for adaptability
- Identification of introduced CMS lines suitable for Sri Lanka
- Transfer of the CMS characteristic to promising Sri Lankan lines
- Development and evaluation of hybrid rice combinations (F1) of adaptable CMS lines
- Development of hybrid rice seed production
- Development of agronomic practices for hybrid rice cultivation.
- Production of nuclear seeds of A, B and R

# Hybrid Rice Research in Sri Lanka



- **Initiated as early as in late 1980s**
- **Tested several IRRI experimental Hybrid Lines**
- **Tested several rice hybrids introduced from China**
- **No progress due to poor adaptability**
- **Started to develop own hybrids using CMS lines introduced from IRRI**
- **Some progress was made**
- **HR R & D program was reinitiated in 1994**
- **1998- IRRI/ADB project support on HR research**
- **2002 -2005 CARP funds - Through competitive contract research program**
- **2007-2009 FAO funded through TCP**
- **2010 - To date DOA Funds**

# Technological Progress (2000-2011)

1. First rice hybrid variety release in 2005 (Bg 407H)
2. Developed promising hybrids with high SH%
3. Developed 8 new restores (R) and 4 CMS lines
4. Direct sowing at low seed rate (25 kg/ha) found to be possible for HR cultivation
5. Developed the procedures to identify hybridity of the experimental hybrids using biotechnological tools
6. Identified new medium age (<3.5m month) new hybrid combinations.
7. Developed locally adopted management practices for HR cultivation
8. Identified improved techniques in HR seed production

## Following areas of assistance

- To transfer the hybrid technologies to farmers for rapid increase in national rice production
- To strengthen national capacity in hybrid rice development
- To strengthen hybrid rice seed production
- Formulation of a comprehensive national program for the development and use of hybrid rice.

## First rice hybrid variety released in 2005

The highest recorded yield of 13t/ha recorded in Murukkan – Yala 2009 form 5 Ac block



**Bg 407H (4 months)**



# Promising Hybrids

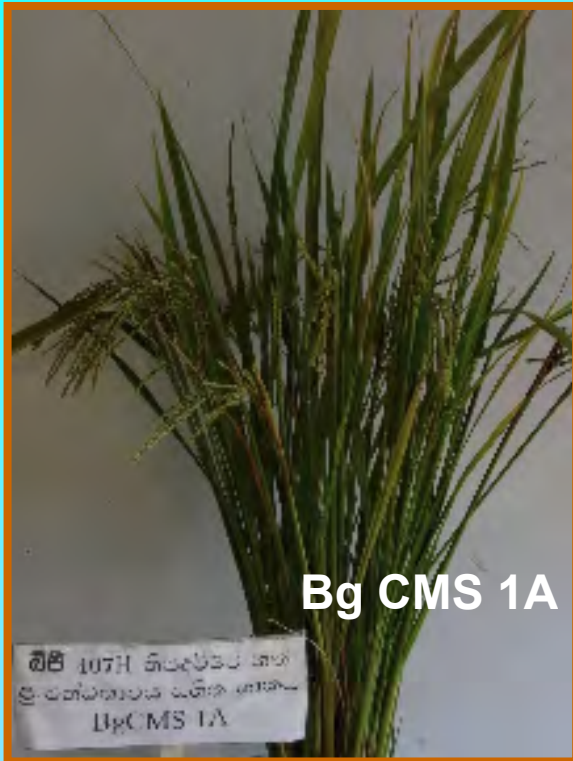




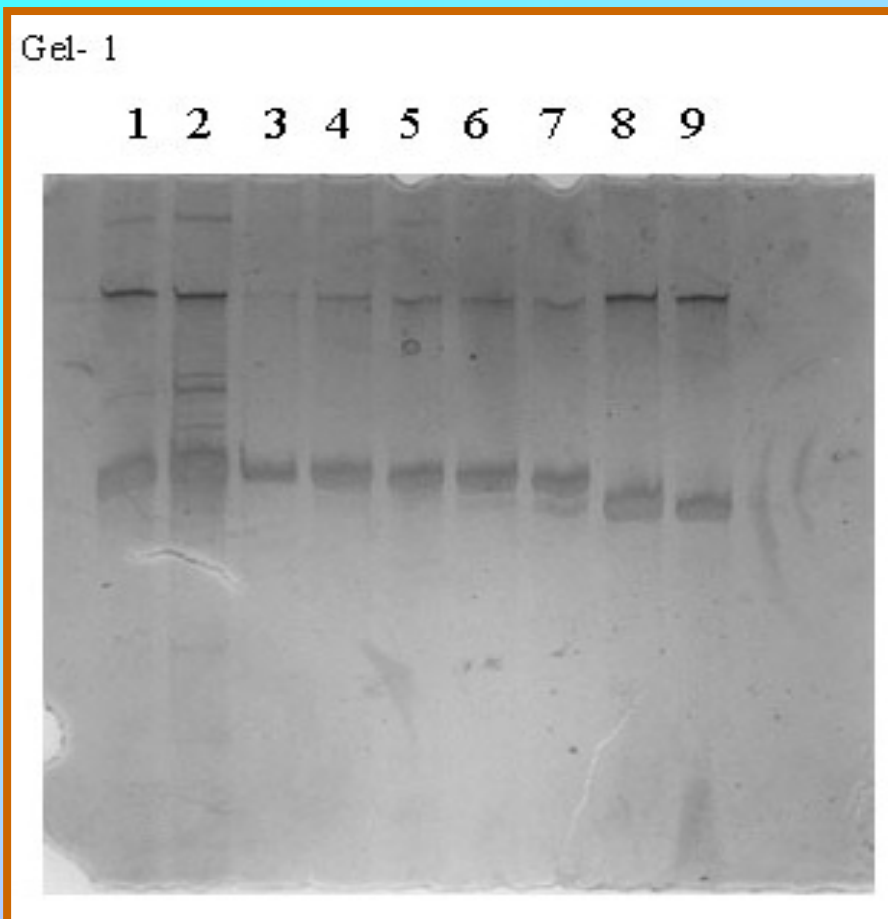
# Promising GSR Hybrid Rice materials



# RRDI Develop CMS lines



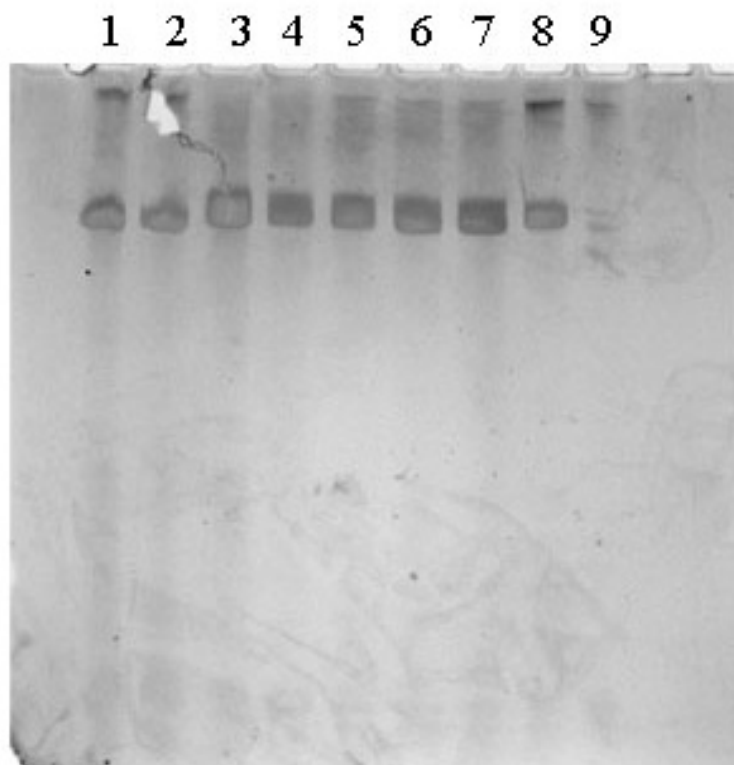
# Check the hybridity of Hybrids using biotechnology tools



- 1 } Bg CMS 1A
- 2 }
- 3 }
- 4 }
- 5 } Bg CMS 1A /IR 547-42- 22-193R
- 6 }
- 7 }
- 8 } 547-42-22-19-3R
- 9 }



Gel- 3 (H9)



- 1 }  
2 } **IR 68897A**
- 3 }  
4 } **IR 68897A/ IR 68077-37-2-3R**
- 5 }  
6 }  
7 }  
8 } **IR 68077-37-2-3-3R**
- 9 }

## Early maturing (3.5 M) hybrid rice variety



**Bg HR 8**



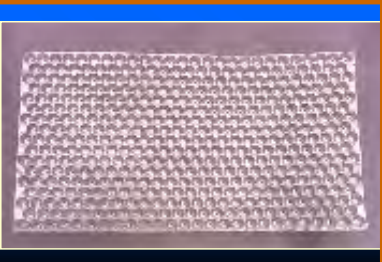


HR parental materials can be used as a Inbred varieties





# Locally developed management practices...



**Seedling Broadcasting Technology**









## Direct sowing in Hybrid Rice





# Potentials for direct sowing in hybrid rice

Establishment method	Yield (t/ha)			Mean
	2009/10 maha	2010 yala	2010/11 maha	
Transplanting @ 20x15cm	4.66	6.22	6.17	5.68
Parachute @ TRP density	4.82	6.12	5.65	5.53
Line sowing @ 20x15cm	4.46	6.41	6.18	5.68
Broadcasting @ 25kg/ha	4.57	6.13	5.84	5.51
Broadcasting @ 50kg/ha	4.43	5.43	5.59	5.11
Broadcasting @ 75kg/ha	4.13	5.08	5.42	4.87
Broadcasting @ 100kg/ha	3.85	4.76	5.13	4.58



Bg 407H under direct seeding at Devahuwa,  
Yield 9t/ha, tillering more than 30 panicles/plant







# Hybrid Rice Seed (F1) Production



# Small Scale Seed Production





# Large scale F1 Seed Production of Bg 407H at RRD I







## Large Scale CMS Seed Production at RRDI





# F1 seed production in farmers fields 2009/2010



**Polonnaruwa**

# Farmer participated seed production



System B



Ampara



Dewahuwa



# Training

- Individual training
- Trainers training
- Training of private sector & NGO persons
- Special trainings

# Training



22/11/2007



# ..training





# Field days at Devahuwa





# Field day at Polonnaruwa





# Development of training materials



1. Translation of HR seed production manual to Sinhala & Tamil
2. Leaflet on HR seed production
3. DVD on HR seed production





# Foreign Experts in field



# Future activities

1. Improvement of seed setting of Bg CMS lines to increase the F1 seed yield of promising hybrids.
2. Improvement of seed setting of local CMS lines using the new materials received IRRI and P.R. China.
3. Speed up the seed production of newly developed short age HR combination ( <3.5 month) and further testing.
4. Develop high yielding management practices for New hybrid.
5. Develop new early maturing high yielding hybrids.
6. Conducting experiments for further improvement of F1 seed production.
7. Study the low cost hybrid rice seed production practices.
8. Further improvement of F1seeds in in farmers fields
9. Morphological improvement (super Hybrid Rice programme Thro TGMS)



# Government commitment, Policy and Financial Support

- Prior to 1998, no government commitment
- In 2000, government identified hybrid rice as a priority and a National Hybrid Rice Research and Development Network involving public, private and NGO institutions was established
- Policy on HR is now clear
  - Introduction of HR from other countries should not be encouraged
  - HR should be developed locally



# Present Government Policy on Seed Production

- Production of basic seeds of all local varieties is handled by the public sector
- Certified seeds are produced by both private and public sector
- Nucleus seeds of HR are produced in research centers in the public sector





# **Current Status of Public-Private sector Partnership**

- **HR research is handled by public sector**
- **Public sector has already initiated collaboration with private sector in large scale seed production**
- **Efforts are being made to get involved more private companies**
- **To date, there is no good public-private sector partnership because;**
  - **Lack of an adequate seed market**
  - **No continuous supply of F1 seeds.**

# Socio-Economic Analysis of HR Technology

- For economic viability under TP conditions
  - A yield advantage of 1-1.5 t/ha for HR cultivator
  - At least 1 t/ha seed yield for HR seed producer
- Under direct seeded conditions
  - At least 1.5-2 t/ha seed yield
- Only socio economic problem to promote HR in Sri Lanka is the practice of broadcasting



## ... Socio-Economic

- Transplanting will not be the solution due to high labor cost
- Seedling broadcasting (SB) which requires only 10-20 kg of seeds/ha may be one of the very effective solutions
- SB is now popular in areas where HR is to be promoted

# Summary

1. We have made significant improvement in hybrid rice technology in Sri Lanka during the last 10 years.
2. Development of early maturing HR is a big achievement.
3. F1 seed production in farmer field (“Saruketh Hybrid Rice Yaya program”) seems to be practical approach.
4. Still we were not able to produce adequate F1 seed to meet the requirement and need to give top priority to improve the seed production research.
5. With the support of DOA/IRRI/FAO/P.R China from 2000-2011 HR&RD activities were boosted up and has made a tremendous progress



## But this is not the end...

- HR, R & D is a never ending process.
- Need lot of work & hard work
- But HR,R & D is need lot of inputs
  - Its high input high output activity.
  - Need lot of staff
  - involve lot of skilled & labour work
  - Improvement of hybrid rice will automatically improve the inberd rice also.
- For all these need money  
Commitment of the People/  
Institutes/Department/Ministry/ Government is essential.



Thank you

