SEED SYSTEM CHANNELIZATION IN PULSES

MG Mula
(Scientist – Seed System)
ICRISAT, Patancheru 502 324, Andhra Pradesh, India

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The Fact: In the wave of Green Revolution

THE PULSES WERE NEGLECTED

- Recorded only 0.9% growth over 50 yrs
- Production increment for pulses = 32% ; cereals = 280%
- Protein availability reduced
  90 g protein/person/day TO < 10 g protein/person/day
India: Import of Pulses

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Inclusive Market-Oriented Development
• Innovate • Grow • Prosper

[Bar chart showing the import of pulses from 1991-92 to 2007-08 with a peak in 2001-02 and a significant increase in recent years.]

- Qty (Lakh tonnes)
- Value (Rs Crores)
Why Seed System? Because …

- Seed is the life blood of Agriculture
- Low productivity @ <700 kg/ha (legumes)
- Good quality seeds will increase productivity by 20-30%
- Farmers save seed of local varieties and use this continuously for 3-5 years
- 80-90% seeds are sourced from farmers’ own-saved seeds
- Low seed replacement ratio @ 2-3%
- Only 10-12% of quality seeds is available each year
- Access to quality seeds by smallholder farmers is a recurring problem
- Inadequate transfer of technologies appropriate for smallholder farmers
What is a Seed System?

“a process through which a cultivar is bred, produced, certified, stored, marketed and used that includes all the channels through which farmers acquire genetic materials and in interaction with the commercial seed industry”

(Tesfaye et al, 2005)
Seed Systems in Legumes are complicated due to these reasons:

- **Economics of legume seed production not attractive enough to encourage private seed sector**, mainly due to large seed volume and high transportation and storage costs.
- **Public seed sector** (responsible for legume seed production) largely failed to meet their obligation due to lack of accountability, poor quality control, low yield and profit.
- **Subsidized government seed supplied to farmers** is often not delivered in time and quality is inconsistent.
- **Farmers are left at the mercy of local traders** who hardly care for variety integrity and quality.
- **Stringent seed certification requirements** and accompanying bureaucratic hassles discourage farmers’ participation in the formal seed system.
Existing Smallholder Farmer Seed System

1. Farmers grow pigeonpea

2. Farmers save their own seed every year (20 kg/ha)

3. After 2-4 years, outcrossing depression is observed

4. Farmers trade with other farmers for new set of seeds

5. Seed is traded with other villages for new set of seeds

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1. Farmers save 20 kg/ha seed every year
2. When germplasm declines, farmers borrow seeds from previous year high yielders
3. Very rarely new seed is purchased from outside the village

Department of Agriculture
Seed Institutes/Companies
Seed Traders
Smallholder farmers (90%)

Note: TLII project
Seed Delivery System in Odisha, India

**NGOs**

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**Certifying Agency**

**Progressive Farmer Seed Grower**

**State Seed Corp/NSC**

**FARMER Seed Growers**

**FARMERS**

Note: Odisha project
3 Types of Seed System

- Formal seed system
- Informal seed system
- Integrated seed supply system
Formal Seed System

- International Agricultural Research Centers
- Government agencies (NARES)
- Government-assisted cooperatives
- Multinational corporations (MNC)
- Domestic private sector companies
- MNC + domestic companies
Informal Seed System

- Farmer Cooperatives/Associations
- Self Help Groups
- Individual Farmers
- NGOs

Strategy in the Informal Seed System

- ‘One Village One Variety’ concept for OPV
- Community Based Seed Production Model
‘One Village One Variety’ Model

- Ability to do seed production (exponential market returns) by smallholder farmers.
- Purity of seed is maintained in subsequent years by avoiding out-crossing.
- Farmer maintains desirable varietal traits (high yields, wilt resistance, etc.).
- Farmers will become entrepreneurs.
Yield According to Variety or Production Type

Number of Hectares

0 50 100 150 200 250

'000 kgs/ Season

High Yielding
Seed Production
Local Variety
Market Return According to Variety and Production Type

Number of Hectares

<table>
<thead>
<tr>
<th>1</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>300</td>
<td>500</td>
<td>700</td>
<td>900</td>
</tr>
</tbody>
</table>

- High Yielding
- Seed Production
- Local Variety

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Science with a human face
Community Based Seed Production Model
i.e. Groundnut

Obtain 2 kg good quality seed

Seed source of a new cultivar

2 kg seed from selected plants to start second Stage-I cycle

I stage II stage III stage

MARKETING

Stage-I seed plot 0.01 ha (1\textsuperscript{st} season)
Stage-II seed plot 0.10 ha (2\textsuperscript{nd} season)
Stage-III commercial plot 1 ha (3\textsuperscript{rd} season)
Promotion of new varieties

Integrate breeding, seed production & distribution

Farmers involved at some stages (FPVS trials)

Shown promise in improving seed supply to smallholder farmers

The strengths and weaknesses of informal seed systems and the formal seed systems are complementary
Strategies in Improving Seed Systems

- Develop strategies to produce, test, & market
- Backup institutional support & crop insurance
- Agreements between farmers & seed agencies
- Help farmers in adoption of new technology
- Develop specific models based on geographic and ethnic considerations
- Implement self-reliance seed programs to decentralize seed business
- Identify and promote farmer preferred cultivars through varietal trail and field demonstration
Strategies...

- Encourage or partner with seed companies to involve in pulses
- Encourage policy makers to support pulses seed programs
- Strengthen capacity of self-help groups (associations and cooperatives)
- Incentives to participating farmers (buy-back scheme)
- Develop a quality seed backup program through government and private sectors
Quality Seed Required By 2025

**Chickpea seed**
- Breeder = 0.5 MT
- Foundation = 6 MT
- Certified = 74.8 MT

**Pigeonpea seed**
- Breeder = 0.5 MT
- Foundation = 2.2 MT
- Certified = 9.2 MT

Diversify & Simplify the Systems

ARE WE READY ???
Seed Production and Multiplication Strategy
(3 year development plan)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Estimated Yield/ha (kg)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Area planted (ha)</td>
<td>Total Yield (kg)</td>
<td>Area Planted (ha)</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>500/ha</td>
<td>5</td>
<td>2500</td>
<td>125</td>
</tr>
<tr>
<td>Chickpea</td>
<td>800/ha</td>
<td>3</td>
<td>2400</td>
<td>30</td>
</tr>
<tr>
<td>Remarks</td>
<td>Breeder</td>
<td>Foundation</td>
<td></td>
<td>CS</td>
</tr>
</tbody>
</table>

Remarks:
- Breeder
- Foundation
- CS
## Pigeonpea Seed Production & Multiplication of Medium Duration Cultivars

<table>
<thead>
<tr>
<th>Year</th>
<th>Area Planted (ha)</th>
<th>Yield Assumption</th>
<th>Area Planted (ha)</th>
<th>Yield Assumption</th>
<th>Area Planted (ha)</th>
<th>Yield Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>1 ha</td>
<td>• Production (500 kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td>2 ha</td>
<td>• Production (1000 kg)</td>
<td>41 ha</td>
<td>• Productivity (500 kg/ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Production (20,500 kg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>3 ha</td>
<td>• Production (1500 kg)</td>
<td>83 ha</td>
<td>• Productivity (500 kg/ha)</td>
<td></td>
<td>1,708 ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Production (41,500 kg)</td>
<td></td>
<td>Year 3 production is estimated at 854,000 kg</td>
</tr>
<tr>
<td>Year 4</td>
<td>4 ha</td>
<td>• Production (2000 kg)</td>
<td>125 ha</td>
<td>• Productivity (500 kg/ha)</td>
<td></td>
<td>3,458 ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Production (62,500 kg)</td>
<td></td>
<td>Year 4 production is estimated at 1,729,000 kg</td>
</tr>
<tr>
<td>Year 5</td>
<td>5 ha</td>
<td>• Production (2500 kg)</td>
<td>166 ha</td>
<td>• Productivity (500 kg/ha)</td>
<td></td>
<td>5,208 ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Production (83,000 kg)</td>
<td></td>
<td>Year 5 production is estimated at 2,604,000 kg</td>
</tr>
<tr>
<td>Year 6</td>
<td></td>
<td></td>
<td>208 ha</td>
<td>• Productivity (500 kg/ha)</td>
<td></td>
<td>6,916 ha</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Production (104,000 kg)</td>
<td></td>
<td>Year 6 production is estimated at 3,458,000 kg</td>
</tr>
</tbody>
</table>

**Note:** Planting distance: 75cm x 30xm  
Seed Requirement: 12 kg/ha  
Productivity: 500 kg/ha
Chickpea Seed Production & Multiplication

Planting distance: 30x30cm or 60x10cm
Seed requirement: Desi – 60 kg/ha; Kabuli – 100-120 kg/ha

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (ha)</th>
<th>Assumption</th>
<th>Var</th>
<th>Area (ha)</th>
<th>Assumption</th>
<th>Area (ha)</th>
<th>Assumption</th>
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</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>1 ha</td>
<td>● Productivity (1500 kg/ha)</td>
<td>Desi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Productivity (2000 kg/ha)</td>
<td>Kabuli</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Year 2</td>
<td></td>
<td>Desi</td>
<td>25</td>
<td></td>
<td>● Productivity (1500 kg/ha)</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>● Production (37,500 kg)</td>
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<td></td>
<td>Kabuli</td>
<td>18</td>
<td></td>
<td></td>
<td>● Productivity (2000 kg/ha)</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>● Production (36,000 kg)</td>
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<tr>
<td>Year 3</td>
<td></td>
<td>Desi</td>
<td></td>
<td></td>
<td></td>
<td>625</td>
<td>● Productivity (1500 kg/ha)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>● Production (937,500 kg)</td>
</tr>
<tr>
<td></td>
<td>Kabuli</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>327</td>
<td>● Productivity (2000 kg/ha)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>● Production (654,000 kg)</td>
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<tr>
<td></td>
<td>Total</td>
<td>43</td>
<td>Production (73,500 kg)</td>
<td></td>
<td>952</td>
<td>Production (1,591,500 kg)</td>
<td></td>
</tr>
</tbody>
</table>
Basic guidelines for the concept note on seed system

• Review existing resources (area, manpower, budget, collaborating institute, etc) to complement external funding.
• Review requirements/needs for the proposed seed system project
• Sustainability issue (impact - commercialization)
Thank you!

ICRISAT is a member of the CGIAR Consortium

International Crops Research Institute for the Semi-Arid Tropics