Bihar Rice Value Chain Analysis and Recommendations

Appendix

July 2013
Agenda

Supply-demand dynamics

Value chain & constraints

Policy & government context

Prioritized interventions
In 2010, Bihar ranked 11\textsuperscript{th} in rice production with yields ~half India avg.; latest estimates suggest position may have improved

**IN 2010, BIHAR WAS 11\textsuperscript{TH} LARGEST RICE PRODUCING STATE**

Largest rice producing states (Million MT, 2009-10)

**WITH PRODUCTIVITY ONLY ~HALF ALL-INDIA FIGURE**

Rice yield (Kg/ha 2009-10)

*Note: 2009-10 latest state-wise data available from central Government source
Source: Ministry of Agriculture, GoI*

In 2010, Bihar suffered from a severe drought, resulting in rice yield ~30% lower than in ’09

2011-12 State Govt. estimates suggest Bihar yield has increased to ~2,100 kg / ha (vs. estimated all-India average of ~2,200 kg / ha from GoI)
Rice is predominantly a kharif crop in Bihar, though yields for small boro crop are almost double that of kharif

\[ \text{AREA} \times \text{YIELD} = \text{PRODUCTION} \]

Note: *2009-10 data last estimate; ^2010-11 data fourth advance estimates
Source: Department of Agriculture, Bihar
Productivity varies widely across Bihar, with highest productivity in western cluster vs. low-yielding north-east

### AVERAGE YIELD BY DISTRICT (2009*)

<table>
<thead>
<tr>
<th>Yield (kg/ha)</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1000</td>
<td>Red</td>
</tr>
<tr>
<td>1000-1199</td>
<td>Red</td>
</tr>
<tr>
<td>1200-1399</td>
<td>Orange</td>
</tr>
<tr>
<td>1400-1599</td>
<td>Orange</td>
</tr>
<tr>
<td>1600-1799</td>
<td>Yellow</td>
</tr>
<tr>
<td>1800-1999</td>
<td>Yellow</td>
</tr>
<tr>
<td>2000+</td>
<td>Green</td>
</tr>
</tbody>
</table>

Note: *2009 data shown as severe drought in 2010 distorted yield data (on average, yield ~30% less than ’09); Rainfall in 2009 was 82% of avg; in 2010 64% of avg (Bihar Economic Survey 2012); District-wise Government data for 2010-11 onwards not yet available

Sources: Dept. of Agriculture, Govt. of Bihar
Average Bihari consumes ~200-250g rice per day, and while landholding sizes are small, many farmers producing for market

**AVG. ANNUAL RICE CONSUMPTION IN BIHAR IS ~75-90KG**

- Average adult consumes **~200-250g rice per day** i.e. 75-90 kg per year
- General trend is **1 rice-based meal per day** e.g. take rice at lunch and chapati (made of wheat) at dinner
- Rice consumption amongst **urban and semi-urban population decreasing slightly**, but trend amongst **majority rural population is flat**

**AVG. FARMER WOULD SELL ~75% OF PADDY PRODUCED**

*Marketable surplus for rice (2008-09)*
~65% of Bihar rice consumption is parboiled non-aromatic, with ~30% raw rice and ~5% aromatic

<table>
<thead>
<tr>
<th></th>
<th>Parboiled (usna)</th>
<th>Raw (arwa)</th>
<th>Aromatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>% market</td>
<td>35%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Avg. price (Rs./kg)</td>
<td>~20-22</td>
<td>~20-32 (dependent on variety; shorter grains cheaper; longer more expensive)</td>
<td>~25-30</td>
</tr>
<tr>
<td>Broken content</td>
<td>TBD</td>
<td>TBD</td>
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</tr>
</tbody>
</table>

Trends

- Trend towards polished rice, driven by middle class and upper middle class, commercial (hotel, restaurant) consumption
  - Polished rice tends to be dust/stone free and hence require less cleaning
- But some still prefer unpolished as they have feel polishing of rice takes away nutrient value of rice
- Aromatic consumption increasing slowly, but off a very low base
- Ratio between parboiled and raw consumption likely to remain in the same range

Source: Primary interviews
Agenda

- Supply-demand dynamics
- **Value chain & constraints**
  - **Surplus**
  - Subsistence
- Policy & government context
- Prioritized interventions
Seeds: Key focus of state government, who have succeeded in increasing seed replacement rate

GOVT. HAS REVIVED STATE SEED CORP AND LAUNCHED SEVERAL SCHEMES

- Defunct Bihar State Seed Corporation (BRBN) revived in 2006
  - Provides foundation seeds to farmers and procures seed from them
  - Also looks after quality control, processing, certification and distribution

Chief Minister’s Crash Seed Program

- 2 farmers from each eligible village in the state are provided with foundation seed at half price

Seed Village Program

- Under this program, all interested farmers are provided with foundation seeds at half price and training on seed production
  - Rs. 15,000 allotted for training for each group of 100 farmers
- Begun in 2007-08, and by 2010-11, 4 villages of every block of the state were included in program

Note: BRBM = Bihar Rajya Beej Nigam = Bihar State Seed Corporation
Source: Govt. of Bihar Agricultural Roadmap
**Seeds:** Some doubts remain about hybrids’ profitability and eating / cooking quality, but appears quality concerns are gradually being overcome

**COST-BENEFIT AND QUALITY CONCERNS HAVE HAMPERED ADOPTION**

- **On-farm yields do not match those of trials**
  - Though hybrid rice requires greater fertiliser and pesticide use, proper quantities frequently not applied in practice
  - Consequently, for many farmers yields for hybrids only marginally higher than OPV

- **As a result, unclear value proposition for farmer**
  - Realised yields do not balance higher input prices
  - Hybrid seed cost 5-6 times OPV; seed can only be used once

- **Many consumers and millers perceive hybrid rice/paddy as inferior**
  - Hybrid not used for farmers’ own consumption due to poor taste and cooking quality perception; regarded as less nutritious
  - Hybrid also unpopular with some millers due to high breakage and lower recovery rates, as well as marketability

**THERE ARE STILL DIFFERING PERSPECTIVES ABOUT HYBRIDS**

<table>
<thead>
<tr>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>“We eat hybrid rice in our home. It really tastes as good as OPV rice does. We usually grow hybrid paddy in the majority of our land, of course because of the yield and also that we can consume it at our home.”</td>
</tr>
<tr>
<td>Paddy farmer, Nalanda</td>
</tr>
<tr>
<td>“Before there used to be a problem with breakage when milling hybrid paddy. Now, with the use of rubber rollers, this really isn’t an issue.”</td>
</tr>
<tr>
<td>Miller, Rohtas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Negative</th>
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<tbody>
<tr>
<td>“Farmers sometimes receive a lower price for paddy from hybrid seeds vs. HYV seeds. While prices for HYV paddy are around Rs. 900 per quintal, paddy from hybrid seeds sometimes only fetches around Rs. 800 per quintal.”</td>
</tr>
<tr>
<td>Official, Bihar State Seed Corporation</td>
</tr>
</tbody>
</table>

Source: IRRI, Interviews in Nalanda, Gaya, Rohtas districts
Seeds: In fieldwork to date, hybrid seeds tend to drive a ~15% yield increase, with a ~5% margin increase.

### OPV

- **Avg. yield:** 39 qtls per ha
- **Avg. land holding:** 2.5 ha

- **Farmgate Price:** Rs. 34.5
- **Margin:** Rs. 10.6

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<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Cost (in '000 Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor</td>
<td>4.0</td>
</tr>
<tr>
<td>Seeds</td>
<td>0.9</td>
</tr>
<tr>
<td>Insecticide</td>
<td>0.2</td>
</tr>
<tr>
<td>Irrigation</td>
<td>3.2</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>5.3</td>
</tr>
<tr>
<td>Labour</td>
<td>7.2</td>
</tr>
<tr>
<td>Packaging</td>
<td>0.8</td>
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<tr>
<td>Transport</td>
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</tr>
<tr>
<td>Margin</td>
<td>1.7</td>
</tr>
</tbody>
</table>
```

**Represents ~31% profitability**

### HYBRID

- **Avg. yield:** 45 qtls per ha
- **Avg. land holding:** 1.6 ha

- **Farmgate Price:** Rs. 45.6
- **Margin:** Rs. 16.7

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<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Cost (in '000 Rs.)</th>
</tr>
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<tbody>
<tr>
<td>Tractor</td>
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<td>Seeds</td>
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<tr>
<td>Insecticide</td>
<td>0.4</td>
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<tr>
<td>Irrigation</td>
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<tr>
<td>Fertilizer</td>
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<tr>
<td>Margin</td>
<td>1.5</td>
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</tbody>
</table>
```

**Represents ~36% profitability**

Note: Estimation based on field interviews and market visits (n = 6 for OPV; n = 9 for hybrid). Entire sample not using SRI practices.

Interviews in Nalanda, Gaya, Rohtas districts. Analysis excludes amount kept for self-consumption (~xx%).

Sources: Primary interviews; Team analysis
Seeds: Though by disaggregating averages, clear that significant risks from promoting hybrids in unsuitable zones.

**IRRIGATED OR FAVOURABLE CONDITIONS**

Paddy - Cost per hectare (in '000 Rs.)

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Irrigated</th>
<th>Rainfed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor cost</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Seeds/insecticide/pesticide</td>
<td>2.9</td>
<td>3.2</td>
</tr>
<tr>
<td>Irrigation</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>5.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Labour</td>
<td>3.5</td>
<td>2.6</td>
</tr>
<tr>
<td>Wastage</td>
<td>8.3</td>
<td>8.3</td>
</tr>
<tr>
<td>Margin</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Farmgate Price</td>
<td>28.2</td>
<td>24.0</td>
</tr>
</tbody>
</table>

Avg. yield: 54 qtls per ha
Avg. land holding: 0.24 ha

Represents ~52% profitability

**RAINFED, UPLAND WITH SANDY SOIL**

Paddy - Cost per hectare (in '000 Rs.)

<table>
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<tr>
<th>Cost Item</th>
<th>Irrigated</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>Farmgate Price</td>
<td>28.2</td>
<td>24.0</td>
</tr>
</tbody>
</table>

Avg. yield: 24 qtls per ha
Avg. land holding: 0.27 ha

Represents ~11% profitability

Note: Estimation based on field interviews (n = 4 for irrigated/favourable; n = 6 for rainfed). Entire sample not using SRI practices. Interviews in Muzaffarpur district.
Sources: Primary interviews; Team analysis
**Fertilisers: Fertiliser usage is reasonable, though balanced application is a major issue**

**FERTILISER USAGE IN BIHAR IS RELATIVELY HIGH**

- Estimated Consumption of Fertiliser (Kg/ha, 2010)

Relatively high usage driven by significant *rabi* crop, where fertiliser usage is typically higher.

- Source: Govt. of India

**THOUGH APPLICATION IS SEVERELY IMBALANCED**

- Estimated consumption of fertiliser (N,P,K as % of total, 2010)

While recommended dose depends on soil type, ratio more in range of 45%:30%:25% (NPK).
**Pesticides/herbicides:** While usage is low, less of a constraint as no government distortion in this sector

**BIHAR PESTICIDE USAGE ONE OF LOWEST IN COUNTRY**

Pesticide consumption - Technical grade Kg/ha of Net Sown Area, 2009-10

- Farmers are generally **aware of type of pesticides** to be used against particular pests/diseases, but typically use it as a **curative** rather than preventive measure
  - If the pest infestation is low, they skip the application of pesticides

- **No government subsidy** on pesticides

- **Several private players** in the pesticide market, with their **own dealer/distribution networks**
  - E.g. Syngenta, Bayer, BASF, Dow, Dupont etc.
  - Prices of these MNC brand pesticides are between ~Rs. 400-1500/L vs. local/national brands which range from ~Rs. 200-500/L

India still lags rice-producing Asian neighbours e.g.
- Thailand: ~1.5
- China: ~2.5

Source: Pesticide Unit, Dept. of Agriculture; Field interviews
Irrigation: Key challenge is cost, with farmers carrying out ‘emergency’ irrigation if required, at cost to incomes

COST IS A CHALLENGE, PARTICULARLY FOR FARMERS W/O OWN BOREWELLS

- ~30% of farmers have tube-well/bore-well irrigation while remainder either rent from these irrigated farmers or rely on rainfall
- Installation cost of a bore-well and pump set costs ~Rs. 27,000
- Many farmers choose to only carry out ‘emergency’ irrigation in the case of monsoon failure due to high costs

“As the diesel prices are increasing day by day, we find it very hard to irrigate our paddy fields. This year we gave only 3-4 irrigations and probably because of this our yield was low.”

Paddy farmer, Bhagalpur

Source: Primary interviews; Lit Search

COST CHALLENGE SET TO EXACERBATE DUE TO RISING DIESEL PRICES

Diesel prices (Rs. /L)

- 2/11/2010: 40
- 25/6/2011: 43
- 17/7/2011: 43
- 26/7/2012: 45
- 14/9/2012: 51
- 27/10/2012: 50

+25%
Agronomic practices: Strict form of SRI extremely challenging to replicate on farm, and in any case should not be adopted as a blanket approach

SRI EXTREMELY CHALLENGING TO REPLICATE ON THE GROUND

- Knowledge intensive package of practices which requires intensive upfront support and training for farmers
  - Government extension services often unable to provide this level of support
- SRI is also labour intensive, particularly for larger farmers who are reliant on hired labour (vs. family labour)
  - Unavailability of quality labour willing to carefully and rigorously follow practices
  - For farmers who do adopt, increased labor costs due to additional activities (levelling of fields, creating drains, weeding 3+ times a season)
  - Lack of availability of mechanization (e.g cone weeders) makes labour requirements even greater

AND DOES NOT EVEN WORK IN ALL CONDITIONS / FARMER SEGMENTS

- Alternate wetting and drying is highly risky in rainfed areas
- Use of only organic fertilisers is simply not feasible in meeting soil nutrition requirements
**Agronomic practices:** Jeevika is a World Bank and Bihar State Govt. project aimed at reducing poverty amongst rural households

**JEEVIKA WAS LAUNCHED IN BIHAR IN 2007 THROUGH WORLD BANK FUNDING**

- Jeevika (or Bihar Rural Livelihoods Promotion Society - BRLPS) was started in 2007 with **$63M funding from World Bank** (til 2015)
  - Co-contribution of $7M from State Govt. in initial tranche
  - Additional ~$140M funding granted in 2012 (~$100M World Bank; ~$40M State Govt.)
- While Govt. of Bihar is officially grantee and implementing agency, Jeevika is **effectively an autonomous society**
  - Predominantly staffed by independent development professionals, not government workers
- **Aim of reducing poverty amongst rural households** by building **community-based organizations**
  - Currently working 55 blocks of 9 districts of Bihar
  - ~580,000 farming households mobilised to into SHGs associated with BRLPS (til May ’12)
  - ~500 field officers
- State Govt. plans to cover **12.5M households and all 38 districts** within 10 years

**LATER, WORLD BANK & GOI STARTED NATIONAL RURAL LIVELIHOODS MISSION**

- ‘Aajeevika’ or the National Rural Livelihoods Mission (NRLM) was initiated by the Govt. of India in 2011
- Perhaps the largest poverty reduction initiative in the world, with its goal of reaching ~70M rural households
- Currently operating in **12 states**
- Funding of **$5.1B from Govt. of India and $1B from World Bank** over 7 years
  - Beyond GOI and World Bank Investment, NRLM will leverage funds from formal finance, other public sector and private sector programs, and CSOs in social poverty reduction
  - World Bank livelihoods programs have in the past leveraged about $10 for every $1 of World Bank investment
- Jeevika **previously operated independently** of NRLM; in 2013 will enter into partnership with overarching NRLM program

Source: World Bank website; Jeevika website; Lit. Search
Agronomic practices: Jeevika co-contribution model appears more sustainable than govt.’s, but farmers prefer easier and cheaper subsidy route

JEEVIKA HAS ADOPTED A CO-CONTRIBUTION SCHEME DRIVING GREATER FARMER ENGAGEMENT

- Jeevika model appears more sustainable as farmers invest Rs. 27 per kattha (~Rs. 1,485 per ha), with Jeevika providing an equal amount to the farmers
- As a result, they take more ownership and feel more invested in the process
- They also receive access to a Village Resource Person (VRP) who is responsible for 30-50 farmers

BUT LOST MOMENTUM WHEN GOVT. SUBSIDY SCHEME ANNOUNCED

# farmers involved in Jeevika program (Bihar)

Program nearly halved in first year post subsidy announcement

Source: Primary interviews, team analysis
Agronomic practices: Pradan is promoting improved agronomic practices in paddy in a few districts of Bihar

PRADAN PROMOTING “SRI” AMONGST ~26,000 FARMERS

- NGO focused on enhancing livelihood capabilities of ‘poorest of the poor’
- Currently working in ~13 blocks of Bihar and directly connected to ~26,138 farmers
  - In each block are ~15-20 VRPs (Village Resource Person)
  - 1 VRP is connected to 40-50 farmers of the cluster
  - Farmers are selected on the basis of their caste and economic level
- Apart from technical assistance, generally Pradan provides a weeder to a group of ~5-6 farmers.
  - Apart from this they also provide a vermi-compost pit (costs Rs. 800 each) and shade for the pit (costs Rs. 720 each) in every cluster

Major Funder SDTT, but also ties with Jeevika

Pradan’s plan is to cover adjoining districts like Jahanabad, Arwal, Aurangabad and Nawada in 2013 as these districts are very poor and Naxalite-prone areas.

Source: Primary interviews, Team analysis
Agronomic practices: BASIX also promoting SRI under fee-for-service model, but has recently shifted focus to OPV seed production

BASIX IS OPERATIONAL IN 7 DISTRICTS IN BIHAR

USED TO EMPLOY A FEE-FOR-SERVICE EXTENSION MODEL, BUT NOW FOCUSING ON OPV SEED PRODUCTION

- Basix started promoting SRI in 2007 in Gaya district using a fee-based model i.e. BASIX would provide technical support to farmers and in return would charge a Rs. 350 service charge.

- Currently working with ~4000-5000 small and marginal farmers in 7 districts of Bihar
  - ~160 field staff including ~100 VRPs (Village Resource Person), ~40-50 LSPs (Livelihood Support Provider)
  - 1 VRP is connected to 20-25 farmers

- Recently shifted its focus to OPV seed production through FPOs, but still in early stages
  - 1 FPO in process of being registered
  - Will also sell seeds, fertilisers and pesticides
  - SRI will continue as secondary activity

“As the government of Bihar has started promoting SRI from 2011 along with subsidies for the farmers, BASIX is now planning to change its working model. Instead of working on SRI, we are planning to go for the seed production of OPVs by the help of some FPOs which are currently being registered.”

Senior Manager, BASIX Patna Office
Mechanization/Labour: CSISA works with ~600 service providers in Bihar, focusing mainly on zero-till machines

CSISA’S MAIN MECHANIZATION FOCUS IS ZERO-TILL MACHINES

• CSISA is promoting mechanization under the service provider model in Bihar since 2008
  - Provides technical training to service providers
  - Runs farmer meetings to increase farmer awareness

• Focused primarily on zero-tillage machines, predominantly for wheat crop
  - ~95% of associated farmers use zero-tillage machines for wheat; only ~5% use zero-tillage machines for rice (mainly in low-land areas; zero-tillage not suitable for medium or uplands)
  - One of the key aims of CSISA in Bihar is to enable early sowing of wheat crop

• Also promotes tractors, combine harvesters, threshers, reapers and rice haulers but at smaller scale; has just begun piloting mechanical transplanters

WORKS WITH ~600 SERVICE PROVIDERS IN 10 DISTRICTS OF BIHAR

Source: CSISA; Primary interviews
Post-harvest: Most have threshing machines and some storage facilities, though not of particularly good quality

THRESHING

• Usually ~ 1-2 rotary threshers available per village
  - As these threshing machines are not portable, they are not rented out to other farmers
• If not, harvested paddy is mostly threshed on floor or on wooden planks

STORAGE

• Threshed grains are either sold off immediately to local traders or are stored in gunny bags to be sold later on in ~3 months time period
• These gunny bags are stacked up in the houses of the farmer itself, while the straws are either used as the fodder for the cattle or to cover up their roofs

Post harvest losses at producer level in Bihar is estimated at ~5% of total produce

Source: Primary interviews
Infrastructure: Currently worst or near worst in the country in terms of both roads and electricity

POOREST ROAD NETWORK IN INDIA, APART FROM NEIGHBOURING JHARKHAND

LOWEST ELECTRICITY CONSUMPTION IN COUNTRY

Rural road density (km per 1000 population, 2008)

Per capita electricity consumption (kWh, 2010)

Source: Team analysis
Agenda

Supply-demand dynamics

Value chain & constraints
  Surplus
  Subsistence

Policy & government context

Prioritized interventions
1c

**Pesticides:** Low awareness; economic case for pesticides less clear for subsistence farmers

PESTICIDE CONSUMPTION NEGLIGIBLE AMONGST SUBSISTENCE FARMERS

- Even in general, concept of pesticide spray in Bihar is **curative**
- Since subsistence farmers have such low margins they are **extremely reluctant to invest in pesticides** before the onset of pests/disease
- Subsistence farmers with very small land holdings usually **do not even use pesticide sprays even as a curative measure** if the infestation is mild
- The few subsistence farmers who do use pesticides tend to use **older and cheaper pesticides** like Bavistin, rather than MNC brands

Source: Primary interviews
Mechanization/Labour: Labour is available within the family and is not currently a constraint

ENOUGH FAMILY LABOUR TO SERVICE RELATIVELY SMALLER LANDHOLDINGS

“We are 7 members in the family including the females and kids. We all work full time together in the field. So we don’t require outside labourers”

Paddy farmer, Sasaram

“All the females of the community get together and help each other in the sowing of the seedlings. By this way we save a lot in labour costs. We require outside labourers only during harvesting”

Paddy Farmer, Muzaffarpur

“Our kids enjoy seedling sowing in the field after their school hours. It’s like a new game for them. They call up all their friends and help us in sowing and other farm activities.”

Paddy farmer, Nalanda

HOWEVER, IF AGRONOMIC PRACTICES WERE TO CHANGE, BASIC MECHANIZATION WOULD BE NECESSARY

- If farmers were to adopt improved agronomic practices (line planting, regular weeding etc.), basic mechanization would be beneficial
  - Machines like mechanical transplanters, cono-weeders, etc. would enable more accurate practices and reduce costs
- As part of their agronomic practices programs, some NGOs (e.g. Jeevika, Pradan) provide cono-weeders to the their associated farmers free of cost

Source: Primary interviews
Agenda

Supply-demand dynamics

Value chain & constraints

Policy & government context

Prioritized interventions
While constitutionally agriculture is a state responsibility, Centre formulates overall policy and provides financial resources through a number of ministries

<table>
<thead>
<tr>
<th>Ministry of Agriculture</th>
<th>Ministry of Rural Development</th>
<th>Ministry of Consumer Affairs, Food and Public Distribution</th>
<th>Ministry of Commerce and Industry</th>
<th>Ministry of Food Processing</th>
<th>Ministry of Chemicals and Fertilizers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consists of three main departments:</td>
<td>Engaged in accelerating the socio-economic development of rural India</td>
<td>Divided into two departments</td>
<td>Responsible for development and regulation of trade policies for India</td>
<td>Promotes development of food processing sector</td>
<td>Responsible for policy, planning, development and regulation of chemicals, petrochemicals and fertilizers</td>
</tr>
<tr>
<td>- Agricultural Research and Education</td>
<td>- Dept. of Rural Development implements govt. policies related to rural agriculture and self/wage employment of rural poor</td>
<td>- Dept. of Food and Distribution looks into timely procurement and distribution of food and grains so as to ensure food security</td>
<td>- Dept. of Consumer Affairs is responsible for formulating pricing policies and looking after other consumer cooperatives and institutions</td>
<td>- This ministry formulates all import and export policies related to agriculture produce and products</td>
<td>- Aims to create increased job opportunities in rural areas, enable farmers to reap benefit from modern technology, create surplus for exports and stimulate demand for processed food</td>
</tr>
<tr>
<td>- Agriculture and Cooperation</td>
<td>- Dept. of Land Resources works primarily in area of increasing biomass production and development of wastelands in the country</td>
<td>- Dept. of Consumer Affairs looks after other consumer cooperatives and institutions</td>
<td>- Dept. of Consumer Affairs is responsible for formulating pricing policies and looking after other consumer cooperatives and institutions</td>
<td>- Dept. of Land Resources works primarily in area of increasing biomass production and development of wastelands in the country</td>
<td>- Dept. of Rural Development implements govt. policies related to rural agriculture and self/wage employment of rural poor</td>
</tr>
<tr>
<td>- Animal Husbandry and Dairying</td>
<td>- Two main departments</td>
<td>Two main departments</td>
<td>Responsible for development and regulation of trade policies for India</td>
<td>Promotes development of food processing sector</td>
<td>Responsible for policy, planning, development and regulation of chemicals, petrochemicals and fertilizers</td>
</tr>
<tr>
<td></td>
<td>- National policies and programmes for agricultural growth</td>
<td>- Dept. of Rural Development implements govt. policies related to rural agriculture and self/wage employment of rural poor</td>
<td>- Dept. of Consumer Affairs is responsible for formulating pricing policies and looking after other consumer cooperatives and institutions</td>
<td>- This ministry formulates all import and export policies related to agriculture produce and products</td>
<td>- Aims to create increased job opportunities in rural areas, enable farmers to reap benefit from modern technology, create surplus for exports and stimulate demand for processed food</td>
</tr>
<tr>
<td></td>
<td>- Coordinate and promote agricultural research &amp; education</td>
<td>- Dept. of Rural Development implements govt. policies related to rural agriculture and self/wage employment of rural poor</td>
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<td>- All policies related to animal husbandry and dairy industry</td>
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</tbody>
</table>
Effectiveness of various State/Centre interventions often reduced because of administrative and political factors, though RKVY may be a new way forward.

| Wide range of interventions with differing political objectives | • Proliferation of policy interventions makes it difficult for Centre and State to coordinate their objectives and make them consistent  
• For instance, Centre supplies subsidised rice to the poor through PDS, but certain States sell rice even cheaper at ~Rs. 2 per kg increasing the subsidy burden  
  - Moves largely politically driven to win more votes  
  - E.g. Tripura government, in July, distributed rice at Rs. 2 to all people living below the poverty line just before the 2012 polls; similar situation occurred in Orissa before the 2009 elections |
| Uncoordinated implementation approach | • Interventions are often rolled out in a piecemeal manner and are uncoordinated between the institutions making decision making difficult for all stakeholders  
• This often creates confusion on interpretation of policy leading to ineffectiveness and misuse.  
• For example, in the programme on agriculture extension by Agriculture Technology Management Agency (ATMA), poor coordination between the stakeholders led to great disparities in implementation within and across states  
  - 11th Planning Commission acknowledges lack of coordination between ATMA and other state agencies – particularly Krishi Vigyan Kendra (KVK) – has led to programmes failing to achieve implementation goals and objectives |
| Funding of state agricultural institutions | • Many State agriculture institutions depend on central government for their funding requirements. As a result, these institutions tend to align their objectives and activities with Central government rather than deal with state specific issues  
• E.g. State Agriculture Universities are very poorly funded by the State and rely heavily on Centre (primarily Indian Council of Agricultural Research), reducing amount of research on regional topics |
| Recent introduction of Rashtriya Krishi Vikas Yojna may provide way forward | • Rashtriya Krishi Vikas Yojna (RKVY) a new scheme implemented by the Planning Commission in 2007 as part of the 11th Five Year Plan aims to reduce confusion between Centre and State by allowing states to make independent agriculture policy decisions  
• Incentivises State governments to draw up agriculture plans that will address state specific issues  
• Too early to judge success, though Centre continuing with RKVY framework in 12th Five Year Plan |
Rice productivity enhancement is a key priority of GOI and it has launched a number of flagship schemes to do so

<table>
<thead>
<tr>
<th>NATIONAL FOOD SECURITY MISSION (NFSM)</th>
<th>BRINGING GREEN REVOLUTION TO EASTERN INDIA (BGREI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Launched in 2007 by GoI’s National Development Council</td>
<td>• Launched by GoI in 2010-2011 to improve productivity of rice-cropping systems in eastern India</td>
</tr>
<tr>
<td>• Set out to increase production of rice, wheat and pulses by 10M, 8M and 2M metric tons respectively by end of 11th Plan (2012)</td>
<td>• Operates in seven states: Assam, West Bengal, Odisha, Bihar, Jharkhand, Eastern Uttar Pradesh and Chhattisgarh</td>
</tr>
<tr>
<td>• Rs. 255 billion (~US$5.1B) funds under 12th Five-Year Plan (2012-17)</td>
<td>• Allocation increased from Rs. 4 billion in 2011-12 to Rs. 10 billion in 2012-13</td>
</tr>
<tr>
<td>• 100% Central government funding to State level autonomous agencies</td>
<td>• Sub-scheme of RKVY, a Central government scheme aimed at giving high levels of flexibility to the states in developing their agri. Sectors</td>
</tr>
</tbody>
</table>
| • Farmer subsidies for approved seed varieties and micro-nutrients | • Block-demonstrations for rice & wheat (~63% of funds)  
  - Identification of progressive farmers to handhold  
  - Provision of implements e.g. drum seeders, cone weeder |
| • Farmer trainings on crop evaluation, crop protection technologies, etc. | • Asset building to enhance water utilization e.g. tubewells, borewells, pump sets (~17% funds) |
| • More than 50,000 demonstrations of SRI and nearly 25,000 demonstrations of hybrid rice have already been conducted | • Site-specific activities e.g. construction/renovation of irrigation channels/electric power supply (~19% of funds) |
| • During 2008-09, nearly 50% of rice districts (70 out of 143) recorded more than 10-20% enhancement in productivity compared to base year of 2006-07 | • In 2011-12, rice production from Eastern region was estimated ~56 million MT, an increase of 19.8% over last year vs. all India increase of 7% |

GOI = Govt. of India  
Source: NFSM website, RKVY website, GOI
After making significant progress over last few years, Bihar Govt. has turned its focus toward a sustainable, environmentally-friendly “Rainbow Revolution”

**RECENT ADVANCES IN BIHAR’S AGRICULTURAL POLICIES**

- After decades of “backward” government policies, CM Sri Nitish Kumar unveiled **5 major agri-related goals** in 2008:
  - **Ensure increase in income** of farmers to viable levels, especially considering small size of holdings
  - **Ensure food security** through increased productivity combined with profitability
  - **Foster nutritional security** through raising productivity as well as raising living standards of rural societies
  - Revitalize farming to create gainful employment and check migration
  - **Ensure growth with justice**, with programs focusing on gender and human aspects

- To accomplish these goals, the Bihar government has been focused on **enhancing productivity and quality of farmer life**:
  - **Seeds**: Major initiatives such as the Seed Village Programme (Beej Gram Yojana), provision of subsidy for use of certified seeds by farmers, revival of hitherto dormant Bihar Rajya Beej Nigam, and strengthening of Bihar seed certification agency
  - **Extension services**: Enhancement of extension services via 1) Farmer's training through Farmers Field Schools, 2) Krishi Vikash Shivir, focused on technology-transfer between scientists and farmers
  - **Farm mechanization**: Subsidies to farmers over and above the subsidy admissible under the centrally sponsored schemes

**2012-2017 ROADMAP FOCUSED ON ACHIEVING “RAINBOW REVOLUTION”**

- **Sustainable agricultural revolution** where equal focus is given to minimizing cost of production, minimizing environmental impact, and increasing productivity
- Ambitious plan targets **growing Bihar’s agricultural output 7% p.a.** over **2012-2017**, with plans to spend ~Rs. 1,500 billion over next 10 years with active help from the private sector
- **Focus on organic, chemical-free, sustainable farming practices**
  - The government is providing a 90% subsidy on organic fertilizers
  - To date, organic fertilizer has been distributed free among more than 3.30 lakh seed growing farmers in 2010-11
- **Goal of increasing storage capacity and improving market linkages**
  - Storage capacity to increase from 9 lakh MT to 65 lakh MT during next 5 years; and 85 lakh MT in the next 10 years
  - New cold storage units to be set up, with the goal of reducing wastage from ~30% to ~5%
  - All-weather road for every village with population >250

- Major push to become a **market leader in food processing**, via the provision of capital and highly competitive incentives for private sector development
  - Bihar was the first state to have a separate Vision Document for Agro/food processing sector and Special Schemes with incentives for food processing sector
  - The Ministry of Food Processing Industries (GoI) cited Bihar as a “model state”

Source: Dept of Agriculture Government of Bihar,
### Approach: Wide range of stakeholders consulted

#### STAKEHOLDER INTERVIEWS

- **Government**
  - Director, Bihar Department of Agriculture
  - Bihar State Food and Civil Supply Corporation
  - Bihar Department of Food & Consumer Protection
  - Bihar Department of Industries
  - Bihar Department of Energy
  - Bihar Rural Livelihoods Promotion Society (Jeevika)
  - Bihar State Seed Corporation
  - Food Corporation of India
  - Chairman, Commission on Agricultural Costs & Prices (CACP)
  - Agricultural and Processed Food Products Export Development Authority (APEDA)

- **Private sector**
  - Rice Miller Associations for several states
  - Large millers (e.g. Jhunjhunwala Oil Mills, Mahajan Mills etc.)
  - Input providers (e.g. Bayer, Syngenta, Pioneer, Metahelix etc.)
  - Technology providers (e.g. Ankur Scientific Technologies, etc.)
  - Infrastructure Leasing & Financial Services (IL&FS)
  - All India Rice Exporters Association (AIREA)

- **NGOs**
  - Pradan, BASIX, Livolink

- **Institutes / Universities**
  - Indian Council of Agricultural Research (ICAR)
  - International Food Policy Research Institute (IFPRI)
  - Central Rice Research Institute (CRRI)
  - International Rice Research Institute (IRRI)
  - Cereal Systems Initiative for South Asia (CSISA)

- **Various BMGF Program Officers**

#### FIELDWORK

- **120+ farmers across 5 districts**
  - Gaya, Rohtas, Nalanda, Bhagalpur, Muzaffarpur

- **100+ other value chain players**
  - Traders, brokers, millers, wholesalers

- **Local government officials**
  - District Agriculture Officers
  - District extension officers
  - Primary Agriculture Cooperative Society officers

- **Field teams of various private/NGO players**
  - Input provider field teams
  - NGO fieldworkers

#### SECONDARY SOURCES

- Ministry of Agriculture data
- Bihar Department of Agriculture data
- Govt. of India Planning Commission
- National Sample Survey Organisation (NSSO)
- Census of India
- Govt. websites (e.g. Department of Energy, FCI, etc.)
- International Food Policy Research Institute (IFPRI) reports
- United Nations World Food Programme
- Press
Government active at most stages of rice value chain

1a. **Seeds**
- Ministry of Agri.
- Central Rice Research Institute
- Dept. of Agriculture
- Bihar State Seed Corporation

1b. **Fertilisers**
- Ministry of Chemicals & Fertilisers
- PACS

1c. **Pesticides**
- Ministry of Chemicals & Fertilisers
- Cen. Insecticides Board

1d. **Irrigation**
- Min. of Water Resources
- Water Resources Dept.

1e. **Access to credit**
- NABARD
- Public sector banks
- BRLPS (Jeevika)

2a. **Agronomic practices**
- Ministry of Agriculture
- Dept. of Agriculture
- Agri. Universities
- Bihar Rural Livelihoods Promotion Society (Jeevika)
- Agriculture Technology Management Agency (ATMA)
- Krishi Vigyan Kendras (KVKs – Agricultural Science Centres)
- District extension staff

2b. **Mechanization & labour**
- Ministry of Rural Development
- Dept. of Agriculture
- Agri. Universities
- ATMA
- KVKs

3. **Post-harvest practices**
- Dept. of Agriculture

4. **Market access**
- Ministry of Consumer Affairs, Food and Public Distribution
- Commission for Agricultural Costs and Prices
- Food Corporation of India
- Dept. of Agriculture
- Bihar State Food and Civil Supply Corporation
- Bihar Department of Food & Consumer Protection
- PACS

5. **Milling**
- Ministry of Food Processing
- Small Industries Development Bank of India (SIDBI)
- Department of Agriculture
- Department of Industries

6. **Infrastructure**
- Ministry of Surface Transport
- National Highway Authority of India
- Department of Energy
- Department of Industries

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BRLPS = Bihar Rural Livelihoods Promotion Society; PACS = Primary Agriculture Cooperative Societies
Seeds: Significant subsidies on high-yielding variety seeds distributed through government channels

**GOVT. PROVIDES SUBSIDIES ON HYV SEEDS**

- Central government provides subsidy on fixed amount of HYV seeds to each state
  - Subsidy has been ~Rs. 5 per kg in recent years

- State governments tend to supplement this subsidy with additional subsidy of their own
  - Also get to decide which varieties receive subsidy

- In Bihar, Central and State govts. combined provide a subsidy of ~25-30% on HYV paddy seeds
  - Rs. 7 / kg subsidy, with HYV seed cost to farmer Rs. ~15-20 / kg
  - Higher subsidy amount possible via various schemes e.g. Chief Minister’s Crash Seed Programme

- Large subsidy has created *govt. dominance in HYV seed sector*
  - Subsidy only available to seeds distributed through government
  - Main provider is Bihar State Seed Corporation; National Seed Corporation and Tarai Development Corporation also provide small quantities

**AS A RESULT, GOVT. DOMINATES HYV SEED SECTOR**

Estimated paddy seed sales (Kharif 2012-13, ’000 qtls)

- 178

*Includes Bihar State Seed Corporation, National Seed Corporation and Tarai Development Corporation (UP & Uttarakhand’s State Seed Corporation)

Source: Govt. of Odisha, Primary interviews
Seeds: Bihar govt. supportive of hybrids, with generous subsidy driving relatively high penetration

CURRENT SUBSIDY ON HYBRIDS OF RS. 200 PER KG UP TO 6 KG

AREA UNDER HYBRIDS IN BIHAR NOW ~10%

- In 2010-11, Govt. of India allocated ~Rs. 19.85 million (~$3.7M) to increase area under hybrid rice in Bihar to ~6% (~200,000 ha) under BGREI scheme
  - Rice proportion ~30% of ~Rs. 63.94 million allocated for all crops
  - Initiatives include demonstration (hybrid rice with SRI, hybrid rice with ‘Plant Protection Chemicals’), hybrid seed distribution and capacity building
- In 2011-12, Bihar Dept. of Agriculture stated intention to increase area under hybrids to ~400,000 ha (i.e. doubling of target or ~12%)
- These targets were achieved according to Govt. of Bihar Economic Survey (Feb 2012), though field interviews suggest ~300,000 (~9%) more realistic estimate

BGREI = Bringing Green Revolution to Eastern India
Source: Department of Agriculture, Bihar; IRRI; Primary interviews
Central government also exerts heavy control over fertiliser sector

**Indian Fertiliser Sector Heavily Regulated**

- **Urea sector** (accounting for ~50% of fertiliser consumption) is **fully regulated** where retail price is fixed and subsidy is variable in order to ensure cost plus return

- Since **April 2010**, **non-urea sector** (i.e. P and K fertilisers) has functioned under a **fixed subsidy-variable retail price framework**
  - Previously also had fixed retail price, but prices were decontrolled under Nutrient Based Subsidy (NBS) scheme, announced in April 2010

- **Retail price differential** between urea and non-urea fertilisers **widening**
  - Partial price deregulation – fixed urea price and variable non-urea fertiliser prices
  - Lower subsidies to P and K under NBS
  - Weak rupee – India heavily dependent on imports for P and K fertilisers

- This has **further skewed consumption** in favour of urea

*Preliminary, some 2008-09, 2009-10 data used in calculation
Source: ICRA, FAI, GOI, Industry Sources, Lit. Search; United States International Trade Commission
NREGA has led to agricultural labour shortage and is continuing to push up wages

**MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE ACT**

- NREGA is a **job guarantee scheme** providing a legal guarantee for **100 days of employment every financial year** to adult members of any rural household
  - Provides public work-related unskilled manual work at statutory minimum wage
  - Effective from August 2005
- NREGA has **pushed labour wages in agricultural sector** from <Rs. 60-80 pre-NREGA to ~Rs. 200 per day currently

“NREGA was supposed to be ‘fallback option’ in situations when rural economy failed to provide normal job opportunities in agriculture.….In reality NREGA...has resulted in **drawing out agriculture labourers from agricultural operations.** Since critical agricultural operations are required to be carried out at appropriate times and cannot be postponed, this has led to **increasing agricultural wage rates, impacting cost of cultivation and affecting farming viability adversely.**”

Sharad Pawar, India Agriculture Minister, December 2011

“What has **hurt profitability most**, farmers said, is **rising wages for labourers**, driven by government efforts to ensure a minimum level of paid work for rural households under NREGA. NREGA’s impact on labour markets and broader inflation **prompted India’s farm ministry to ask the rural development ministry to halt the scheme** during the sowing season.

Reuters, October 2011
Heavy government involvement in rice procurement and distribution likely to continue

INCREASING SHARE OF RICE PURCHASED THROUGH GOVT. REGIME

Food subsidy by Centre (Rs. Billion)

Used to be ~14.5% during 1980s

MOOTED FOOD SECURITY BILL MAY REQUIRE FURTHER STEP-UP IN PROCUREMENT

- Proposed National Food Security Bill (NFSB) aims to meet dietary requirements of ~67% of the population
  - This includes a promise to provide 25kg of rice/wheat per family every month
- The target food requirement is 60 million MT of rice/wheat
- Procurement of rice is expected to increase by at least 1 million MT if the NFSB passes

Source: Govt, FCI, Lit. Search
Even assuming farmers are able to receive MSP for all produce, the trend of rapidly increasing rice cultivation costs continues to lower margins.

**WHILE MSP FOR COMMON RICE HAS DOUBLED OVER LAST DECADE**

NOT RISING FAST ENOUGH TO COVER RAPIDLY RISING CULTIVATION COSTS

- For the 2012-13 kharif season, the MSP of paddy will increase by Rs. 170 (~16%) to Rs1,250 per quintal given rising input costs.
- CACP themselves state that 2012-13 MSP barely covers the projected cost of cultivation (C2) for farmers, which includes paid out costs, imputed cost of family labour and rentals of land foregone on account of cultivation.
- Over last 3 years, CACP has found that the C2 (currently at average of ~Rs 1,185 a quintal) has increased 53% but paddy MSP has only gone up ~20%.
  - Sharp increases in inputs such as labour wages, fertilisers, diesel, fodder and cattle feed have occurred over the last 3 years.
  - Average labour wages increased 74% in last 3 years while price of fertilisers such as DAP more than doubled in the past 1 year.

"[Rising costs] has squeezed farmers’ margins in paddy cultivation and served a double blow to the farmer with the rising costs and declining margins even with respect to MSP."

CACP latest report (Financial Express)

Notes: 1. For years 2006-07 to 2009-10, the MSP captures the bonus payment.
Source: FCI, CACP, Hindu Business Line online, Financial Express online.
Biomass is the most promising alternative energy source to supplement power supply in milling

**SOLAR POWER**

- A solar powered unit can **provide up to 100-150kW of power**
  - This is insufficient to meet the **500kW requirement** of a large (6MT/hour) boiler, drier and rice processing plant
  - This is sufficient to meet the requirements of a small (<1MT/hour) village mill
- The **reliability** of solar powered units is greatly reduced by the occurrence of monsoon rain and / or smog
- In addition, **government subsidies are not available** for units over 100kW
- Given the size, reliability and financial constraints of solar powered units, it **does not appear to be a viable solution** to increase milling capacity in Bihar

**BIOMASS**

- The use of dual fuel **biomass / diesel sets** allows millers to **reduce fuel costs by ~60%**
- The **capital cost** of a biomass gasifier which can be added to an existing diesel set is **relatively low**, particularly given the **50% government subsidy**
- The **husk required** by a dual fuel set can be **produced through the milling process**
- Millers have **already begun adopting** this technology due to its financial viability
- **Positive growth** is expected in the medium term with an expected capacity increase of 50% for mills that switch to dual fuel systems

Source: FCI; Interviews
BMGF is uniquely positioned to influence and work with the government

**BMGF DIFFERS FROM OTHER ACTORS IN SEVERAL KEY WAYS**

1. **Access** to senior-most levels (e.g. Chief Minister) via Bill and Melinda Gates

2. **Trust and credibility** across Central and State Governments based on previous work

3. Convening power to bring **private sector** to the table

4. Can contribute **significant own funds** to progress agenda

5. Seen as **non-political** – can play role of ‘honest broker’

**BMGF LEVERAGED THESE ADVANTAGES SUCCESSFULLY IN AVAHAAN PROGRAM**

- Avahan is BMGF’s initiative to **reduce spread of HIV** in India through targeted prevention programmes
- Programme was **established in 2003**, following Bill Gates’ much heralded visit to India the previous year
- **Numerous government agencies**, **over 100 NGOs and private sector consultants** have been involved in the collaborative effort to reduce spread of HIV and expand the programme nationwide
  - Reputation and clout of Gates Foundation played a significant role in facilitating this large-scale programme
- With a commitment of **US$338 million over a 10-year timeframe**, the Gates Foundation is one of the largest private donors involved
- Control of the programme is gradually being handed over to its ‘natural owner’, the **government-run National AIDS Control Organization** (NACO)
- BMGF can **leverage credibility and trust** built through Avahan programme to **work with the Government in the agricultural sector**

Source: Lit. Search; Primary interviews
World Bank’s Agri. Competitiveness Project demonstrates impact leading international agencies can have through partnering with govt.

**APMC ACT WAS IN SERIOUS NEED OF REFORM, BUT GOVT. FACED CHALLENGES IN RECTIFYING ISSUES**

- Agricultural Produce Market Committees (APMCs) are responsible for providing marketing services/facilities throughout India, but faced serious efficiency challenges
  - Though APMCs were meant to enable direct market access for smallholder farmers, the agricultural supply chain remained fragmented with a large number of intermediaries
  - As a result, the functionality and relevance of the APMCs was questioned
- In conjunction with the Ministry of Agriculture and the State Governments, the World Bank developed and distributed Model APMC Rules in 2007
  - Guidance on market reforms included regulation related to private markets, direct marketing, contract farming and market fees

**WORLD BANK WAS ABLE TO LEVERAGE ITS CREDIBILITY AND FUNDING TO EFFECT SUCCESSFUL CHANGE**

- Given its vast experience in the development sector and its access to funding, the World Bank was ideally positioned to implement market reforms
- Agriculture Competitiveness Projects were established in Maharashtra, Rajasthan and Assam with the aim of increasing productivity, profitability and market access of the farming communities
- World Bank committed a total of US$350 million to these projects
- Reforms created favourable environment for private sector involvement
  - For example, Maharashtra attracted US$5.6 million in setting up private wholesale markets between 2009 and 2012. In addition, licences for 18 new markets were issued
- These projects provides a useful benchmark for other states looking to incorporate the model rules into a revised version of the APMC Act

Source: Indira Gandhi Institute of Development Research; World Bank
Agenda

Introduction

Supply-demand dynamics

Market & policy context

Value chain & constraints

Prioritized interventions
Objectives: Rice strategy goals based on BMGF’s South Asia agriculture development strategy

**SOUTH ASIA TARGETS & PRIORITIES SHOWN**

**Vision:**
Sustainable productivity growth for smallholder farmers

**Goal:**
More than double productivity for 45M farming households in India & Bangladesh by 2030

**Anchor geographies:**
- Bihar
- Orissa
- Bangladesh

**Priority value chains:**
- **Cereals:** Rice, Wheat, Maize
- **Legumes:** Chickpeas, Groundnuts
- **Livestock:** Cows, Goats, Chickens, Buffalo

**Objective**
Sustainable income improvement of rice farmers in Bihar, Orissa and Bangladesh

Source: BMGF website; Discussions with BMGF team