

### Some Recent Initiatives in Indian Agriculture in Energy, Water and Markets

#### Publication History

Received: 26 November 2016

Accepted: 31 December 2016

Published: January-March 2017

#### Citation

Mukul Asher, Stuti Rawat. Some Recent Initiatives in Indian Agriculture in Energy, Water and Markets. *Climate Change*, 2017, 3(9), 491-517

# Some Recent Initiatives in Indian Agriculture in Energy, Water and Markets

October 14, 2016

International Conference on “Food, Water, Energy Nexus in Arena of Climate Change”, Anand, Gujarat, India

---

Mukul Asher and Stuti Rawat,  
Lee Kuan Yew School of Public Policy, National University of Singapore



National University of Singapore

# Structure of the presentation

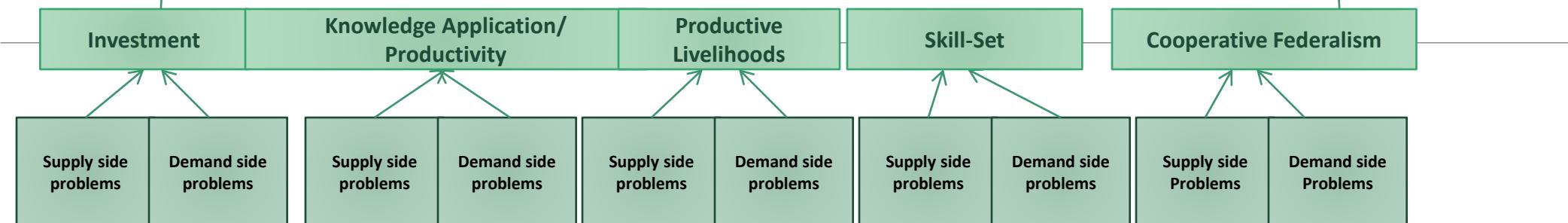
---

- The Growth Diagnostic Framework to diagnose challenges in a context specific manner
- India's Agriculture Sector: Key Challenges
- National Energy Efficient Agriculture Pump Programme (NEAPP)
- Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)
- Electronic National Agricultural Market (ENAM)

## Possible Approach to Diagnosing Growth Challenges in a Context- Specific Manner

### Output/ Income Per Person/per Household

(Consistent with reasonable trade-offs between sustaining natural capital and growth)



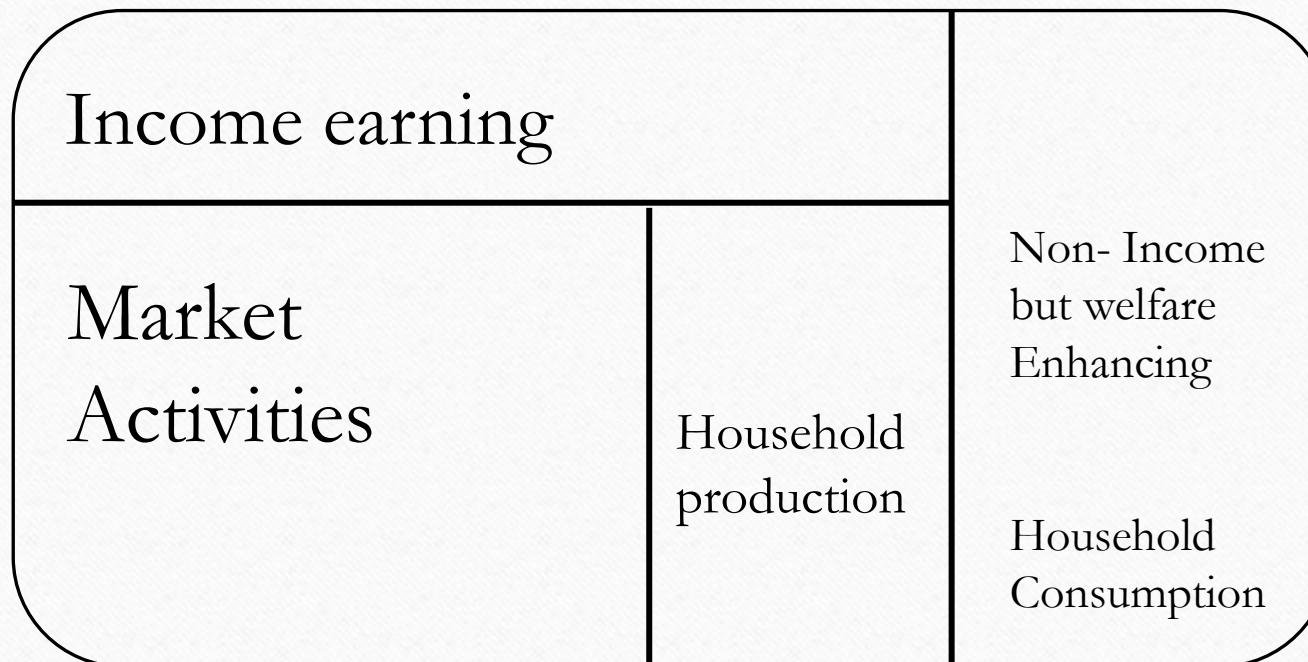
In each of the above areas, initiatives needed to plan to minimize imbalances in demand and supply sector specific risk mitigation strategies, such as in Agriculture, and Infrastructure, also need to be well designed and implemented.

### Other areas to consider:



Source: Adapted and modified by Mukul Asher (October 2016 version) based on Dani Rodrik (2010) *Diagnostics before Prescription. Journal of Economic Perspective, Vol. 24*

# Components of household welfare



Source: Constructed by .  
Mukul Asher

# India's agriculture sector: an overview

---

- **More than 50% of the working population** derives main livelihood from agriculture (Ministry of Agriculture & Farmer's Welfare, 2016)
- But its **share in GDP** is 12% (Ministry of Agriculture & Farmer's Welfare, 2016)
- **Productivity is lower** than the global average. For cereal, Indian yield per hectare: 2.9 tonnes. Global average: 3.8 tonnes (World Development Indicators, 2016)
- **Agriculture is a state subject**, so coordination, policy coherence and challenges inherent in India's federal polity
- India's cultivable **land to population ratio has declined** from 0.34 hectares per person (1961) to 0.12 hectares per person (2013) (Directorate of Economics & Statistics, 2015)

- All India average size of holding has declined to 1.14 Hectares (Ministry of Agriculture & Farmer's Welfare, 2016)
- In **some states this is less than 1 Hectare** (Ministry of Agriculture & Farmers Welfare (2016))

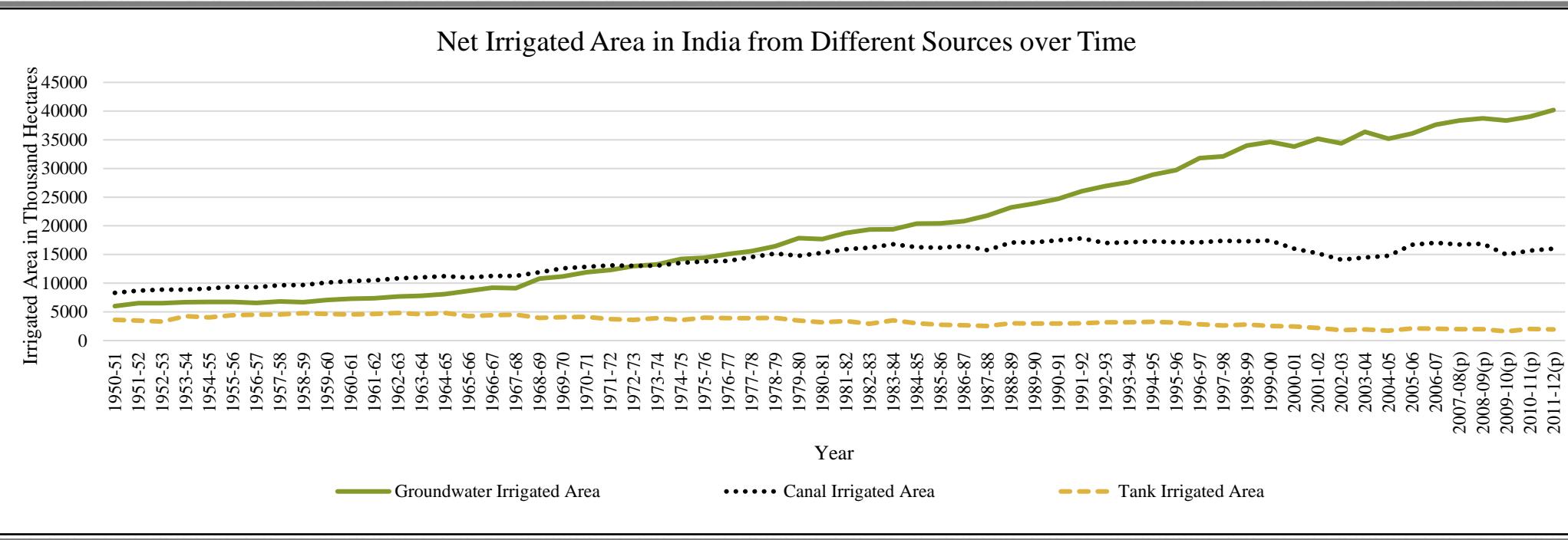
| S. No. | State         | Average area per holding in Ha |
|--------|---------------|--------------------------------|
| 1      | Bihar         | 0.39                           |
| 2      | Kerala        | 0.21                           |
| 3      | Tamil Nadu    | 0.78                           |
| 4      | Uttar Pradesh | 0.74                           |
| 5      | West Bengal   | 0.74                           |
| 6      | All India     | 1.14                           |

**“Given limited land, agricultural growth will come from higher agricultural productivity per unit land and from innovations”**

# Water and Energy

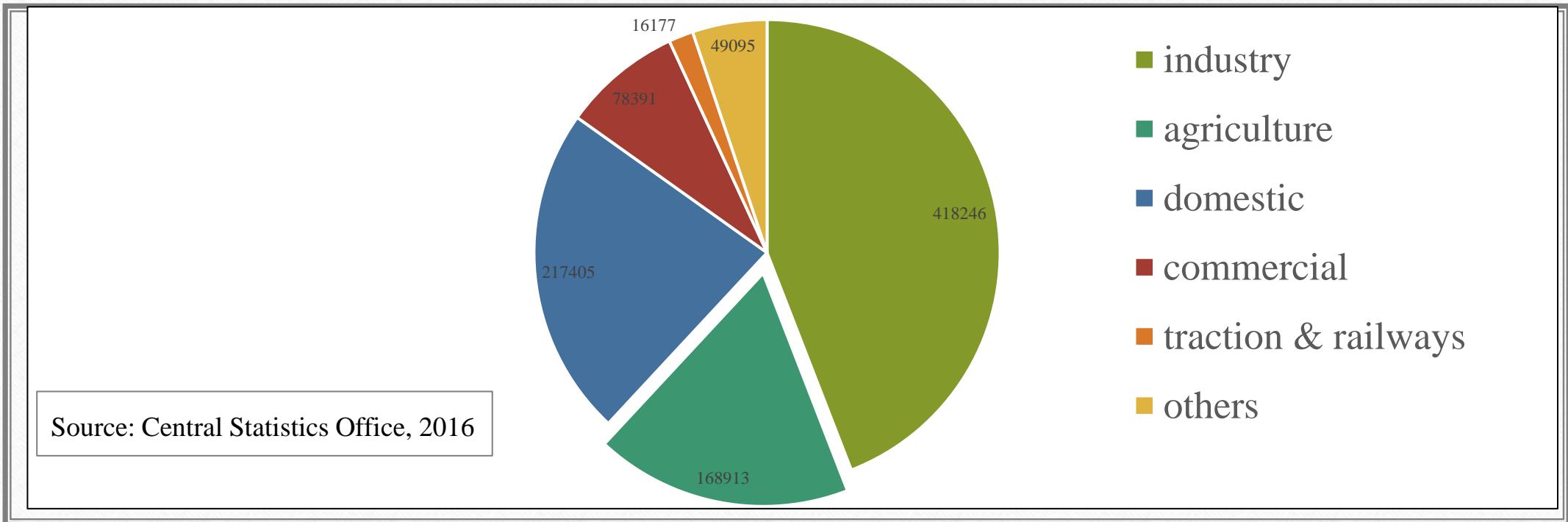
---

- India characterized as a '**high water risk**' region (World Resources Institute, 2016)
- **90% of total water withdrawal emanates from agriculture** (FAO-AQUASTAT, 2016)
- Though irrigated land in India as a proportion of total agricultural land is 36.3% (World Development Indicators 2016a)
- **Water use efficiency**, varies between **35-40% for surface water** and between **65 to 75% for groundwater** (Ministry of Agriculture 2013)
- At current trends it is projected **availability of water for agricultural use may be reduced** by 21% by 2020 (Indian Agricultural Research Institute, 2016)
- **Groundwater** is an important source of irrigation, with pumps and tubewells increasingly using **electricity** to pump out water (Minor Irrigation Statistics Wing, 2014)



## Role of groundwater irrigation in India

Source: Directorate of Economics & Statistics, 2015



Consumption of Electricity by Sectors in India in 2014-15\* (in Giga Watt Hour)

Share of electricity consumed by agriculture in India (17.8%) is higher than most nations (Central Electricity Authority, 2015)

- Excessive reliance on zero price, subsidized electricity to pump out groundwater has led to **depleted aquifers** in states such as Punjab, Andhra Pradesh, Karnataka (Birner et al. 2011)
- Farmers have **no incentive to economise on water and energy consumption** (Strand 2010)
- **Average operating efficiency of pumps is less than 30%** (TUV SUD, 2010; Oza 2007)
- Subsidized agricultural power has an **adverse impact on the financials of state electricity utilities (Biswas, 2011) and state governments** (Gupta and Sharma, 2011).
- The UDAY (*Ujwal DISCOM Assurance Yojana*), a financial turnaround and revival package for electricity distribution companies of India (DISCOMs) initiated by the Union government is expected to address this issue.
- Has resulted in **shifts in cropping patterns** towards crops that are agro-ecologically unsuitable for a region (Mukherji et al. 2012)
- **Diesel** is the other major source of energy for pumping out groundwater. **6.26 million diesel wells and tube wells** in 2010 (Agriculture Census Division, 2015) that **emit greenhouse gases** through burning of diesel
- At present agriculture is among the **highest contributors to greenhouse gas emissions** in India (Swain and Charnoz 2012)

# National Energy Efficient Agriculture Pumps Programme (NEAPP)



Source: Roy Chowdhury (2016)

- Under NEAPP farmers can replace inefficient pumps free of cost with BEE star-rated energy efficient agricultural pump-sets (operating efficiency of 40-50%), that come enabled with smart control panel and a SIM card, giving farmers the flexibility to operate their pumps using their mobile phones (PIB, 2016).

# Objectives and expectations: NEAPP

---

- Expected to lead to 30% saving in energy consumed by 2019 amounting to an **annual saving of about Rs 20,000 crore on agricultural subsidies**
- Expected to **reduce peak load demand** and result in lower **load shedding**
- Expected to benefit farmers from **lower occurrences of pump failure** and from improved electricity supply due to lower load shedding.
- Expected to benefit industrial and commercial consumers because of **lower cross subsidisation for the agriculture sector**
- Expected to **reduce carbon dioxide emissions** by 5–30% per annum (Singh, 2009)

# Challenges and requirements for success: NEAPP

---

- **Financial barrier** because farmers used to zero-priced electricity will not have any incentive to adopt energy efficient pumps unless provided free of cost (Swain and Charnoz, 2012)
- In the long run **incentives need to be created for adoption and sustained use** of energy saving technologies in agriculture
- NEAPP envisages replacement of 200,000 inefficient pumps, which is **less than 1.5 percent of the total number of electric pumpsets**
- Unclear if NEAPP focusses on diesel pumpsets as well, given that 6 million diesel pumps operating in agriculture (Agriculture Census Division 2015) together accounted for 5.6% of total diesel consumption in India (nielson 2013).

- Efficient pumps by **themselves may not motivate farmers to economise on their electricity and groundwater consumption**, as long as electricity is provided at a flat rate.
- Should also not be assumed that water use efficiency will immediately follow energy efficiency
- NEAPP's success requires simultaneous improvements in distribution networks, tariff rationalisation and metering.
- Requires innovative policies to promote switch to cleaner and efficient technologies

# Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

---

- The major objective of PMKSY is to **enhance irrigation coverage**, alongside **improving on-farm water use efficiency**, using the catch phrases of “*harkhetkopaani*” (water for every field) and “per drop more crop” respectively(Press Information Bureau 2015a; Government of India 2016b)
- Seeks a convergence of **irrigation investments on the field**, introduction of **sustainable water conservation practices** through the possible reuse of treated municipal based water for peri-urban agriculture, adoption of **precision-irrigation** (and other water saving technologies) and attract private investment into such systems.
- Envisages a **decentralized state level planning and execution**, which provides states with the autonomy of drawing up their own irrigation plans based on district irrigation plans and state irrigation plans

## Four components of PMKSY:

| Component  | Tasks  | Nodal Agency   |
|--|--|--|
| <b>Accelerated Irrigation Benefit Programme (AIBP)</b> | <u>Faster completion of ongoing Major and Medium Irrigation</u> including national projects  | Ministry of Water Resources, River Development and Ganga Rejuvenation        |
| <b>Har Khet Ko Pani (HKKP)</b>                         | <u>Creation of new surface water and groundwater minor irrigation structures</u> in addition to the <u>repair and restoration</u> of traditional water bodies, command area development, and the strengthening, creation of distribution network from sources to the farm. | Ministry of Water Resources, River Development and Ganga Rejuvenation        |
| <b>Per Drop More Crop (PDMC)</b>                       | <u>Precision irrigation systems, efficient water conveyance and water lifting devices</u> , micro level and secondary storage structures, and extension coordination and management activities.  | Department of Agriculture and Cooperation, under the Ministry of Agriculture |
| <b>Watershed Development (WD)</b>                      | <u>Soil and moisture conservation, ridge area treatment, drainage line treatment, rainwater harvesting</u> and other watershed interventions   | Department of Land Resources, Ministry of Rural Development.                 |

# Objectives and expectations: PMKSY

---

- To conserve water resources, reduce the gap between irrigation potential created and utilized, reduce the gap between cropped area and irrigated area
- Expected to provide a boost towards integration of technologies, that show promise but are at a nascent stage in India, example precision agriculture
- Expected to allow for region/context specific plans : Irrigation expansion in areas of low development of groundwater (eg. Eastern India), while better utilisation of existing structures, soil-moisture conservation, supplementing irrigation with treated municipal water in areas of over-exploited water resources (eg. Northern and Southern regions)
- Expected to offer a platform for the convergence of various government initiatives and between different implementing agencies and stakeholders.

# Challenges and requirements for success: PMKSY

---

- Requires **high level of coordination and communication** between departments and states
- The challenge posed by state level strategies impinging on regional strategies has to be overcome
- AIBP is key component of PMKSY. However, AIBP in the past has drawn flak for institutional weaknesses, financial irregularities, and slow progress on projects (Bhaduri 2013; Nayar 2011; Shah and Singh 2011)
- An unchanged **AIBP** would be unlikely to deliver, unless issues identified with it in the past are resolved

# Markets

---

- Agricultural crop price dispersion i.e. the variation in price across states (National Sample Survey Office 2014) affects farmers' incomes.
- Agricultural Produce Market Committees (APMCs) administer trade in *mandis* in states
- APMCs wield considerable **monopoly power (particularly at the State and Regional levels)** enabling them to charge multiple fees of substantial magnitude, that have a substantial **cascading effect on the final price** of the good (Ministry of Finance 2015)
- Farmers face barriers in the form of market charges and movement controls (PIB 2016)

- The cascading effect on prices **impacts consumers, without gains being passed on to farmers** (Asher and Rawat, 2016)
- **APMC revenues** do not accrue to the state treasury, hence exempt from legislative oversight. Resulting in **lack of accountability and transparency** (Ministry of Finance, 2015)
- **Post-harvest losses** in the current set up **are considerable** to the tune of Rs. 926.5 billion for major agricultural commodities (PIB, 2016)

| S.No. | Commodity/Crop      | Losses during Transportation (%) | Losses during Farm Operations (including transportation loss) (%) | Losses during Storage (%) | Overall Total Loss (%) | Monetary value of the loss (in Rs. billion) |
|-------|---------------------|----------------------------------|---|---------------------------|------------------------|---|
| 1     | Milk                | 0.02                             | 0.71  | 0.21                      | 0.92                   | 4.409                                       |
| 2     | Meat                | 0.00                             | 1.99  | 0.72                      | 2.71                   | 1.235                                       |
| 3     | Marine Fish         | 0.91                             | 9.61  | 0.91                      | 10.52                  | 4.315                                       |
| 4     | Inland Fish         | 0.17                             | 4.18  | 1.05                      | 5.23                   | 3.766                                       |
| 5     | Egg                 | 0.36                             | 4.88  | 2.31                      | 7.19                   | 1.320                                       |
| 6     | Poultry Meat        | 0.66                             | 2.74  | 4.00                      | 6.74                   | 3.942                                       |
| 7     | Cereals             |                                  |   |                           | 4.65-5.99              | 20.698                                      |
| 8     | Pulses              |                                  |   |                           | 6.36-8.41              | 3.877                                       |
| 9     | Oilseeds            |                                  |   |                           | 3.08-9.96              | 8.278                                       |
| 10    | Fruits & Vegetables |                                  |   |                           | 4.58-15.88             | 40.811                                      |

# Electronic National Agriculture Market (ENAM)

- ENAM envisages creating a unified state and national level market by promoting real time price discovery, based on actual demand and supply and transparent sale transactions.



# Components of ENAM

---

- An **online trading platform** called e-NAM which uses **ICT to network existing APMCs** into a common electronic platform. e-NAM provides a direct interface for sale and purchase absent the middlemen
- A more **liberal licensing regime** for traders, buyers and commission agents which does not require shop premises in the yard or their physical presence
- A **single point of levy of the market fees**, the validity of a **single trading license** across markets in the state and **harmonisation of agricultural produce standards**

# Objectives and expectations: ENAM

---

- To reduce **asymmetries of information** that farmers and traders face in marketing their produce and to **lower transactions' cost** that accrue from high levels of market charges and movement controls
- To **promote transparency** in market operations, thereby curbing deadweight loss of existing set-up
- **Reduces book-keeping**, manpower and reporting requirements for *mandis*
- **Curbs post-harvest agricultural produce** losses through faster movement of produce
- **Expected learning effects** in the long term via transfer of knowledge and inputs across states
- **Expected** to benefit **consumers** through access to better quality produce at more reasonable rates
- **Expected** to benefit **farmers** from more options for sale and for receiving prices commensurate with quality
- **Expected** to benefit **traders and bulk buyers** through access to a larger market for secondary training

# Challenges and requirements of success: ENAM

---

- Involvement of **small and marginal farmers** who sell to local private traders instead of the *mandi*. May require additional measures for financial inclusion and risk mitigation
- Onus on **states** for provision for an electronic auction, a single license and a single point of levy of market fee
- Infrastructure requirements of NAM integrated *mandis*-operations and maintenance
- NAM target is to link **585 markets by 2018**. But there exist **over 7000** regulated markets (principal and sub-markets) (Ministry of Finance 2015).
- **Standardisation of quantities and the quality of produce** will also be a challenge (Chandorkar 2016)
- Useful to create a **feedback mechanism** wherein ENAM can be refined as it progresses.

# Concluding remarks

- NEEAPP, PMKSY, NAM show promise towards make agricultural sector activities **more efficient** in energy, water and markets. Also important in their inter-linkages with other departments and ministries.
- ENAM in particular is a step towards making **agriculture more professionally managed, informed by technological and other knowledge input**
- However, **implementation and monitoring** are key
- Given that agriculture is a state subject. The maturity and integrity with all stakeholders pursue **cooperative federalism** will significantly impact on the outcomes of the Schemes discussed in this presentation. A constructive competition among the States to deliver development outcomes is an integral part of cooperative Federalism structure.
- The quality of **data gathering and reporting** are also important in assessing performance
- An **appropriate dashboard to monitor their quantitative and qualitative significance** in agricultural markets, value addition and farmers' incomes will help measure their success, and also help in further refinement