Transforming Smallholder Performance in India: Lessons from Asian Countries

India's food system relies on small and marginal farmers who produce most of the country's staples on limited land. While price controls protect consumers, rising input costs have constrained farm incomes, making productivity growth essential. With land and water scarcity and climate risks increasing, higher yield per hectare is the only sustainable path to food and nutrition security. Comparisons with Asian peers show that better irrigation, seeds, inputs and market linkages can significantly raise rice and pulses productivity.

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Contents

1. **Introduction** 3
2. **Rice Productivity: India vs China & Vietnam** 4
3. **Pulses Productivity: Why India Still Lags in Asia (Asia-Centric Evidence)** 5
4. **What India Gains by Closing the Productivity Gap** 7
    1. Gains for farmers 7
    2. Gains for consumers 7
    3. Gains for government finances 7
    4. Gains for nutrition and public health 8
    5. Gains for the rural economy 8
    6. Gains for food and trade security 8
    7. Gains for Natural Resources and Climate Resilience 8
5. **National Productivity Action Framework: Roles and Responsibilities** 9
6. **The Way Forward: A National Productivity Action Framework** 10

1. Introduction

India's food system rests on the productivity of millions of small farmers. Under the Government of India's official classification, **marginal farmers cultivate less than 1 hectare and small farmers cultivate 1–2 hectares** of land. According to the **latest National Sample Survey (77th Round, 2018–19)**, **about 89 percent of Indian agricultural households operate less than 2 hectares**, placing them in the small and marginal category. This group produces the bulk of the country's rice, pulses, milk and fodder, despite operating on highly fragmented and resource-constrained landholdings.

Over the last decade, the Government of India has kept food-grain price inflation low through procurement, subsidies and the public distribution system, with retail prices of staples such as rice and wheat rising only about **4–5 percent per year on average** despite global volatility. While this has protected consumers, it has limited the scope for farmers to raise incomes through prices. At the same time, smallholders – who operate **about 86 percent of India's farm holdings under two hectares** – have faced sharply rising costs, with fertiliser prices increasing by around **150 percent** and seed and labour costs roughly doubling. In this environment, improving **per-hectare productivity** becomes the primary pathway for raising smallholder incomes.

Farm productivity therefore lies at the heart of India's food and nutrition security. It determines how affordable food is for consumers, how stable incomes are for farmers, how large government subsidies become, and how dependent the country is on imports. With land and water becoming scarcer and climate risks increasing, India can no longer rely on expanding cultivated area. The future depends on how much food small farmers can produce from each hectare.

This white paper compares India with a set of comparable Asian countries – China, Vietnam, Myanmar, Bangladesh and Pakistan—that also depend heavily on smallholders and face similar land and climate constraints. Yet many of these countries achieve significantly higher yields, especially in rice and pulses. This contrast raises a fundamental question: if farmers operate under similar conditions, why do outcomes differ so widely?

2. Rice Productivity: India Vs China & Vietnam

Rice is the single most important crop in India's food system, providing the primary source of calories for a majority of the population and supporting millions of smallholder farmers. Because rice is cultivated across diverse agro-ecological zones and under both irrigated and rainfed conditions, its performance offers a clear view of how effectively the broader agricultural system functions.

China and Vietnam provide especially relevant benchmarks for India. Like India, they rely heavily on small farmers and face similar pressures of land scarcity, population density and monsoon-linked water systems. Yet their rice outcomes differ substantially. To understand why, it is necessary to look beyond yields alone and examine the full production environment covering landholding patterns, water access, mechanisation, fertiliser use, post-harvest management and market organisation. The table-1 brings these key elements together to allow a direct system-level comparison of rice cultivation in the three countries.

The table-1 highlights that India, China and Vietnam all operate with predominantly small landholdings, indicating that differences in rice performance cannot be explained by farm size alone. Despite this similarity, the supporting systems around farmers vary widely. Water availability, access to machines, efficiency of input use, post-harvest handling and the structure of markets together shape how much output each hectare ultimately delivers.

By presenting these elements side by side, the table provides a framework for understanding why rice productivity differs across the three countries. It shows how the combination of physical infrastructure, input management and institutional support defines the conditions under which small farmers produce, setting the stage for the broader analysis of productivity patterns that follows.

Country	Typical land holding size (ha)	Rice yield 2023 (t/ha)	Yield trend 2010-2023	Rice area under irrigation (%)	Rice farm mechani-sation (%)	Fertiliser use (kg/ha)	Nitrogen use efficieny (kg grain/ kg N)	Post-harvest losses (%)	Rice procurement market system	Rice exports (mn tonnes /year)
India	~0.7 ha or less	4.32	3.50 → 4.32	~55%	50-60%	~200	~33	4-6	MSP + FCI procurement	21-22
China	~0.6-0.65 ha	6.80	6.00 → 6.80	~70%	80-85%	~365	45-50	2-3	MSP + state buying	<2
Vietnam	~0.45 ha (est.)	5.69	5.40 → 5.69	~89%	85-95%	~290	50-55	2-3	Export-oriented private & cooperatives	6-7

3. Pulses Productivity: Why India Still Lags in Asia (Asia-Centric Evidence)

Pulses are the most important source of dietary protein for Indian households. According to the National Sample Survey and FAO food balance data, pulses contribute roughly **25-30 percent of total protein intake** in India, and significantly more for vegetarian and low-income households. However, average pulse consumption in India remains only **30-45 grams per person per day**, well below the **60–70 grams per day** recommended for balanced nutrition. This gap has direct consequences for protein deficiency, especially among children and women.

The demand for pulses is also rising beyond direct human consumption. By-products of pulses processing are increasingly used in poultry, dairy and aquaculture feed, linking pulses availability to the affordability of eggs, milk, chicken and fish. As incomes rise and diets diversify, India's protein demand is growing faster than cereal demand, placing increasing pressure on the pulses supply system. Understanding how effectively pulses are produced across comparable Asian farming systems is therefore essential for evaluating India's future food and nutrition security.

Why farmers avoid pulses despite high prices

- Low yield ceilings compared to cereals
- Tight rice–pulse time windows
- High labour cost for harvesting and threshing
- High pest and stray-animal risk
- Pulses cannot reduce cereal output without hurting income
- Inadequate irrigation water availability

Country	Avg pulses yield	Chickpea yield (t/ha)	Mungbean yield (t/ha)	Urdbean yield (t/ha)	Lentil yield (t/ha)	Pulses area irrigated (%)	Fertiliser use in pulses (kg/ha)	Post-harvest losses (%)	Net pulses trade (Mt)
India	0.74–0.90	1.10	0.58	0.62	0.94	~25	40–50	6–8	**–3.3**
China	1.80–2.10	1.95	1.53	NA	2.56	~55	120–150	2–3	**+0.3 to +0.6**
Myanmar	1.30–1.50	1.48	1.36	NA	NA	~35	70–90	2–3	**+1.2 to +1.6**
Bangladesh	1.10–1.30	1.24	1.02	1.05	1.32	~48	90–110	2–3	**+0.1 to +0.3**

The table shows that pulses yields in India are substantially lower than in comparable Asian countries, while irrigation coverage and nutrient application are also significantly lower. At the same time, India experiences higher post-harvest losses and remains a large net importer of pulses. Together, these indicators highlight how differences in production efficiency and system support across Asia translate into very different outcomes for pulses availability and price stability.

What This Asia-Centric Evidence Establishes

The Asia-only evidence shows that India's pulses crisis is driven by **multiple system-level constraints acting together**, not by farmer capability.

1. **Structural production disadvantages**
   - Very low irrigation coverage for pulses
   - Chronic under-application of nutrients, especially phosphorus,sulphur and biofertilisers
   - High post-harvest losses due to weak drying, storage and processing
   - Weak and unreliable market support
   - Continued dependence on imports despite large domestic area
   - Lack of high-yielding pulse varieties; recent releases focus on climate resilience and biofortification but offer limited yield advantage
2. **Low yield potential creates high risk**
   - Most pulse varieties in India have **low yield ceilings** compared with cereals.
   - In irrigated regions, farmers prefer cereals because pulses offer **lower and less predictable output per hectare**.
   - Frequent losses from **pod borers, diseases and stray animals** further reduce the attractiveness of pulses.

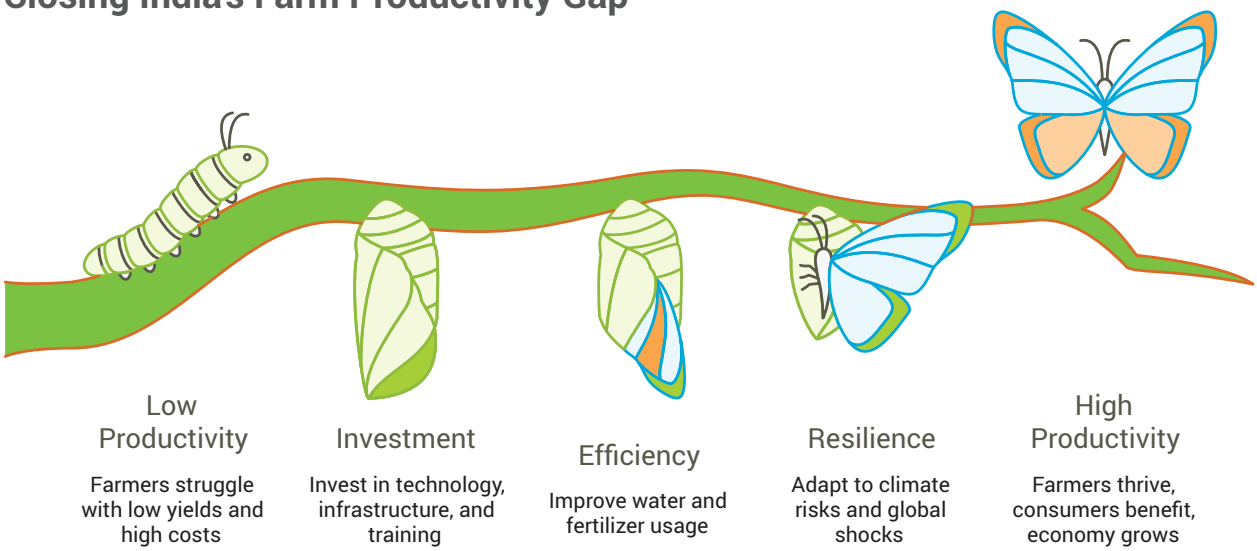
3. **Labour and mechanisation trap**
   - Labour costs are rising faster than crop yields.
   - Pulses suffer more because **harvesting and threshing are still largely manual**.
   - The **cumbersome and costly** harvest process pushes farmers toward cereals, which are mechanised and faster to harvest.
4. **Prices do not compensate for risk**
   - Market price alone does not offset the combined risks of **low yield, pest damage and labour intensity**.
   - Farmers therefore avoid pulses even when prices are relatively high.
5. **The result: a low-productivity cycle**
   - Pulses become a **high-risk, low-return crop**.
   - Farmers under-invest in seed, fertiliser, irrigation and plant protection.
   - Low productivity persists, forcing India to import pulses and pushing up **dal, milk, egg and poultry prices**.

4. What India Gains by Closing the Productivity Gap

Closing India's farm productivity gap delivers **simultaneous economic, social, fiscal and environmental benefits**. Unlike many reforms, productivity growth does not create trade-offs; it creates **positive spillovers across the entire economy**.

1. **Gains for farmers**
   - Higher **net income per hectare** without depending on subsidies
   - Lower **cost per unit of production** as yields rise
   - Reduced dependence on **informal credit and debt**
   - Greater income stability, even when market prices fluctuate
   - Improved attractiveness of farming for the **next generation**
2. **Gains for consumers**
   - Lower and more stable **food prices**
   - Reduced seasonal price spikes in **rice, pulses, milk and poultry**
   - Better protection of **household purchasing power**
   - More affordable and reliable **nutrition**
3. **Gains for government finances**
   - Lower **procurement and subsidy burden**
   - Reduced need for **emergency imports** to control prices

Closing India's Farm Productivity Gap



- Shift from recurring price support to **one-time productivity investments**
- Savings in **foreign exchange** from lower imports of pulses and feed

4. **Gains for nutrition and public health**
   - Lower prices of **pulses**, improving protein intake
   - Cheaper **animal feed**, reducing the cost of milk, eggs, fish and poultry
   - Better outcomes for **child nutrition, maternal health and workforce productivity**
5. **Gains for the rural economy**
   - More demand for **transport, storage, processing, packaging and services**
   - Growth of **non-farm rural employment**
   - Reduced **distress migration** from villages
6. **Gains for food and trade security**
   - Less exposure to **global price shocks and supply disruptions**
   - Reduced vulnerability to **import dependence** in pulses and feed
   - Stronger **national food system resilience**
7. **Gains for natural resources and climate resilience**
   - More output from the same land reduces pressure on **forests and fragile ecosystems**
   - More efficient use of **water and fertilisers**
   - Better adaptation to **climate risks** without sacrificing food supply

5. National Productivity Action Framework: Roles and Responsibilities

Government (Centre & States)	Policymakers	Industry	Farmers (Smallholders)
Develop district-wise **rice–pulse cropping system plans** identifying where pulses can be added as second or third crops (rice fallows, short-duration windows)	Create a **national framework for cereal–pulse system integration** instead of treating pulses as standalone crops	Develop **short-duration rice and pulse varieties** that allow pulses to fit without reducing cereal yields	Grow pulses as a **second or third crop** in rice fallows or after early-maturing cereals where recommended
Ensure **irrigation scheduling and water delivery** is aligned with short pulse windows after rice	Align procurement and incentives to **support pulse crops in rice-based systems**	Produce and scale **high-vigour pulse seed** suited to short growing windows	Select **short-duration varieties** for pulses to avoid yield loss in cereals
Establish **district time-management benchmarks** for sowing, harvesting and turn-around between rice and pulses	Protect farmers from income risk by **stabilising pulses prices during harvest**	Provide **machine solutions for rapid land preparation, sowing and harvesting** between crops	Use **rented machines** to quickly prepare fields and sow pulses after rice
Expand **custom hiring centres** in rice belts to allow fast turnaround for pulse planting	Link subsidies and schemes to **cropping system productivity** rather than single-crop output.Identify and incentivise farmers who constantly produce more per unit area.	Offer **turnkey mechanisation packages** for rice–pulse systems	Follow **time-bound cropping schedules** to fit pulses without affecting rice
Prioritise development of high-yielding pulse varieties tailored to agro-climatic zones through ICAR and national research institutes.	Enable **assured market access for pulses** grown in rice-based systems	Provide **input bundles (seed, nutrients, advisory)** designed for system crops	Apply **balanced fertilisers** to support both cereal and pulse crops
Provide **price-deficiency or procurement support** specifically for system-grown pulses	Reduce policy uncertainty so farmers feel safe planting pulses	Build **village-level drying and storage** so pulses can be safely marketed	Dry and store pulses properly to avoid post-harvest losses

Contd.../

Government (Centre & States)	Policymakers	Industry	Farmers (Smallholders)
Strengthen **FPOs in rice-pulse belts** to aggregate and market pulses	Legally empower **FPOs and Water User Associations** for system-level coordination	Link **FPOs to processors and exporters** for pulses	Sell pulses through **FPOs instead of distress sales**
Deploy **extension teams** trained in rice–pulse systems rather than single crops	Institutionalise **system-based planning** at State and national level	Provide **digital advisory and cropping calendars** for rice–pulse rotations	Use **mobile advisories** for crop timing, pest and irrigation decisions

6. The Way Forward: A National Productivity Action Framework

- Ensure reliable irrigation scheduling and water delivery aligned with short pulse windows after rice harvest.
- Develop district-wise rice–pulse cropping system plans, identifying where pulses can be added as second or third crops (rice fallows, short-duration windows).
- Prioritise development of high-yielding pulse varieties tailored to agro-climatic zones through ICAR and national research institutes.
- Establish district-level time-management benchmarks for sowing, harvesting and turnaround between rice and pulses.
- Expand custom hiring centres in rice belts to enable rapid field preparation, sowing and harvesting of pulses.
- Provide price-deficiency payments or procurement support specifically for pulses grown within rice-based systems to reduce income risk.
- Deploy extension teams trained in rice–pulse systems, rather than single-crop advisory models.
- Strengthen FPOs in rice–pulse belts to aggregate, store and market pulses effectively.

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Dr. Vasant P. Gandhi
Chairman, Governing Council

Ph.D. from Stanford University, MBA (PGP) from IIM Ahmedabad (IIMA), formerly he was Professor and NABARD Chair Professor at IIMA, and Founder Chairman Post-Graduate Programme in Food and Agribusiness Management, which is currently ranked no.1 in the world

N.K. Arora
Secretary, Governing Council

An accomplished professional with 45 years of experience in Agri Input industry with having diverse leading role. Holding unanimously elected position of President-Agri Alumni Association of Pantnagar since its inception in 2008

Dr. Atanu Purkayastha
Agriculture & Farmers Welfare

MBA from the University of Strathclyde, Glasgow, UK and PhD from IIT Kharagpur on Land Reforms and Livelihood Generation. Served with the Government of India as Director and Joint Secretary in the Ministry of Home Affairs, Ministry of Agriculture and Cooperation and as Secretary, Central Information Commission.

Anil Jaysing Ghanwat
Farmer Representative

Anil Ghanwat (B.Sc. Agriculture), 63 years old, is a farmer from SriGonda in Ahmednagar district in Maharashtra. Since 1985 he has been involved with the Shetkari Sanghatana

Dr. Arvind Kapur
Seed Expert

Ph. D in Plant physiology bearing over 3 decades of experience in National and Multinational Seed Industry. He is also a prominent member of various business associations like CII, FICCI, Assocham, and PHDCCI, chairs of the APSA IP Committee

Dr. Ramendra Singh
Crop Nutrition

Dr. Ramendra Singh, a Soil Scientist, has over 45 years' experience in Natural Resource Management (NRM) for sustainable agriculture .

Dr. R.K. Malik
Agronomist

Dr. Ram Kanwar Malik, Ph.D in Agronomy is a renowned Agronomist with more than 45 years of experience. He has successfully implemented many projects in association with CIMMYT, IRRI, ACIAR, DFID, ICAR (NATP and NARP) and FAO

Vijay Sardana
IIMA Alumnus & Advocate, Supreme Court of India

IIMA Alumnus & Advocate, Supreme Court of India, NGT & Delhi High Court; Spl. in Techno-legal, IPR & Contracts Matters; Corporate Governance Trainer for Independent Directors; Member-Corporate Boards & Expert Committees

Dr. R.S. Sodhi
Dairy & Co-operative

Dr. R.S Sodhi, President, Indian Dairy Association, Delhi .
Ex Managing Director GCMMF (Amul)
Chairperson, NIFTEM -T

Nimish Gangrade
Media Representative

Nimish Gangrade is an experienced professional in the field of Agriculture. He is currently Director at Krishak Jagat – The National Agriculture Newspaper. He is an accredited journalist by the Government of India.

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Registered Office: A-88, Ashok Vihar, Delhi - 110052

Phone No. : +91-9123611833 | Email : anusandhank@gmail.com

Website : www.kakvfoundation.com

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