

Towards inclusive and sustainable vegetable value chains in Odisha

Some policy recommendations

Introduction

Odisha grows about 10.9 million tons of vegetables in 2023-24 from 0.77 million hectares, representing about 8% of Gross Cropped Area.¹ In recent years, it has witnessed a significant increase in vegetable production and is presently the 7th largest vegetable growing state in India accounting for over 5% of national vegetable production. At the same time, there is a perception that demand for vegetables far outstrips supply; consequently, the state depends on other states to make up the shortfall in supply. The Government of Odisha has focused on increasing vegetable production with a range of innovative policies and has recognized that vegetable farming as a key pathway to agricultural commercialization and doubling farmers' incomes.

Against this backdrop, we undertook an ambitious research effort as part of a larger project titled INCATA to document the pace and nature of transformation of vegetable value chains in Odisha.² The study comprised many components, including rapid reconnaissance visits to 19 districts in the state, secondary data analysis and qualitative case studies. Our research culminated a large-scale survey of 5640 value chain actors (farmers, inputs suppliers, wholesalers, commission agents and retailers). In addition, we documented the profile of 11,800 traders across 158 vegetable markets and 35,913 households in vegetable growing villages in 24 blocks and 6 districts as part of a listing exercise. We summarize the results of this study in a series of project notes and research briefs. This policy note aims to distill lessons from the study to identify a set of policy interventions.

A key finding of the INCATA project is that vegetable farming is a reliable pathway to agricultural commercialization for Odisha's farmers, that is both profitable and inclusive. The farm and off-farm segments of Odisha's vegetable value chains have been transforming at a brisk pace. This transformation is in its early stages and likely to be associated with "**growing pains**" as growth intensifies. The policy interventions we identify aim to build on current efforts of the Government of Odisha, to help **accelerate** the

¹ Economic Survey 2023-24, Government of Odisha.

² The project "*Tracking commercial small-scale producers for inclusive agricultural transformation*" (INCATA) studied the relationships between commercial small-scale producers (farmers) and micro, small and medium enterprises (MSMEs) in horticulture value chains in Odisha, India with similar work conducted in Kenya. In Odisha, our focus was on vegetables other than Potato, Onion, Garlic and Ginger.

ongoing growth of the vegetable sector and shape this transformation to make it more **inclusive, sustainable** and **resilient**. We restrict our recommendations to those that emerged from our research study. There are potentially other opportunities for policy interventions that we do not explore.

The overarching insights from the INCATA project underpin our recommendations.

- ▶ The policy framework for vegetables needs to go beyond the farm and adopt a value chain approach.
- ▶ There exists a vibrant off-farm segment of Micro Medium and Small Enterprises (MSMEs) including traders, transporters, and input dealers, who share symbiotic relationships with small scale vegetable producers.
- ▶ Wholesale and retail markets are critical value chain nodes. Most of Odisha's vegetables flow through these marketplaces, many of which are not directly regulated by the State government. 90% of the trades we recorded passed through unregulated or privately regulated markets. Policies should focus on these "real" marketplaces.
- ▶ Much of the growth in vegetable farming has occurred in clusters. Policy efforts should both strategically target and leverage these clusters and adopt differentiated approaches that respond to their varied characteristics.
- ▶ While some policy interventions can involve tradeoffs between objectives and hence require careful design, others may be considered "double duty" interventions that serve multiple objectives simultaneously.

Policy recommendations

Access to water

Access to irrigation is the single most important factor associated with farmers' uptake and continuance of vegetable farming. Only 36% of ~36,000 households we listed in our surveys had some access to irrigation (public or private). Public irrigation infrastructure is in disrepair in many areas and there is increasing reliance on private irrigation from groundwater sources. Responsible irrigation investments must be a key priority – it can accelerate vegetable farming, while providing a buffer against climate variability, but such expansion must not come with overexploitation of groundwater, especially in water constrained regions.

Three aspects require specific attention:

- ▶ Repair, rehabilitation and renovation of **public irrigation infrastructure**.
- ▶ **Rainwater harvesting structures** in water constrained regions for protective irrigation and **groundwater recharge structures** for replenishing and compensating for groundwater withdrawal. Until recently the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has enabled these investments. These should continue under the VB G-RAM-G Act as well.
- ▶ **Financing private irrigation investments** including solar pumps, drip and sprinkler systems.

Access to land

- ▶ **Land development** is important for entry into vegetable farming. Vegetable farming households report having initially undertaken land levelling (38%), soil amendment (23%), and raising land levels (15%) to enable vegetable cultivation. Land levelling can bring in new lands under cultivation while raising land levels can aid conversion of lowlands currently devoted to paddy to vegetable cultivation. Allocating resources via the new VB G-RAM-G (as was done under the MGNREGA) and convergence with other schemes, such as the Comprehensive Rice Fallow Management (CRFM) Programme may be considered, especially targeting small and marginal farmers from marginalized communities.
- ▶ **Land leasing and vertical farming** Land/space constraint is the most frequently cited issue (63%) that prevents households from taking up vegetable cultivation. Although land leasing is widely prevalent, our qualitative research suggests that there remains friction in land leasing markets, sometimes preventing those from the Scheduled Castes (SCs) from accessing land. Currently, even those unable to access land do participate in the vegetable value chains as farm workers and retailers. That said, innovative pilots around Gram Panchayat level **land banks for vegetable growing** and **vertical farming** can be explored to enable households to overcome land constraints.

Tackling animal conflict

Apart from water and space constraints, **animal conflict** appears as a significant and pervasive factor that prevents farmers from taking up vegetable cultivation (7% of non-vegetable farmers) and prompts farmers to quit growing vegetables (46% of who quit), or causes losses to those who remain engaged (26% of current vegetable farmers). Reports of monkeys, wild boars, elephants, wild buffaloes raiding vegetable fields abound. There is an urgent need to consider solutions, some of which may perform double duty to both tackling animal conflict as well as climate variability.

- ▶ **Financing solar powered fencing.** A simple solution to protecting vegetable farms from wild animals is electric fencing. About 8% of vegetable growing households surveyed used fencing before they began vegetable cultivation, while others had installed electric fences more recently to ward off animals.
- ▶ **Polyhouse-based vegetable cultivation.** Growing vegetables in polyhouses is not currently widespread; in some coastal areas, farmers who attempted it quit because these structures cannot withstand cyclones. There is a need to design polyhouses that are cyclone-proof, using low cost but durable materials since affordability is a key constraint. Polyhouse-based vegetable farming could help manage animal conflict and climate risks.
- ▶ In general, a reliable mechanism for **inter-departmental coordination** between Departments of Forests, Agriculture and Horticulture and community outreach is essential for developing and implementing animal management policies and animal-human conflict management.

Enhancing productivity and resilience

- ▶ **Nursery development** Currently, few vegetable farmers use seedlings. Our experience from research elsewhere suggests that nurseries, usually MSMEs, serve as critical outsource service enterprises to support vegetable cultivation, generating inclusive employment. We recommend a **bundled nursery development** program in vegetable clusters aimed at creating “**veggiepreneurs**”,

that provides start-up capital, technical training and enterprise skills training nursery establishment, especially for emerging farmer producer companies (FPCs) and for those from marginalized communities and women.

- ▶ **Planting materials:** There are two broad areas where upstream investments and lab-to-farm transfer of innovations would be important
 1. The identification and/or development of **climate resilient vegetable seeds** for key crops where Odisha has a comparative advantage. Our survey of farmers reveals that 84% of vegetable growing households have faced weather shock in the past 10 years.
 2. Developing packages of practices (POPs) to **raise yields of indigenous “niche” crops** and specialized marketing tools such as geographic indications (GI) could help secure the longer-term viability of certain spontaneous clusters that have emerged in Odisha.
 3. The use of saplings, especially **grafted varieties**, has emerged in some parts of Odisha, potentially helping farmers increase yields and negotiate climate risks during the germination stage. A **systematic approach to evaluating technologies** such as these would help identify specific practices to promote.

Sustainability, environmental and human health

- ▶ **Biodegradable materials:** the ongoing commercialization of vegetable farming has been accompanied by increasing use of plastics along the value chain. The INCATA surveys show a gradual uptake of plastic mulching and use of plastic seed trays on farms and widespread plastic bagging and packaging post-harvest that are likely to pose significant plastic pollution challenges in coming years. Investments in **development of biodegradable materials and their large-scale adoption** by value chain actors is a critical area that requires resources for research and development and possible policy interventions.
- ▶ **Chemicals and biopesticides and biofertilizers.** Our research suggests that the proportion of vegetable farmers using pesticides, herbicides and chemical fertilizers has increased rapidly. Vegetable production costs/ha are 56% higher than rice (\$700 vs \$1095). We also found that input suppliers are an important source of advice for farmers. About 25% of vegetable farmers noted that input dealers were the most valuable source of information for vegetable farming and over 52% of input dealers noted that they had offered advice to farmers when they made their most recent sale. Policy and technology to limit use of chemicals to address farmer and worker health while ensuring food safety and farm-level profitability is becoming increasingly relevant. There is scope for public and private investments in the following:
 1. **Upstream research on safer pesticides/herbicides** specifically for vegetable production
 2. **Spraying technologies** such as with drones with the following goals (a) improving health and safety for workers by reducing direct exposure (b) developing protocols to reduce risk of spray drift etc. (c) protocols/POPs to ensure most efficient and effective use to protect yields while maintaining profitability.
 3. **Safe disposal of pesticides** from farms

4. **Training and education of input dealers on safer chemicals, safe and efficient use and safe disposal**, especially within vegetable clusters.
5. Technology transfer and targeted financial **support for MSMEs for production of scientifically proven biopesticides and biofertilizers**, especially in vegetable production clusters.

► **Village vegetable infrastructure.** Our research shows that contrary to popular belief most vegetable farmers sort, grade and pack in the villages. Much like the traditional communal *khaliana*, *manda* or *kalam* (i.e. village threshing areas) for grains, it might be useful to think of communal sheds, where farmers, traders or workers can **wash, sort, grade, and pack**. These sheds need to be planned and designed in consultation with the local community; in particular, these facilities should protect workers and farmers (from heat stress, for example) and ensure food safety and quality. These facilities would be most useful in **vegetable clusters**.

Market infrastructure and governance

Our research reveals two key problems with the existing market infrastructure across Odisha. First, most marketplaces have limited or poor infrastructure. For example, only 25% have toilets (functional or not) and 27% have a drinking water point. Second, we found many instances of markets being sited poorly or poorly designed. For example, in some recently built or renovated markets, we found unutilized cold storages and ambient warehouses, unused *pindis* (market platforms) and empty storage rooms for produce on the first floor. Our case studies reveal that these facilities are often constructed without consultation about the preferences and needs of potential users.

Prioritize upgrading of market infrastructure based on **user-centric designs** developed through participatory consultations with users, especially women and smaller businesses such as retailers and consumers, whose needs are often overlooked.

Waste disposable systems. Most markets surveyed had poor waste disposal practices and little segregation of plastic waste. With growing public health concerns, including **food safety**, there is an urgent need to establish effective waste disposal systems that segregate waste, compost or convert organic material to biogas. Provision of clean water for washing vegetables, and clean drinking water and functional toilets too are essential investments.

Develop **market places and stalls** to address considerations such as **urban heat stress** (via tree planting and durable stalls or movable shading that protect vendors from the elements, or rest areas for workers) and electric pushcarts for small scale retailers that reduce drudgery and work effort.

Social protection for retailers. Our extensive visits to markets as part of the rapid reconnaissance reveal that retailers, especially in urban areas, tend to be vulnerable, often falling through the cracks when it comes to government support. There is scope to explore targeted cash transfers for urban retailers, leveraging market-based trader associations for interventions around healthcare, such as group health insurance, or other welfare benefits (for example, disaster payments). Our research suggests that women/SC/ST retailers start their business with limited resources and accumulate less. Hence targeting them specifically would help level the playing field.

Transport:

The INCATA project did not focus on transporters, specifically third-party logistics, but they are critical to the functioning of markets, and their role is often under-recognized. We note here that it is important to research this segment to better understand the constraints that need to be addressed.

Institutions:

- ▶ Our learnings from case studies of the Agricultural Production Cluster (APC) program reveals that it has been an effective way to **get recognition for women as farmers** and facilitate women's access to institutional credit and government subsidies. Following the recent Bhubaneswar Declaration of the Government of Odisha³, concrete efforts via a state-wide campaign to enable women who farm to obtain formal recognition as farmers would be helpful, considering that the farm segment tends to be very inclusive of women.
- ▶ Our study of the APC program underscores the promise of cluster programs that explicitly focus on women from marginalized communities. A key question, however, is the viability and the sustainability of the Farmer Producer Companies (FPCs) formed when the program culminates. We recommend a differentiated approach, where FPCs with promise, operating in larger clusters that are likely to grow are offered support via **FPC Accelerator Program** that provides bundled inputs, such as enterprise training (finance, marketing, digital literacy, etc.), working capital, support for investments in logistics. The weaker or smaller clusters that are more survivalist and unlikely to grow are also unlikely to be viable as FPCs. The Government could consider supporting these using alternative organizational forms, such as cooperatives, etc.

Data

- ▶ In implementing the research under the INCATA project, we struggled with a serious dearth of high-quality data on production, yields and prices of vegetables across the state; further these data currently appear to be fragmented and maintained locally. We recommend leveraging existing initiatives to institutionalize low-cost methods of data collection and the use of digital technologies (including remote sensing and image processing and phone surveys) to generate near-real time data to support decision making.

³ In late 2025, the Government of Odisha recognized the role of women as central actors in agriculture, not merely beneficiaries but key contributors to agricultural continuity, climate resilience, and biodiversity conservation. This declaration is referred to as Bhubaneswar Declaration on Women Farmers and Conservation of Agricultural Heritage.

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