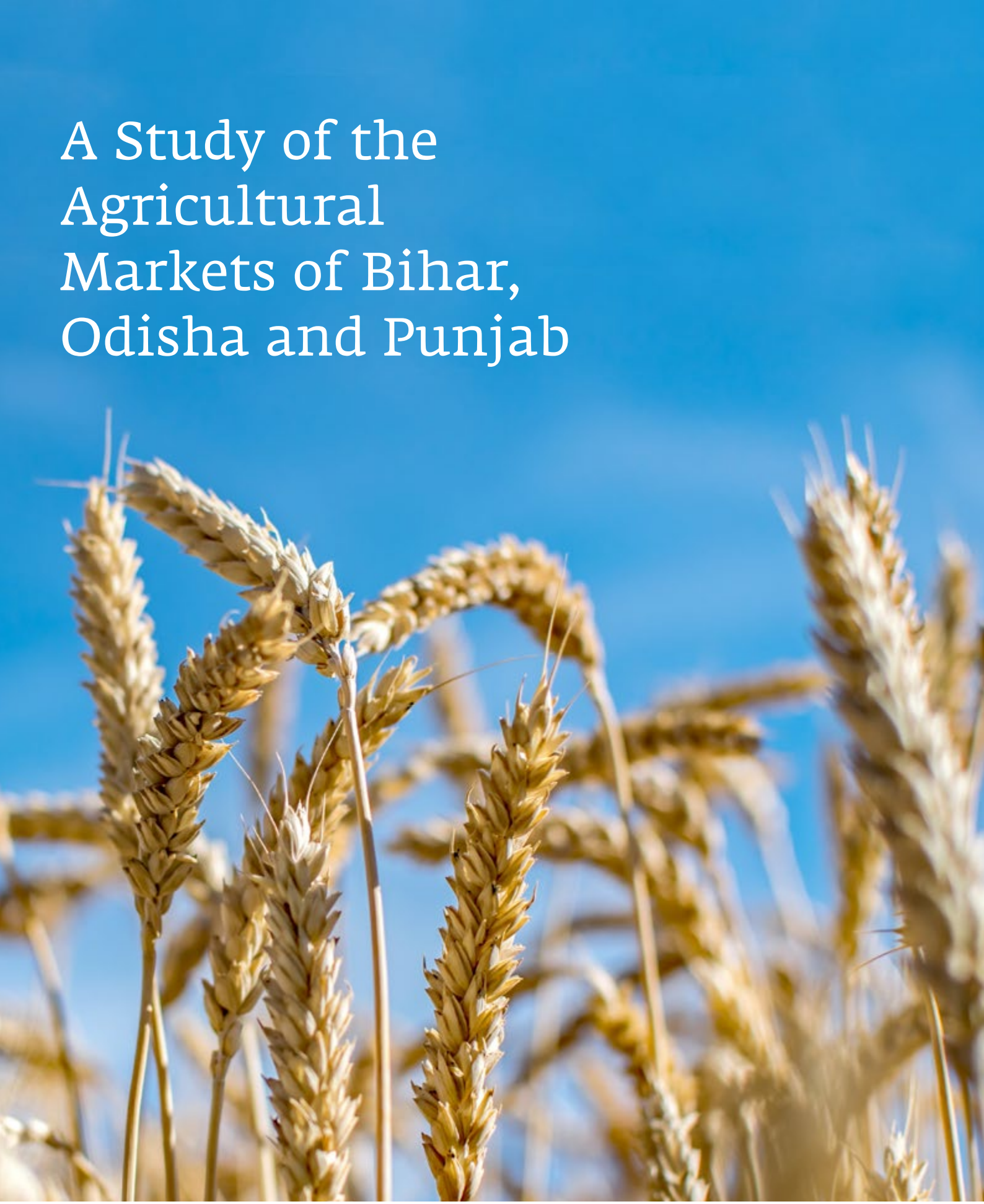
A Study of the Agricultural Markets of Bihar, Odisha and Punjab



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Abbreviations

AAPCL	Aranyak Agri Producer Company Ltd.
AORMA	All Odisha Rice Millers Association
APMA	Agriculture Produce Market Act
APMC	Agricultural Produce Marketing Committee
BSFCSC	Bihar State Food and Civil Supplies Corporation Limited
CACP	Commission for Agricultural Costs and Prices
CASI	Centre for the Advanced Study of India
CMR	Custom Milled Rice
CGWB	Central Ground Water Board
DAC	District Allotment Committee
DAP	Diammonium Phosphate
DBT	Direct Benefit Transfer
DCP	Decentralised Procurement Scheme
DEO	Data Entry Operator
eNAM	Electronic National Agriculture Market
FAQ	Fair Average Quality
FCI	Food Corporation of India
FPC	Farmer Producer Company
FPO	Farmer Producer Organization
GI	Geographical Indication
HYV	High-Yielding Variety
ICDS	Integrated Child Development Services
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
JAM	Jan Dhan-Aadhar-Mobile
KALIA	Krushak Assistance for Livelihood and Income Augmentation
KCC	Kisan Credit Card
KMS	Kharif Marketing Season
KVK	Krishi Vigyan Kendra
LAMPCS	Large Area Multi-Purpose Cooperative Societies
LAMPS	Large Area Multi-Purpose Societies
LPS	Land Possession Certificate
Markfed	The Punjab State Cooperative Supply & Marketing Federation Limited
MDM	Mid-day Meal
MSP	Minimum Support Price
MOP	Muriate of Potash
M-PAS	Millet Procurement Automation System
MSP	Minimum Support Price
NCDEX	National Commodity & Derivatives Exchange
NFSA	National Food Security Act
NGO	Non-Governmental Organization
NREGA	National Rural Employment Guarantee Act
NREGS	National Rural Employment Guarantee Scheme
NSSO	National Sample Survey Office
NTFP	Non-Timber Forest Produce
OBC	Other Backward Caste
OMM	Odisha Millet Mission
OMSS	Open Market Sales Scheme
OSCSC	Odisha State Civil Supplies Corporation Limited
PACS	Primary Agricultural Cooperative Society/ Primary Agricultural Credit Society
PAIC	Punjab Agro Industries Corporation Limited
PDS	Public Distribution System
PMAY	Pradhan Mantri Awas Yojna
PFMS	Public Financial Management System
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMGSY	Pradhan Mantri Gram Sadak Yojana
PM-KISAN	Pradhan Mantri Kisan Samman Nidhi
PMKSY	Pradhan Mantri Krishi Sinchai Yojana
P-PAS	Paddy Procurement Automation System
PP	Pani Panchayat
PPC	Paddy Purchase Centre
PSWC	Punjab State Warehousing Corporation
Pungrain	Punjab Grain Procurement Corporation Limited
Punsup	Punjab State Civil Supplies Corporation Limited
RMC	Regulated Marketing Committee
RMS	Rabi Marketing Season
RRC	Rice Receiving Centre
SC	Scheduled Caste
SDO	Sub-Divisional Officer
SHG	Self Help Group
ST	Scheduled Tribe
TDCCOL	Tribal Development Co-operative Corporation of Odisha Limited
VM	Vyapar Mandal
VRP	village resource persons

Glossary

Arhtiya	Commission Agent in Punjab, primarily operating from a mandi
Bazaar Samiti	Translates to marketing committee, used in reference to mandis which are erstwhile regulated markets of Bihar
Dalal	Village Trader/Intermediary in Bihar and Odisha
Gaddidar	Commission Agent in Bihar, primarily operating from a mandi
Haat	Open-air, local, usually rural market, dealing in a variety of consumer goods, including agricultural produce in wholesale and retail quantities
Jaleri	Small-scale intermediary in Odisha
Kaanta/Kanda	Weighing scale
Kaantawala	Aggregator/Intermediary in Odisha, operating from a haat and/or villages
Kirana/Karyana	Provisions store
Mandi	Agricultural market, may be regulated or unregulated
Paikar	Village Trader/Intermediary in Bihar
Palledar	Labour in the mandi
Sahukar	Village Trader/Intermediary in Bihar, Large-scale intermediary in Odisha
Thekedar	A contractor for farm or mandi labour
Vyapari	Trader

PART ONE

Kotapad Haat; Koraput, Odisha

Chapter One

Introduction to the Project

Broadly stated, Indian farming policies initially focused on land reforms in the 1950s to reduce acute landlessness and land inequality, especially among marginalized social groups. Then faced with famines in the mid-1960s and the specter of population growth outpacing agriculture production, it shifted to emphasizing output growth. This underlay policies underpinning the Green Revolution, with its emphasis on new seed technologies, input subsidies, and public procurement in selective regions. The goal subsequently shifted to ensuring food security for a large malnourished population, which led to the creation of a large but spatially concentrated public procurement system linked to supplying a vast public distribution system.

In more recent years, the priority has shifted to a new goal: increasing farmers' incomes. In 2016, the Indian government announced plans to double farmers' incomes by 2023. The time period—seven years—was seen as much too ambitious and unrealistic given that the prior doubling of farmer's incomes in India (in real terms) took 22 years (1993–94 to 2015–16).

To achieve this goal, the Government of India created an inter-ministerial Committee on Doubling of Farmers' Incomes. The committee issued a 14-volume report focusing on seven major sources of growth, six of which were within agriculture and one outside. The report acknowledged that the relative weight of these sources of growth would vary across states depending on the specifics of agricultural development.

The report made many recommendations pertaining to all aspects of agriculture. It identified "improvement in real prices received by farmers" as a key source of growth for farmer's incomes and to this end prioritized post-production interventions, including agri-logistics and agricultural marketing.

The relative shifts in policy priorities, notwithstanding, the five key aspects of the agricultural economic system—production, marketing, processing, distribution, and consumption—are interlinked in complex ways. Public policy has often tried to address each of them separately without fully incorporating these fundamental inter-linkages.

The assured procurement policy that commenced in the late 1960s targeted increasing production of paddy and wheat. The policy—underpinned by a plethora of input subsidies on energy, fertilizers, and credit—had multiple long-term effects. It has quadrupled output, altered regional production patterns, and decreased crop diversification, and has also had damaging ecological consequences, especially in terms of water use in certain regions.

Over time, procurement coupled with the Minimum Support Price (MSP) emerged as a ***de facto*** insurance mechanism, further incentivizing the cultivation of paddy and wheat over other crops. Recently, the focus has shifted to policies that may have less distortionary effects on markets, like cash transfers to farmers and deficit payment mechanisms, but face their own limitations.

The attention to farmers' incomes has led to a focus on the real prices farmers receive for their produce and, in turn, on agricultural markets. The first time public policy seriously thought about this aspect of agriculture was the 1928 report by the Royal Commission on Agriculture in India, which declared that the countrywide establishment of regulated markets "would confer an immense boon on the cultivating classes of India.[1]" This idea was entrenched in independent India's agricultural development policies, and regulated markets came to be seen as key to helping farmers realize a reasonable price in an environment where private trade was underdeveloped and controlled by mercantile power.

Subsequently, states adopted their versions of what came to be known as Agricultural Produce Marketing Committee (APMC) Acts in the 1950s and 1960s. Indeed, in its initial years, regulated markets led to substantial improvements in agricultural trade and farmer incomes, with diminishing inter-regional mismatches of supply and demand within India. But over time, many APMCs were also captured by entrenched interests and what began as a facilitative instrument enhancing farmers' incomes became viewed by policymakers more as a roadblock. More importantly, agriculture markets were relegated as a policy priority.

After nearly four decades of pulling different policy levers, with limited success on increasing farmer incomes, attention turned again to agricultural marketing. However, for the most part, attention has focused on the fallibility of the APMCs and the legislative acts that were responsible for creating them. The first Model APMC Act, which called for various reforms, was put forth in 2003. Subsequently, modest attempts at reforms continued, including clarifying provisions for contract farming and allowing processing companies to buy produce directly from farmers in many states, albeit remaining within the regulatory ambit of the APMC.

These reforms were limited in their benefits, especially for small

[1] Great Britain and Royal Commission on Agriculture in India, *Report of the Royal Commission on Agriculture in India*, London: H.M. Stationery Office, 1928.

and marginal farmers. Renewed attempts were made with a second Model APMC Act. A more ambitious attempt was a new software-led architecture called eNAM, which linked various APMC ***mandis*** in the country to create a National Agricultural Market. However, the implementation of the reforms has faced stumbling blocks, becoming ensnared in contradictions between stated objectives and actual policies, and in the wide gap between the ground realities of agriculture marketing and the high-level understanding of policymakers. The latter has impeded on-ground implementation of useful reforms and also kept states from fully accepting any Model APMC Act. As this report was being drafted, in May 2020, amidst the Covid-19 epidemic and its economic consequences, the Central Government announced its intention to push reforms to the APMC Acts via central legislation towards a goal of establishing a national market. In September 2020, three new farm laws came into force, with wide-ranging implications on the manner and degree of State regulation over the exchange, storage, movement, and taxation of agricultural produce in India.

It is important to recognize that agricultural marketing encompasses much more than the APMCs and the acts underpinning them. Three concepts need to be distinguished. An ***economic market*** refers to an institution or an agreement between buyers and sellers to exchange goods or services for money. Markets are the means by which scarce resources are allocated through the price mechanism.

The formation of an economic market requires the existence of buyers and sellers, a medium of exchange, a means of communication, and a legal system underpinning contracts. An economic market spans space and time and, therefore, allows for trade to take place across distant locations. It also facilitates exchange of goods today, in lieu of payments at a later date or vice versa. The economic market is not limited to any particular geography. Indian basmati rice is consumed the world over and that is the market for basmati rice. The market for Odisha's betel vine leaves might be more limited in geographic spread because of its uses and taste preferences.

A key component of the economic market is the ***market site*** or the physical location at which the exchange of goods occurs. In a state like Punjab, this is typically an APMC-regulated mandi. In states like Bihar, where APMCs were abolished, farmers typically sell at the farmgate, and this is their market site. And in other cases, like Odisha, farmers often sell in the village or to periodic markets or paddy procurement centers depending on their location and commodity.

Finally, the marketing system is the actual network of sites and institutions through which commodities flow based on price signals via processes of exchange in a decentralized manner. It encapsulates both monetary and non-monetary transfers between the full range of buyers and sellers participating in the agro-commercial system. But market systems also include other sites and institutions through which agricultural commodities are transported, transferred, and transformed (including sites of storage, processing, and distribution). Since state regulation influences prices, it also shapes a marketing system.

Many reforms by previous governments, such as those that focused on improving availability of agricultural inputs, availability of credit to small and marginal cultivators, or connectivity should thus be seen as a part of reforms to the agricultural marketing system and market. After all, a robust agriculture market requires a robust marketable surplus in the first place.

Clarifying these distinctions matters. Today, although policy focus has once again shifted back to agricultural marketing, it is largely fixated on a very particular component of economic markets—***the APMC mandis***. Other components of the market—unregulated village exchange to international trade, insurance, input markets, land markets, labor markets, the market for information and knowledge, etc.—deserve equal attention.

It is with this understanding and approach in mind that this project was conceived. The project analyzes the role of agricultural marketing in determining farmer incomes in three Indian states—Punjab, Bihar, and Odisha—with an emphasis on the latter two states. At a broad level, it seeks to examine the opportunities markets can provide to increasing farmer incomes and to identify possible policy and regulatory changes to do so.

The project focused on the ***first market site***, i.e., the point of sale by the farmer—wherever that might be—in the states of Bihar and Odisha, which have among the lowest crop yields and farmer incomes in the country. The project also included one district from Punjab to serve as a case of a high procurement state with a well-developed mandi system). The study assesses how agricultural markets function for different agriculture commodities and locations, how farmers interact with markets, including various intermediaries, and what factors determine the prices farmers obtain for their produce, across a one-year agricultural cycle.

The study was guided by several research questions:

- Markets and market sites—how do we best conceptualize the agricultural marketing systems in these states?
- How do different market sites, including APMC mandis, function? What features of these sites are valuable for small and marginal farmers?
- How do farmers across the study districts bring their produce to the market? In what ways does this vary with farm characteristics including crops grown, size of cultivated holding, amount of land owned, tenurial status, family size, and distance to market locations?
- What are the marketing challenges faced by small and marginal farmers, and how do these differ from marketing by larger farmers?
- What roles do intermediaries of various kinds, from village-level traders to mandi traders and commission agents, aggregators and processors, actually play? Are their roles and returns commensurate with the risks they take?
- What factors most affect price realization, and how do these vary across agro-economic patterns and holding sizes?
- How is payment made to farmers, how long are the

delays, and what are the imputed costs of delayed payments?
- How does risk affect farmers' decisions about which crops to grow and their market behavior?
- How important are MSP and procurement policies, whether sponsored by the national or state governments, in crop choice and price realization? Do these help or hurt small and marginal farmers and in what ways?
- What is the penetration and usage of eNAM? What is its impact on market behavior, and what are the impediments to greater adoption?

The study used a multi-methods and multidisciplinary approach, drawing from anthropology, economics, and political science. The studies and data it generated include:

- background studies of the history, current policies, and functioning of agricultural markets in each state and of the agroecology and agricultural economy in each district;
- year-long ethnographic studies of each of district's agricultural and marketing systems and operations;
- a survey of 9,500 farm households at three intervals in the agricultural cycle;
- a survey of marketing intermediaries in Bihar; and
- a limited price data collection in Bihar and Punjab.

Initially we hoped to determine "wedges" along the supply chains from farmgate to processor by collecting high-frequency price data. In the field, we soon learned that while farmers were willing to give us information about their sale prices, it was harder to obtain this information from intermediaries and impossible in the case of processors.

The project got underway in December 2017. The initial months were devoted to detailed planning for the fieldwork and preparation of the state and district background studies. Fieldwork began in July 2018 including the deployment of two field researchers in each of the seven districts. The first farm household and ***kharif*** planting survey went to the field in September–October 2018. Subsequent surveys of kharif marketing/***rabi*** planting and rabi marketing took place in February–March and June–August 2019. Given the difficulties of setting up a price monitoring system along the supply chain, a survey of village-level intermediaries (identified by farmers) was added to the project and fielded in Spring 2019.

Purnea, Bihar–Maize being aggregated from village

Chapter Two

Analytical Toolkit: Understanding Agricultural Markets and Commodity Supply Chains

This toolkit seeks to provide a framework for assessing agriculture markets and commodity supply chains. This chapter has three goals. First, it outlines the analytical methodology of what was implemented. Second, it provides lessons on why some things worked and others did not. Third, it gives recommendations on possible improvements—what would we change if we were to do it all over again? And we also recommend replacements for specific strategies that we think would be hard to implement.

Agriculture marketing systems are complex and context specific, not only in terms of the historical context, such as land and labor relationships, but also in their commodity specificity. The research in this study helps understand the flow of particular commodities in particular geographies. It shows that the same commodity has very different flows in even different districts of the same state. Conversely, within the same district, different commodities can have very different supply networks. Perhaps the most important lesson from this chapter will be to highlight how we need to combine thinking across disciplines to understand agricultural markets and commodity networks.

Different academic disciplines have different ways of looking at and analyzing an issue. While the end goal is similar—deeper understanding of actors, mechanisms, and consequences—approaches can differ drastically. The complexity of agriculture supply chains means that an analysis through the lens of a single discipline risks an analogy with the parable of the elephant and the blind men, each believing that the view from their analytical lens is the correct one. For this reason, this research drew on the expertise of anthropology, economics, political science, and statistics.

2.1 The choice of study states and districts

The focus of the project was eastern India for exactly the reasons that have led to its exclusion in most agriculture-related research. Compared to the rest of the country, the east has the smallest farm sizes, lowest yield, lowest farmer incomes, and least developed marketing systems. We picked Bihar and Odisha, which shared many common features but were significantly different in others. Bihar does not have a formal regulated marketing system and reflects greater diversity in the crops it grows, especially vegetables. It also has cultivation in both cropping seasons. Odisha, on the other hand, has a regulated marketing system with a formal marketing act, although its implementation has been relatively weak. Unlike Bihar, Odisha has also invested significantly in decentralized paddy procurement. We added Punjab to Bihar and Odisha to serve as a benchmark, since it is a large agricultural state with a well-developed public procurement and marketing system.

Within Bihar and Odisha, we wanted to pick districts from different agroecological zones. In Punjab, we wanted to pick a district that did not grow only paddy and wheat. Given the diversity in its agroecology, Hoshiarpur was the obvious choice as it is known for the cultivation of maize, sugarcane, potatoes, and peas. These were crops that we also expected to find in Bihar. All sites were finalized after a round of field visits and interviews with agricultural experts, government institutions, and practitioners in each state. The section that follows provides a brief introduction to the study districts and their defining characteristics. Further details on the sites and commodity markets studied, especially on the distribution and dynamics of land, crops and cropping patterns, production costs and processes, and commodity systems are presented in Part 2 of the report.

2.1.1 Nalanda, Bihar

Nalanda lies in the south Bihar alluvial plains and is a drought-prone district. The net-sown area of Nalanda is 77.1%, 22% above the state average in 2015–16. The groundwater extraction levels are also one of the highest in the state. Nalanda appears to have had success in getting early access, implementation, and benefits of many of the state's development initiatives such as the separation of electricity feeders for the agricultural sector for irrigation, development of the state's first organic farming corridor under the third Agricultural Road Map, and the fourth-largest paddy procurement levels in the limited operations that the state undertakes in the 2019–20 marketing season.

Other than paddy, wheat, potato, and onion are important crops in the region. The ***taal*** area in the north-eastern part of the district, which remains submerged underwater in the ***kharif*** season, is especially suited for the cultivation of pulses.[2] Farming households located close to market sites such as Bihar Sharif, Soh Sarai, and Deep Nagar grow a variety of vegetables due to the availability of a ready sale point. Owing to the multiple production centers that have come up across the country supplying cheaper produce, Nalanda's importance as a producer of potato and onion has declined over the years.

[2] The *taal* area comprises a group of seven continuous *taals* or lakes. It is spread over a vast area of land in central Bihar and acts as a delta for many rivers that flow into it. Cultivation of *rabi* crops gets affected in this region if the drainage does not complete by the time of sowing.

Nalanda has a host of market organization structures. The Bihar Sharif Bazar Samiti, with its history dating back to the early 1960s, is under the administrative control of the Sub-Divisional Officer, while other ***mandis*** like Soh Sarai, set up in the 1950s, function independently after the repeal of Bihar's Agriculture Produce Market Act. While farmers rarely visit these mandis, some mandis have been set up more recently through collective action by farmers where they can directly transact with traders. Meanwhile, the historical mandis lose their importance as the abolishment of the act has led to traders buying farmer's produce at the farmgate and from other market sites.

2.1.2 Purnea, Bihar

Purnea, in the north-east alluvial plains of Bihar, is located in the Kosi and Mahananda river basins and is prone to floods due to erratic rainfall and flooding from the Himalayan rivers. Residents of Purnea have pointed towards the district's alluvial soils being highly fertile, owing to which all types of crops can be cultivated in the region. While conforming to Bihar's paddy centricity in kharif, maize cultivation in rabi has steadily replaced all other rabi crops in the district over the last two decades, which included jute, gram, pulses, and ***ragi*** (finger millet). The seasonal advantage that the district enjoys in being a supplier of rabi maize when other major producing regions in India have dried up their supply of kharif maize has provided an economic advantage to the farmers, pushing out cultivation of other crops in the rabi months. Farmers in Purnea also cultivate banana and ***makhana*** (fox nut).

Gulabbagh mandi is at the center of Purnea's corn revolution. Till 2013, the flourishing maize trade in Gulabbagh mandi, which received maize not only from Purnea, but also its neighboring districts from Bihar's maize belt, was a well-kept secret by five–six multinational companies. In 2012, when the National Commodity & Derivatives Exchange (NCDEX) noted the skew in maize prices on its trading platform between April and September, it decided to launch its maize contacts in Gulabbagh. Due to the entry of new players every season, the mandi has seen an increase in the number of intermediaries and brokers. Additional market sites include places like Gunda Chowk, located right outside the Gulabbagh complex, which had an opportunity to boom as a result of the state's limited procurement operations and the absence of an Agriculture Produce Market Act.

The Gulabbagh Mandi, having first been set up by the municipal council, has survived over 40 years to become one of Asia's largest maize trading centers. The lack of infrastructure in the mandi is striking, and the market is run solely by the efforts of intermediary associations. But the commodity has generated sufficient demand for the incoming corporations to invest in local warehousing, research and development, and input markets, contributing to Purnea's rise as a maize production hub.

2.1.3 Samastipur, Bihar

Samastipur, located in Bihar's north-west alluvial plains, is high on the diversification index, cultivating a range of horticulture crops, steadily shifting from its cereal cultivation cycle. Ethnographic evidence points to this horticultural boom having affected the tenancy arrangements towards leasing-in rather than sharecropping in the district. In addition to finding sharecropping exploitative in terms of resource sharing, the farmers also have to give 50% of the produce in rent, which is possible for grains but tricky when it comes to perishables.

Farmers conduct the majority of grain trade with the village-level intermediary. The intensive vegetable production has led to the cropping up of multiple ***haats*** across the district where farmers often go themselves to sell their produce directly to the market intermediaries. While the trade of bulkier vegetables like potato, cauliflower, and elephant yam continues at the village level, the overall presence of village traders is lower in the case of vegetables because aggregation can be time-consuming due to small farm sizes and affect the freshness and quality of the produce. The majority of vegetable trade has motivated the Samastipur's Bazar Samiti to switch up its operations to function at night to deal with the large trading volumes of rabi vegetables.

The numerous haats of Samastipur are run under a diversity of institutional arrangements. With the state law not regulating any of the market sites, some haats have traders operating independently, while a few others have trader associations to set standard market practices. The haats are set up on privately owned, government-owned, and sometimes encroached land. The traders operating from these haats make payments of taxes and rents as prescribed by the landowning authority.

2.1.4 Balasore, Odisha

Balasore in Odisha has an 81-km-long coastline, and because of its proximity to the sea, it is interspersed with several perennial rivers, rivulets, seasonal streams, and saline creeks. As a major portion of the district is situated in the deltaic region of Gangetic river systems, it possesses rich alluvial deposits and is suitable for intensive crop production. Paddy is the most important crop across the district.

Despite the state's heavy focus on paddy procurement, produce here is frequently sold at the village level to an intermediary for a price lower than the Minimum Support Price (MSP). The state has attempted multiple ICT measures to break the rice miller–PACS official–village intermediary nexus, which keeps the farmers out of the market, most recently introducing centralized token issues and Aadhar-based procurement at the paddy purchase centers. With no market yards of its own, the three Regulated Marketing Committees (RMCs) of Balasore are heavily reliant on the areas made operational by the cooperative societies in the district for the procurement operations. In spite of the availability of a Rs 50 crore fund, the RMC has not invested in building a market yard. There is a proposal to set up an eNAM mandi under the RMC Bampada for which additional infrastructure is expected.

Other than paddy, key crops in the district include betel vine and green chili. Betel vine has long trade channels leading up to the cities of Delhi and Mumbai. The markets which operate for the commodity in the district see farmer–trader interactions and have lasted over generations with varying landownership, fee collection, and market committee membership arrangements. Green chili is marketed by a well-organized syndicate of traders who pool in resources to purchase the chili at the farmgate through village intermediaries and sell the produce in Delhi's Azadpur mandi. Many villages in Balasore have seen the adoption of a paddy–prawn system of cultivation, which has given farmers both major profits and massive losses across seasons.

2.1.5 Koraput, Odisha

Koraput's two sub-divisions of Jeypore and Koraput have distinct topographical and agroecological features. Jeypore is located on flat land and has been regarded as the center of origin of rice, while the hilly and forested Koraput sub-division cultivates a wide variety of horticultural produce. There is significant inter-block variation in production patterns in Koraput, deriving from the knowledge practices of diverse Adivasi communities.

Paddy procurement is not a widespread exercise in the district with only 20 paddy purchase centers for the third-largest district in the state in terms of area. Odisha is in its second year of millet procurement at present, and Koraput, with the largest area under millet cultivation in the state, is a key site, although procurement levels remained low in the first year.

The proximity to Andhra Pradesh and Chhattisgarh brings in traders frequently to one of Koraput's many weekly haats, with one market site functional every day of the week in the district. The RMC primarily manages these haats with supervisors and market guards deputed to ensure proper functioning and fee collection. The Kunduli haat has been given the status of a modern vegetable market, seeing the construction of a market yard and introduction of eNAM for ginger and potato trade.

2.1.6 Sambalpur, Odisha

Sambalpur has three distinct physiographical divisions with hilly terrains in the north, plateau and ridges in the south-east, and valley plains in the south-west. The Hirakud Dam built across the Mahanadi river in the south-western region of the district has played a critical role in defining the district's social composition, land relations, and production patterns. Some of the larger farmers who have settled in the blocks falling under the Hirakud Dam's command area came from Andhra Pradesh, bringing with them in-depth knowledge of paddy cultivation.

The Western Odisha Farmers' Union has been instrumental in ensuring stringent and structured paddy procurement in the district, but the influence of the union is largely limited to the blocks falling under the command area, while farmers in other blocks continue to make their paddy sales through the village traders. This has also impacted the presence of rice mills, which are concentrated in the command area.

Embodying the spirit of Odisha's Agricultural Produce Markets Act, Sambalpur's market sites are host to a variety of regulatory authorities ranging from the RMC to the municipalities and the gram panchayats. A variety of vegetables are traded in these markets in wholesale and retail. The Kuchinda RMC has been earmarked to conduct the red chili trade on the eNAM platform, but the stronghold of the local trading communities has made the implementation a challenge.

2.1.7 Hoshiarpur, Punjab

Hoshiarpur in Punjab brings to the fore the rain-fed, non-mechanized, and diversified agriculture that still exists in pockets of the state. Located on the western border of the state of Himachal Pradesh, it has upland and low-lying areas, adding to district's varying agroecology as home to the Kandi and Bet areas, historically considered backward, with rocky terrain and limited access to irrigation. The higher proportion of small and marginal operational holdings than the state average and a large proportion of the Non-Resident Indian population has together impacted the cropping and marketing practices of the district's farmers.

Wheat, maize, paddy, and sugarcane have replaced traditional crops like pulses, sunflower, and mustard. Located in the northern region of the state, the district has the advantage of the early onset of winter to supply the north Indian agricultural markets with the first seasonal supplies of potato and green peas. The dynamism of these horticultural markets picks up in the rabi months, with traders from all across India flocking to the villages and regulated markets of Hoshiarpur. With increased technological connectivity, the long-drawn connections of Hoshiarpur's farmers with the commission agents of markets like Azadpur in Delhi have faded to make way for new risk-taking intermediaries, offering the farmers greater convenience of making sales at the farmgate.

The district and state authorities are presently struggling with several infrastructural and regulatory bottle necks. The Hoshiarpur Market Committee presents eNAM as a functional platform, while the commission agents in the agricultural produce market are only willing to support the authorities to the extent that the platform appears active, continuing their practice of physical auctions. The commission agent's position in the markets is at stake as the Central Government intensifies pressure on the Punjab government to make direct payments to farmers for paddy and wheat procurement through the Public Financial Management System. The impact of the latest Punjab Agricultural Produce Markets (General) (Amendment) Rules, 2020, allowing for special market yards, private market yards, producer market yards, and producer-consumer market yards, remains to be seen.

2.2 Diversity, complexity, dynamism: Ethnographic fieldwork and analysis

Since the structure, relations, and dynamics of agricultural markets and commodity networks are impossible to illuminate without fine-grained fieldwork and because these markets are seasonal, we conducted detailed ethnographic studies in each district over a full agricultural year. A team of two field researchers were based in each site from July 2018 until June 2019. All 14 fieldworkers were selected from a well-qualified pool of applicants and were chosen for their strong field-based interests and commitments and their language skills. The entire research team was trained over a two-week period on a range of topics and methods before it set out for fieldwork. Throughout the fieldwork period, we had weekly review and planning calls with each team based on its detailed field notes, which were uploaded onto a shared drive.

The field teams traveled extensively during the initial weeks, visiting all the blocks in the district and focused on quickly orienting themselves to the agroecological diversity and the seasonal cropping patterns. This information, especially the specific timing of the crop production and harvesting cycles across different sites, was crucial for the farmer surveys. The commodity network mapping, a complex task, and the relationships built with farmers, intermediaries, traders, and state officials were also important for the price data collection exercise. The field teams were also able to help identify and geo-code major and minor market sites across the district. They provided critical inputs for the survey questionnaire and were able to conduct back-checks and ground-truthing. So, while they were primarily responsible for the in-depth qualitative data collected on agricultural markets, there were also essential members of the interdisciplinary team involved in conducting the surveys and developing price data collection systems.

The fieldwork teams were able to capture fine-grained and detailed empirical materials based on continuous observation and in-depth interviews across key market actors and institutions. They were also able to investigate in detail the implementation of particular government policies and schemes (especially public procurement and eNAM) as well as provide detailed studies of transactional life and market practices both in villages and key market sites, and we were also able to understand changes over time. Each team was able to build a set of diverse and detailed profiles, process flows, and commodity networks. The teams worked through major challenges, including cyclones and very high summer temperatures, and had to work through a national election. The entire team met in Delhi in February 2019 to debrief and plan the final phase of research and field analysis, and then once again in July 2019. These were vital sessions for the entire research team and enabled comparative learning and sharing of insights and fieldwork strategies across the teams.

2.3 Production, markets, price realization, and market power: Surveys and prices

Building on an initial corpus of field-based knowledge, we conducted a large-scale three-part survey (of about 10,000 farmers), in order to get quantifiable estimates of farmers' production costs, their relationships with input dealers, creditors, and buyers, the terms of engagement, outputs, marketing, terms of sales, etc. Subsequently, we empirically tested the data we had gathered for correlations and possible generalizations.

Understanding market power was at the heart of the project. Do prices paid by intermediaries and traders to farmers reflect competitive markets or market power, and if so, which actor(s) along the supply chain have most market power? However, this is only true at the first transaction between the farmer and the intermediary who shows up at the farmgate. We had two options to get a generalized understanding of what the wedges are at other points along the supply chain and estimate market power. The first was to directly survey other actors—agro-processors, agri-businesses, and larger aggregators. However, the costs of an extensive survey and the absence of any sampling frame of these businesses rendered this moot. We instead decided to draw from new advances in economic analysis that use "pass-through" regressions to estimate market power, separating it empirically from real operating costs. This required us to collect weekly price data, specifying the quality of the crop, at various points in the supply chain.

We were not entirely successful in the last exercise and discuss the reasons for this below. However, mid-way through the project, we found a way to piggyback on the farmer surveys and build a sampling frame of intermediaries operating in our sampling districts. This allowed us to revert to our first strategy of interviewing intermediaries directly. This meant that we managed to get a good idea of the businesses of the front-line intermediaries, most of whom are small and buy produce from the farmers at the farm gate. This is a significant breakthrough to get systematic data on intermediaries—the organization of their business, costs, and profits—about whom we largely had ethnographic data earlier. However, in this study we were unable to get similar systematic data on actors that come later in the supply chain.

In the sections that follow, we provide details about implementing data collection, discuss the pros and cons of various choices including the questionnaire design, and provide some recommendations for future research.

2.4 Farmer surveys

Sampling frame: We decided to use the voter lists as our frame from which we drew our random sample of respondents. Since the voter list is the most accurate record of rural residents in India, it seemed the most robust choice and lowered costs as well. This approach worked well in Bihar and Odisha. However, in Punjab, which has a lot of both in- and out-migration, this technique for constructing the sampling frame did not work well. Most households that appeared on the voter lists were not found on the ground since they had migrated away from the village or even the district. Hence, we had to resort to a listing of farming households, which significantly increased survey costs.

In such cases, we recommend a rapid listing of farmers at the start of the agricultural year. It is the best and the only reliable way to accurately capture migrant farmers and sharecroppers/ leaseholders. Based on our field research, one consequence of our sampling frame is that we believe we may have undercounted the population of sharecroppers and tenants in Odisha, some of whom are migrants and not on the voter list.

Questionnaire design: If there was one lesson from the surveys, it was this: any questionnaire longer than 30 minutes is not very reliable. Understandably, farmers find it tedious and time-consuming to respond to long detailed inquiries. Longer questionnaires must be spread over repeated visits. Our respondents took 45–50 minutes to complete their interviews. We understood the costs in terms of accuracy, but were limited by the financial and logistical costs of conducting any more than three rounds of surveys during one agricultural cycle.

We implemented a rigorous system of daily data consistency and back-checks. This process was partly automated, where we used computer algorithms. However, we were also continually verifying survey data against the ethnographic data. Whenever we found discrepancies, we went back and forth until we resolved it one way or the other. Many errors were found. Simple issues were first verified over the phone. More complex matters were verified during follow-up visits since our surveys had three rounds.

It is because our field researchers regularly gave us updates on what was happening on the ground that we caught surveyors recording ghost responses in Sambalpur. When we could not reconcile recorded responses, our field researchers had to visit survey villages physically, and that is when they found that the on-paper respondents do not exist. Therefore, we had to resurvey the entire round of the questionnaire in Sambalpur.

We also found that it is simply not possible for farmers to remember minute details during a survey interview. This is especially true of small farmers who form the majority of our population. For example, they were unable to recollect and provide crop-specific costs. They keep incurring expenses over the year but in their own calculations, do not typically account for how much urea was used on rice versus tomato. They could recall prices well but not payments. From our field research, we knew that promised prices are never the same as payments made to farmers for their crops. Intermediaries usually deduct a certain amount on account of transport, cleaning, bagging, impurities, etc. We tried to ask this in the survey, but farmers largely multiplied reported prices by the quantity to tell us the total payment. It could also be that farmers are made bundled payments for a variety of products sold together, and hence asking crop-specific payments is futile.

The only way to get these numbers would require repeated visits by technically-proficient and highly motivated surveyors who would themselves observe the farmer's decisions and record details. This is the approach followed by the Commission for Agricultural Costs and Prices (CACP) in conducting the cost of cultivation surveys for which they send students from agricultural universities.

The one other module that we find unreliable in the survey is the time use module. The pilots of the module went smoothly, so we are confident about the design. The weak quality of responses was mainly due to the length of the questionnaire, which required a separate visit.

Our general recommendation is that errors should be minimized at the source, and it can be done by keeping the survey short and spreading it over two–three visits. As much as possible, interviews should be conducted at a time of the farmers' convenience and not by showing up at their doorsteps at a random time of the day. And it is best to avoid conducting farmer surveys during peak sowing and harvest weeks.

2.5 Price data along supply chains

We set out to collect prices at four points – the farm gate, intermediary/wholesale markets, processing plants, and retail locations. However, simply capturing price data is not enough. For analysis, the price should be accurately attributive to the observed characteristics of the crop, i.e., quality. Moreover, we need to know if that crop is traded between the two locations where we have set up the price collection system. This last piece of information is crucial because if tomato at the retail location is not coming from neighborhood villages then what we learn from the pass-through regressions, which compare retail prices to local farmgate prices, has a more complex interpretation.

We began by identifying a set of commodities that are produced and consumed in each geography, and then we specified their quality parameters to make accurate adjustments. Since we had a team of field researchers in our districts, we asked them to collect retail prices. This is labor intensive and created a significant burden on their time.

Capturing regular prices at various points in a supply chain requires substantial infrastructure that cannot be done without coordination with and help from local authorities. We had such support in Bihar (but not in Odisha or Punjab) from JEEViKA, which has a large team of village resource persons (VRPs). We partnered with JEEViKA to recruit VRPs and train them, after which we asked them to collect regular price data at the village level. We also hired a district-level data-entry operator (DEO) whose job was to aggregate the information from the various VRPs. Some VRPs/DEOs were more responsible than others, but this exercise worked well. Although it took us until the end of the kharif season to set up the machinery, and thus we were left with a thinner sample of data to work with—a few weeks of kharif and rabi data—we are confident that this exercise can be done when planned ahead in time. The DEOs and VRPs also helped us to get data from village-level marketplaces—mandis and haats.

The major bottleneck was getting any price information from processors/millers. They were very skeptical about giving information to private surveyors, although our field researchers were the ones who had approached them. It is our view, therefore, that unless the government seeks this information, it will be very difficult for any private/market-intelligence survey company to get it. One of the recommendations in this report is that understanding agri-businesses and agri-processors is vital

in order get a deep understanding of farmer incomes. To do so, we would recommend setting up a large-scale dedicated survey of these firms along the lines of the Annual Survey of Industries conducted every year by the Central Statistics Office.

Such price data is important. High-frequency movement in prices across locations and along the supply chain can quickly help us figure out bottlenecks and market power in real time. However, collecting it will require investing in local resource persons who will reliably and consistently collect this information.

2.6 Intermediary survey

Sampling frame: The first challenge of a survey of intermediaries is the absence of any frame to draw upon. Their listing also seems improbable as many of these actors are continually mobile. We had the advantage of asking the details of intermediaries from farmers in the first round of surveys. Thus, when we realized that the price data collection system might not be ready in time, we decided to directly survey intermediaries using our list of intermediaries from the farmer surveys as the sampling frame. This approach, however, gives us a very specific sample—the first layer of intermediaries who directly buy from farmers.

Survey responses: While we began this survey in all three states, owing to ambiguities in the legality of this occupation in Odisha, intermediaries refused to respond to our questions. In Punjab, the *arhatiyas* were worried that their responses would somehow be used by the government against them and hence were giving us unreliable responses. For this project, we decided to concentrate on intermediaries in Bihar where we got the best responses.

Questionnaire design: Knowing that intermediaries are busy, we designed short questionnaires and interviewed each intermediary over multiple visits. On an average, it took us three–four visits to finish one interview. Understanding the costs of the intermediaries was the trickiest challenge. They conduct several transactions over the course of the season, and it is impossible to ask them about each as they cannot recollect these. So we asked them to tell us about three transactions, one from a village nearest to their residence, one farthest, and one from somewhere in the middle. We could get reasonable estimates of their monthly fixed costs, like rents of shops they might own. We could also get estimates of transaction-specific costs, like payments made to labor.

There are other costs, like transportation costs, which accumulate over various transactions and are not fixed, as intermediaries go from village to village collecting crops and delivering them to a larger trader or a processor. The questionnaire was not set up to capture this cost accurately, and there is scope for improvement here. This poses some analytical challenges because unless we can correctly apportion a fraction to the total transport cost to a particular transaction, it would be tough to understand the margins in a transaction. The other approach could be to get an idea of total costs and sales over all transactions, and that would enable the researcher to compute margins.

Both the intermediary and the farmer surveys were successful. Hence, we are confident that a systematic survey of bigger intermediaries and agri-processing firms can be operationalized. That will be the most straightforward way of understanding their operations, costs, mark-ups, and, therefore, market power.

2.7 Analytical synthesis

The single-most important analytical departure in this research process was that the interdisciplinary expertise (anthropology, economics, political science, and statistics) brought together a common analytical framework to illuminate the structure and performance of primary agricultural markets. Different methods were able to generate diverse empirical data and possible explanations for the outcomes observed, but these were then continuously related to each other to both confirm and qualify our understanding of how things worked in the field. Therefore, this report is a genuine attempt at ***analytical synthesis***—across disciplines, sites, empirical data sets, and analytical techniques. We do wish to emphasize, however, that it is, at this stage, only the first detailed presentation of the key findings and analysis from our research and future publications will deepen and expand our analysis of all the data and materials collected, and more fully reflect our ongoing engagement with wide-ranging sources and scholarly work in this field.

Hoshiarpur, Punjab–Wheat loading

Chapter Three

Farmers and Markets:The First Sale and Its Role in Realized Prices

3.1 Introduction

Do post-harvest processing activities affect prize realization? How does the time of sale, i.e., the number of days after harvest, affect price realization? Does the type of buyer and the location of the buyer affect prices? And does the size of the output on sale matter, i.e., is there a price premium for large farmers who have a much larger amount to sell than small farmers, whose marketable surplus is less? This chapter examines the principal factors that could affect the price a farmer gets for his produce after harvest.

Our analysis is based on data from the farmers' survey and focuses on paddy, wheat, maize, mustard, and potato.[3] These crops are most widely produced and are comparable across states and districts. In some cases, we also include vegetables in the analysis and will explicitly mention their inclusion when we do so. Since paddy and wheat are invariably publicly procured (on behalf of the Food Corporation of India [FCI]) at the Minimum Support Price (MSP) in Hoshiarpur, our analysis of the factors affecting prices excludes this district (since there is no variation to explain). For this reason, the cross-state comparisons take one of the two forms—either we exclude Punjab and use all crops, or we exclude paddy and wheat but include all districts.

3.2 Market participation and marketable surplus

Before we examine issues related to price realization, we will first examine the market participation of farmers. In particular, we first want to underline that for many small farmers, the total output is so small that they do not participate in the market even when one exists.

Figure 3.1 shows that market participation by farmers is the lowest in Bihar, followed by Odisha, and almost universal in Punjab. A major reason behind this is the small scale of farmers who produce so little that it barely meets their personal consumption. Indeed, 98% of the farmers who did not sell any output said that the main reason was home consumption.

To show that this is linked to the small scale of farming we present two charts. Figure 3.2 plots the average land cultivated by the farmers that sold in the market compared with those that did not and figure 3.3 plots crop-wise the ratio of average land cultivated by those farmers that sold in the market to those that did not. The figures show that across states, larger farmers are more likely to participate in market transactions. Indeed, in Bihar and Odisha where average market participation is low, the famers who sell in the market are on average at least twice as large as those farmers who do not sell.

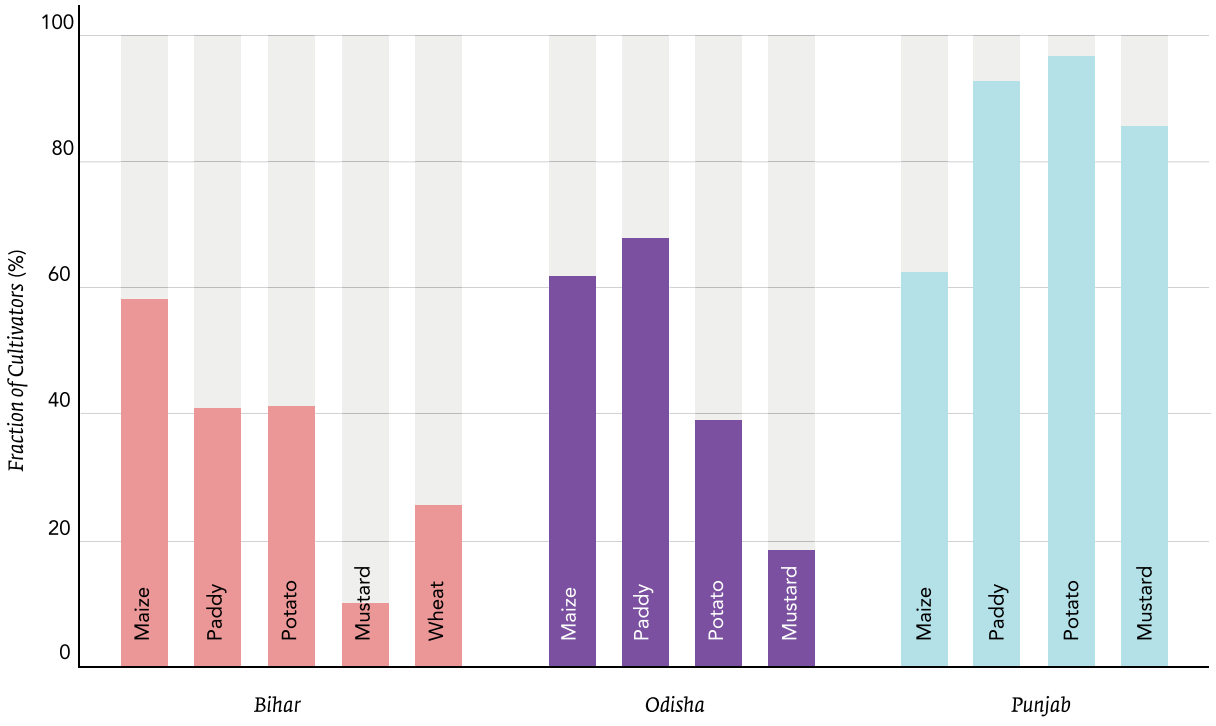


Figure 3.1 Fraction of cultivators of different crops who sell it

[3] Whenever tables or regression tables derived from survey data mention "All crops," unless otherwise noted, it must be assumed that we are referring to the following five crops—paddy, wheat, maize, mustard, and potato.

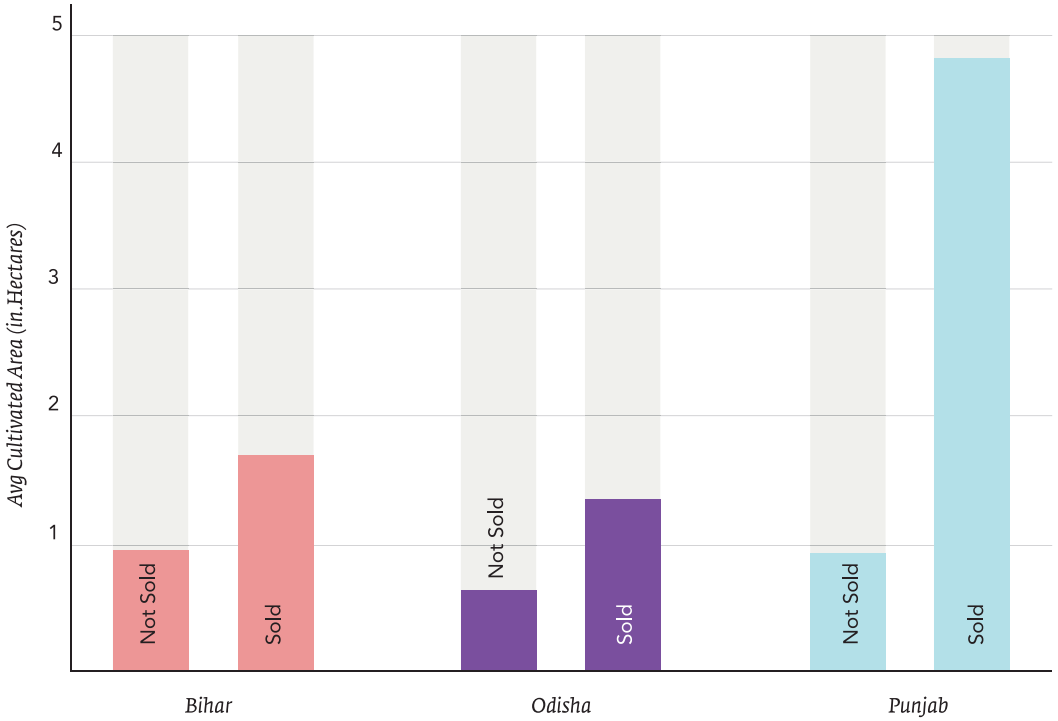


Figure 3.2 Average cultivated area by area participation

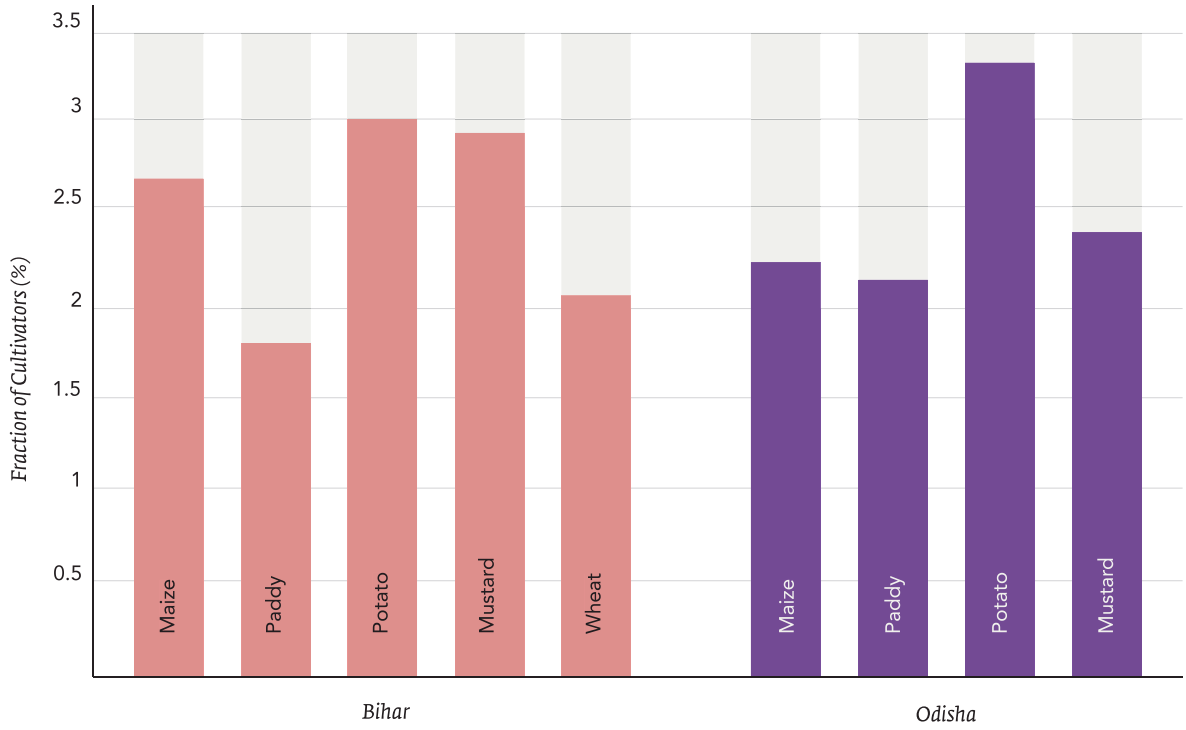


Figure 3.3 Fraction of bigger framers selling in the market

Next we turn to the question of marketable surplus. From the total output, farmers keep a fraction for home consumption, a fraction as seed, and another to pay labor in kind. Figure 3.4 plots this distribution and shows that market participation is the highest in Punjab. Not only is a smaller fraction of output kept for personal consumption but also hardly anything is kept as seed (i.e., seeds are bought in the market) and labor is paid in cash and not in kind. Bihar and Odisha show a higher proportion of the output of the crop being kept for self-consumption, but a smaller fraction of the output is kept on average as seed or used for payments to labor. Essentially very few farmers keep the crop for seed or use it to pay labor. The 10% of farmers who keep a part of the crop for seed or labor save on an average 7–12% for each purpose.

A higher proportion of the output being kept for self-consumption in Bihar and Odisha is reflective of a smaller average output in those states. To illustrate this, figure 3.5 plots the average amount of output that is kept for self-consumption by farmers. The heterogeneity in the volume of crops kept for home consumption reflects local dietary preferences. Paddy, which is a staple in Bihar and Odisha, and wheat, which is consumed in Punjab and also in Bihar, are the major crops that are saved. The minor difference between the average wheat that is saved by farmers in Punjab and that in Bihar is mostly accounted for by the larger number of household members in Punjab. Potato is interesting because it is a cash crop and yet a larger amount is saved for home consumption by farmers in Bihar but not in Punjab.

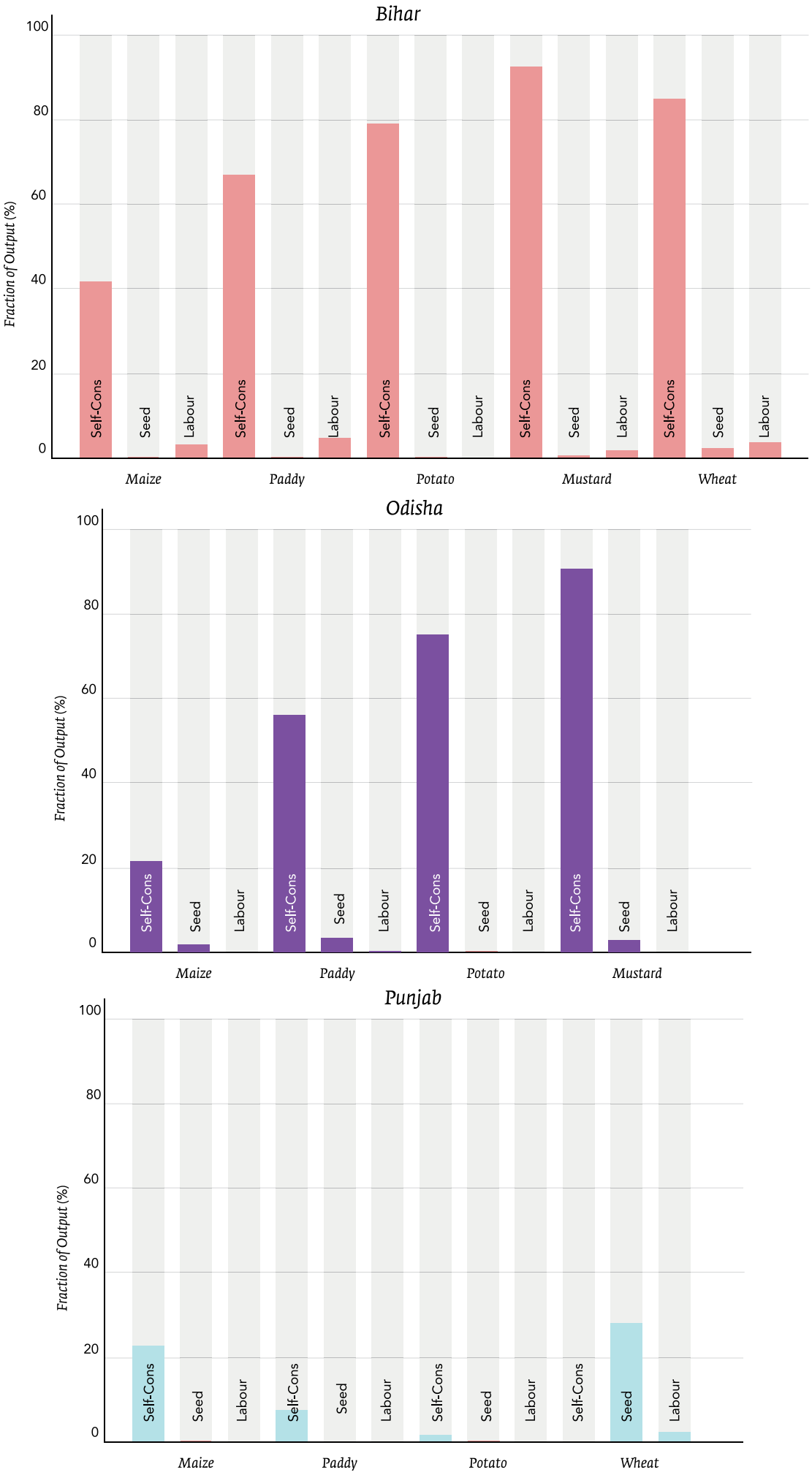


Figure 3.4 Average volume of crop kept for self-consumption by farmers

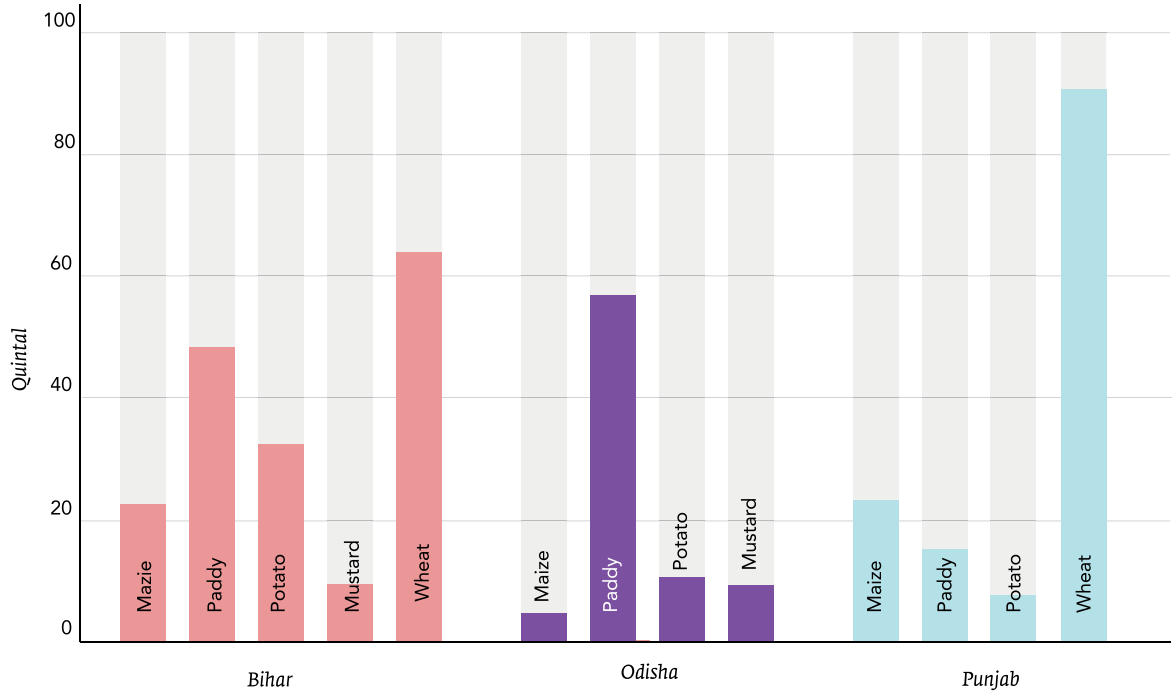


Figure 3.5 Average volume of crop kept for self-consumption by farmers

In the following sections, our focus will be those farmers that actually sold their crops.

3.3 Quality of output: Post-harvest processing by the seller

Our standard assumptions are that:

i. post-harvest processing such as cleaning, sorting, and grading will fetch a higher price in the market;

ii. these activities are labor intensive to varying extents and farmers have an opportunity cost of time and effort to undertake these activities;

iii. the price premium for post-harvest processing produce relative to unprocessed produce will influence the degree to which farmers will invest in these processes.

Table 3.1 shows the variance in post-harvest processes across crops, types of processes, and regions. In all states and for all cereals, most farmers clean their crops, followed by drying (especially for maize and paddy). The post-harvest processing of potato is the lowest among all crops in the three states. Farmers in Odisha perform more post-harvest processes on an average than in the other two states, while farmers in Bihar perform the least.

Table 3.1 Post-harvest processing: Percentage of farmers performing different processes

	Punjab				Bihar				Odisha			
	Cleaning	Grading	Drying	Avg # of post-harvest processes	Cleaning	Grading	Drying	Avg # of post-harvest processes	Cleaning	Grading	Drying	Avg # of post-harvest processes
Maize	80.9	43.2	50.8	1.7	64.5	22.0	69.0	1.7	80.1	80.1	50.0	2.4
Paddy	76.5	58.3	54.6	1.9	61.2	12.4	10,3	1.9	89.3	89.3	67.6	2.2
Potato	37.8	28.3	0	0.7	38.5	28.7	1.4	0.7	67.7	67.7	8.7	1.5
Mustard	-	-	-	-	72.7	32.1	-	-	62.8	62.8	65.7	1.9
Wheat	80.0	50.6	18.2	1.5	57.3	28.4	9.3	1.5	-	-	-	-

To understand which farmers engage in post-harvest processing and the financial returns associated with these practices, we resort to the following regression models. First, we estimate a linear probability model where we regress an indicator for each of the post-harvest processes by a farmer who has sold a specific crop on the land owned by the farmer, the quantity of output sold by that farmer, the total land cultivated by the farmer, and an asset index of the farmer. We add a measure of proximity to markets sites *(mandis)* and towns. We do so using Google Maps to query the distance from the farmer's location to the district headquarters and the nearest mandi site (in units of traveled time).

We further include the household size as a control since many of these processes are labor-intensive activities. Finally, we also include an indicator for sales to government agencies to check if that affects the propensity of farmers to engage in post-harvest processing.

All regression models control for district fixed effects and crop fixed effects. The district fixed effects control for unobserved district-specific and crop-invariant factors like soil productivity, availability of inputs like labor, average rainfall, average plot sizes, etc. The crop fixed effects control for unobserved effects specific to varieties of crops but invariant across farmers and geographies—for example, the shine and length of grains.

Therefore, the regression model takes the following form

$$\mathbb{1}\{process\}_{fc} = \beta_0 + \beta_1 \log \text{land owned}_f + \beta_2 \log \text{qty sold}_{fc} + \beta_3 \text{wealth}_{fc} + \beta_4 \log \text{HH size}_f + \beta_5 \mathbb{1}\{\text{sold to FCI/PACS}\}_{fc} - \beta_6 \log \text{dist to nearest mandi}_f + HQ_f + \beta_7 \log \text{distance to district } HQ_f + \gamma_c + \gamma_d + \varepsilon_{fc} \quad (3.1)$$

where the process is either cleaning, grading, drying, or any other. We also run a fifth model where the dependent variable is the number of processes performed by the farmer on a harvest of a particular crop.

The results are shown in tables 3.2–3.4. Amongst the three processes, only drying is predicted by the total quantity sold. Doubling of the quantity sold is associated with a near doubling of the likelihood of drying the crop. Table 3.2 shows that this effect is mostly prevalent in Bihar and Odisha but not in Punjab. We can also see that when farmers sell to government agencies, they are less likely to clean their output but make a serious effort to dry their crop. This effect is evident in all three state. Although the estimates are less robust, larger households appear more likely to conduct post-harvest processing. As we will see later, this is consistent with the finding that larger farmers are more likely to participate in public procurement operations in Bihar and Odisha. It is also an indication that farmers are aware that high moisture content is likely to disqualify them from meeting the government's fair average quality (FAQ) specifications.

Table 3.4 shows that a doubling in the quantity sold is associated with two additional post-harvest processes being performed by the farmer. The association between the quantity sold and the number of post-harvest processes is positive everywhere but especially strong in Odisha.

Table 3.2 Likelihood of different post-harvest processes

VARIABLES	(1) Cleaning	(2) Grading	(3) Drying	(4) Any
log land owned	0.008	-0.008	-0.007	0.004
	(0.006)	(0.006)	(0.005)	(0.005)
log qty sold	0.006	0.005	0.019***	0.002
	(0.006)	(0.007)	(0.006)	(0.005)
Asset index	0.003	0.001	-0.004	0.003
	(0.004)	(0.004)	(0.004)	(0.003)
log HH size	0.023	0.013	0.013	0.018*
	(0.013)	(0.014)	(0.012)	(0.010)
Sale to FCI/PACS	-0.083***	0.023	0.061**	-0.010
	(0.031)	(0.036)	(0.029)	(0.019)
log dist mandi	0.011	0.003	0.016	0.008
	(0.016)	(0.018)	(0.017)	(0.013)
log dist DistHQ	-0.041**	-0.023**	0.022	0.013
	(0.019)	(0.021)	(0.021)	(0.015)
Constant	0.853***	0.489***	0.280***	0.819***
	(0.080)	(0.095)	(0.094)	(0.068)
Observations	9,395	9,395	9,395	9,395
R-squared	0.112	0.226	0.318	0.124
Crop FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Punjab	Yes	Yes	Yes	Yes
Bihar	Yes	Yes	Yes	Yes
Odisha	Yes	Yes	Yes	Yes

Note: Standard errors clustered by village in parantheses. *p<.05; **p<.01; ***p<.001.

Table 3.3 Likelihood of drying in different states

VARIABLES	(1) Drying	(2) Drying	(3) Drying	(4) Drying
log land owned	-0.010*	-0.000	-0.015	-0,007
	(0.005)	(0.012)	(0.018)	(0.005)
log qty sold	0.023***	0.019*	-0.013	0.019***
	(0.007)	(0.010)	(0.014)	(0.006)
Asset index	0.000	-0.010	0.003	-0.004
	(0.005)	(0.007)	(0.010)	(0.004)
log HH size	-0.005	0.019	0.045	0.013
	(0.014)	(0.022)	(0.038)	(0.012)
Sale to FCI/PACS	0.031	0.080**		0.061**
	(0.041)	(0.034)		(0.029)
log dist mandi	0.036**	-0.005	-0.001	0.016
	(0.018)	(0.029)	(0.066)	(0.017)
log dist DistHQ	-0.032	0.068**	-0.018	0.022
	(0.028)	(0.033)	(0.073)	(0.020)
Constant	0.313**	0.319**	0.393	0.280***
	(0.122)	(0.157)	(0.242)	(0.094)
Observations	4,085	4,100	1,236	9,395
R-squared	0.495	0.089	0.153	0.318
Crop FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	No	Yes
Punjab	No	No	Yes	Yes
Bihar	Yes	No	No	Yes
Odisha	No	Yes	No	Yes

Note: Standard errors clustered by village in parantheses. *p<.05; **p<.01; ***p<.001.

Table 3.4 Predictors of total number of post-harvest processes

VARIABLES	(1) #Processes	(2) Drying	(3) Drying	(4) Drying
log land owned	0.005*	-0.030	-0.034	-0.010
	(0.016)	(0.027)	(0.045)	(0.014)
log qty sold	0.015	0.055*	0.016	0.035**
	(0.019)	(0.023)	(0.036)	(0.014)
Asset index	0.004	-0.010	0.038	0.000
	(0.014)	(0.013)	(0.027)	(0.009)
log HH size	0.028	0.069	0.047	0.049*
	(0.038)	(0.048)	(0.083)	(0.028)
Sale to FCI/PACS	0.064	0.004		-0.006
	(0.130)	(0.084)		(0.072)
log dist mandi	0.016	0.021	0.106	0.028
	(0.041)	(0.069)	(0.147)	(0.038)
log dist DistHQ	-0.133**	0.022	-0.212	-0.059
	(0.067)	(0.069)	(0.154)	(0.045)
Constant	1.579***	1.864***	1.871***	1.698***
	(0.298)	(0.346)	(0.523)	(0.209)
Observations	4,058	4,100	1,236	9,395
R-squared	0.155	0.106	0.056	0.297
Crop FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	No	Yes
Punjab	No	No	Yes	Yes
Bihar	Yes	No	No	Yes
Odisha	No	Yes	No	Yes

Note: Standard errors clustered by village in parantheses. *p<.05; **p<.01; ***p<.001.

Does the degree of post-harvest processing have any bearing on the prices farmers get? To arrive at this, we regress log of price of any crop that the farmer sells on an indicator for each of the processes. As before, we use crop and district fixed effects and control for the quantity sold since that is a predictor for post-harvest processes. In the case of Punjab, we add a model for maize because that is a non-MSP crop (in contrast topaddy and wheat).

Our regression model is the following:

$$\log \text{price}_{fc} = \beta_0 + \beta_1 \mathbb{1}\{\text{cleaning}\}_{fc} + \beta_2 \mathbb{1}\{\text{grading}\}_{fc} + \beta_3 \mathbb{1}\{\text{drying}\}_{fc} + \beta_4 \log \text{qty sold}_{fc} + \gamma_c + \gamma_d + \varepsilon_{fc} \quad (3.2)$$

Table 3.5 Effect of post-harvest processing on prices

VARIABLES	(1) Bihar All crops log price	(2) Odisha All crops log price	(3) Punjab All crops log price	(4) Punjab Maize only log price
Cleaning	-0.012**	-0.000	-0.033	-0.043
	(0.005)	(0.016)	(0.026)	(0.131)
Grading	-0.010	-0.017	-0.023	-0.288**
	(0.007)	(0.009)	(0.017)	(0.129)
Drying	0.015*	0.031***	0.032*	0.108
	(0.008)	(0.009)	(0.016)	(0.100)
log qty sold	0.030	0.044***	0.040***	0.211***
	(0.003)	(0.004)	(0.012)	(0.063)
Constant	7.253***	7.156***	7.566***	7.611***
	(0.008)	(0.016)	(0.041)	(0.295)
Observations	4,458	4,499	1,224	147
R-squared	0.662	0.295	0.461	0.257
Crop FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	No	Yes

Note: Standard errors clustered by village in parantheses. *p<.05; **p<.01; ***p<.001.

The results in Table 3.5 show that drying is unambiguously associated with a price premium, although the magnitudes are small—about 3% in Odisha and Punjab and only about 1.5% in Bihar. Grading, on the other hand, is associated with a negative price premium, although the estimates are less robust. This could be the case if grading and sorting either puts a large discount on poor quality or there is only a small part of the total output benefits from the grading. This implies that farmers have a major disincentive to grade their produce before selling if the pooled crop attracts a higher price. Cleaning of crops has no significant association with price realization in Punjab and Odisha, but it is puzzling that it is negatively associated with price realization in Bihar.

Overall, however, these findings are consistent with the understanding (one that farmers in these states share too) that the time and resources spent in cleaning and grading their produce is unlikely to fetch a significant price premium under current conditions of exchange. The ability to minimize moisture content, to the extent possible, is, in contrast, an aspect of post-harvest processing that is easily understood and can be prioritized.

3.4 Storage and timing of Sale

It is usually assumed that small and marginal farmers are more liquidity constrained and are, therefore, forced to sell immediately after harvest. The holding capacity of farmers is likely to be related to farm size as well as storage facilities. In reality, most farmers are unable to delay their marketing deep into the marketing season.

We will test these hypotheses and also try to understand what might drive the timing of sales and holding capacity. Our surveys provide detailed information on both the date of harvest as well as the date of sale for grains. However, it was not possible to get this data for perishables since there are multiple harvests within the season. Our ethnographic research found that farmers in Bihar and Odisha (who are usually small and marginal) sell perishables immediately after harvesting.

Table 3.6 clearly shows that the duration between harvest and sales is the lowest in Punjab, even though farmers there are larger and wealthier than those in Bihar and Odisha. This is largely explained by government procurement of paddy and

wheat at MSP, which gives farmers little incentive for holding the crop for a greater duration in the hope of getting a higher price. However, we observe a shorter holding duration for maize in Punjab—the mean at 12.3 days is a little more than half the number of days compared to farmers in Bihar (22.3 days) and less than one-third the time for farmers in Odisha (39.9) days—even though unlike paddy and wheat, there is no government procurement. This is most likely due to the presence of "thick" markets in that state with clear market sites where buyers show up in the post-harvest period. While we test this formally below, the revealed preference of a short holding duration shows that markets are efficient in that there are few benefits from waiting to sell.

Table 3.6 Days between harvest and sale

	Punjab			Bihar			Odisha		
	Mean	Median	S.D	Mean	Median	S.D	Mean	Median	S.D
Maize	12.3	3.5	21	22.3	17	19.9	39.9	23	24.6
Paddy	6.9	0	13.7	34	24	30.5	21.4	37	24.5
Potato	-	-	-	54.4	54	37.5	36.6	28	21.8
Mustard	5.4	7	7.3	39.9	30	29.5	-	-	-

Our analysis proceeds in three steps. First, we will analyze the type of storage available to farmers in the three states. Second, we will try to understand if there are any systematic predictors for timing of sales. We will limit this analysis to Bihar and Odisha since farmers in Punjab are holding the crop for a very short duration. Third, we will examine if there is any price premium for selling the crop later after harvest.

When asked about storage, almost every farmer in Punjab responded by saying that they do not store their produce, which is consistent with the table 3.6. Of the farmers in Bihar and Odisha, 54% and 88%, respectively, do store their crops but almost everyone (>98%) does so in their homes. This could either point to a lack of access to common storage facilities for farmers or that the marketable surplus is not large enough to justify specialized storage.

To formally understand which farmers hold crops for longer, we regress the days between harvest and sales (hold period) on the same farmer characteristics as before.

$$\text{hold period}_{fc} = \beta_0 + \beta_1 \log \text{land owned}_f + \beta_2 \log \text{qty sold}_{fc} + \beta_3 \text{wealth}_{fc} + \beta_4 \mathbb{1}\{\text{sold to FCI/PACS}\}_{fc} + \beta 5 \log \text{dist to nearest mandi}_f + \beta 6 \log \text{distance to district HQ}_f + \gamma_c + \gamma_d + \varepsilon_{fc} \quad (3.3)$$

The regression results are provided in Table 7. First, in both Bihar and Odisha, we find that those farmers who sell their crops to government agencies hold the crop for longer. This may seem puzzling at first, given that the price they get when selling to a public agency is fixed. However, from our field research we found that this is due to delays in the onset of procurement by government agencies in these two states. As we note later, sales to public agencies gives farmers a better price, but larger farmers have preferential access Larger farmers are also likely to have greater holding capacity.

Second, there is some variance across states, likely due to the marketing conditions particular to each state. In Odisha, in addition to higher prices obtained from sales to government agencies, wealthier farmers and those that own more land hold their crop for longer, in line with arguments that larger farmers have more capacity to wait for a longer duration for a better price. However, we do not find this result in either Bihar or Punjab.

The third puzzling result relates to distance to the district headquarters, which normally is also the closest large town. In Bihar and Punjab, farmers in remote villages hold the crop for shorter duration while in Odisha, remote farmers hold the crop for longer. Theoretically, there could be two countervailing forces at play here. The farmers living closer to big towns have access to a thicker market. Therefore, they can also afford to wait longer. However, if marketing in inefficient, then those in farther off places would find buyers only after a prolonged duration and hence would have to wait longer to sell their later. It could be that the first factor is dominant in Punjab and Bihar, while the second is dominant in Odisha, given its more isolated farms, especially in the hilly tribal areas.

Table 3.7 Farmer characteristics and time between harvest and sales

VARIABLES	Bihar All crops hold period	Odisha All crops hold period	Punjab Maize hold period
log land owned	-0.157 (0.386)	2.184*** (0.499)	-2.000 (1.233)
log qty sold	0.001 (0.534)	-0.694 (0.523)	1.332 (1.097)
Asset index	-0.141 (0.344)	0.783*** (0.271)	0.899 (0.715)
log HH size	21.814*** (4.175)	3.048* (1.747)	
Sale to FCI/PACS	-0.502 (0.937)	-0.645 (1.557)	5.324* (2.701)
log dist mandi	-2.262 (1.219)	-8.104 (1.373)	-6.845** (2.975)
log dist DistHQ	40.787*** (5.167)	5.606 (7.430)	13.701 (10.713)
Constant			
Observations	4,048	4,090	188
R-squared	0.229	0.118	0.089
Crop FE	Yes	Yes	Yes
District FE	Yes	Yes	No

Note: Standard errors clustered by village in parantheses. *p<.05; **p<.01; ***p<.001.

Finally, we examine if there is an association between price realization and the duration over which the crop is held by farmers. We regress the log price that the farmer obtains for the crop on hold period and the same set of controls as before. Landownership and wealth control for the bargaining power of the farmer vis-à-vis traders. The amount of the crop sold is used to control for aggregation effects. Since farmers selling to government agencies are likely to realize a different price, hence we control for that. The distance measures control for the effect of remoteness to towns and mandis. In addition to the crop and district fixed effects, we also include a season effect since different seasons might have different market prices, especially for paddy. We also introduce a month of sale fixed effect because there are nationwide aggregate price shocks that might be correlated with the holding period and also affect the prices that farmers get. A season fixed effect is subsumed by the month-year fixed effect and therefore we omit that. Our regression model is as follows:

$$\log \text{price}_{fc} = \beta_0 + \beta_1 \text{hold period}_{fc} + \beta_2 \log \text{land owned}_f + \beta_3 \log \text{qty sold}_{fc} + \beta_4 \text{wealth}_{fc} + \beta_5 \{\text{sold to FCI/PACS}\} + \beta_6 \log \text{distance to nearest mandi}_f + \beta_7 \log \text{distance to district HQ}_f + \beta_8 \text{month of sale}_{fc} + \gamma_c + \gamma_d + \varepsilon_{fc'} \quad (3.4)$$

and here we divide the holding period by 30 such that the interpretation of β_1 is in terms of every additional month rather than days.

The results are shown in table 3.8. Only in Odisha is there a positive effect of holding the crop longer on realized prices, which is consistent with the previous result. In particular, holding the crop for a month increases price realization by about 2% and this incentive presumably leads particular farmers to select into holding the crop for longer before selling. Although the point estimates are positive for Bihar and Punjab as well, they are not statistically significant.

Table 3.8 Price realization and time between harvest and sale

VARIABLES	(1) Bihar All crops hold period	(2) Odisha All crops hold period	(3)Punjab Maize hold period
Hold period	0.001	0.019***	0.045
	(0.004)	(0.006)	(0.063)
log land owned	-0.002	-0.016***	0.049**
	(0.002)	(0.004)	(0.021)
log qty sold	0.024***	0.025***	-0.108***
	(0.003)	(0.004)	(0.020)
Asset index	(0.003)	0.007***	0.009
	0.002	(0.002)	(0.018)
Sale to FCI/PACS	0.160***	0.175***	
	(0.015)	(0.009)	
log dist mandi	-0.007	-0.015**	-0.000
	(0.005)	(0.007)	(0.045)
log dist DistHQ	-0.004	-0.017**	0.164**
	(0.007)	(0.008)	(0.067)
Constant	7.287***	7.292***	6.698***
	(0.032)	(0.037)	(0.243)
Observations	4,048	4,090	180
R-squared	0.674	0.401	0.451
Crop FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes

Note: Standard errors clustered by village in parantheses. *p<.05; **p<.01; ***p<.001.

3.5 Volume of sales and price realization

Do farmers who sell larger quantities get a better price? Two explanations suggest themselves why this might be so. A farmer who sells a larger quantity could have more bargaining power; alternatively, buyers may have reduced unit costs when they buy from large producers and pass on some of that to the seller. This question can also be examined from the earlier regression result (Table 3.8). The results show that a farmer who sells twice as much receives a 2.4–2.5% higher price on an average in both Bihar and Odisha. This finding is in line with initiatives that prioritize the aggregation of small and marginal farmers' produce.

In Punjab, however, larger volumes are associated with significantly lower prices. Based on our ethnographic research, this is likely related to issues with quality, often associated with larger lots, where buyers expressed reservations in being able to adequately and evenly assess quality. Buyers may be discounting for lower quality in these large lot sizes put up for sale.

3.6 Site of sale and primary buyer

The word "market" is often used interchangeably with the notion of an "economic market" and a "market site" which clouds our understanding of the economic process. The term "economic market" refers to the distribution and thickness of demand for any producer's output. In that sense, lack of market access is related to geographical remoteness or institutional barriers to potential buyers.

The term "market site" has a physical and spatial dimension. One form of this is mandis, which are physical sites for buyers and sellers to meet and exchange their goods. These sites may or may not be regulated by the government. In general, however, a market site does not have to be a mandi. It refers to any site at which buyers and sellers meet to carry out transaction such as the farmgate, the village ***chowk***, a ***haat***, and so on.

The dual connotation of the term "market" has led to a misunderstanding on several economic issues. We try to theoretically disentangle them here and then provide empirical evidence.

Sheer remoteness leads to several disadvantages for both producers and consumers. High costs of transportation affect prices. It also allows intermediary agents—traders, transporters, and processors—to charge a markup. This has nothing to do with, and hence should not be confused with, the existence of a physical market site. In a strict economic sense, market access can be related to geographic remoteness but can also be due to institutional barriers like restrictions on the movement of goods across state borders or regulations on how much inventory a trader can hold.

A physical market site has several advantages. For example, it allows authorities to regulate trade—ensure best practices, a fair price discovery mechanism, prohibit exorbitant use fees, provide a space for storage, and so on. It also allows farmers to learn from other farmers and traders about the value of their produce and get information on agricultural and non-agriculture activities.

Since these two concepts are fundamentally independent, a farmer in a village might have access to either, both, or neither. We first begin with a description of the primary physical marketing sites for the farmers in our study districts and its implications for farmers. We later discuss issues related to remoteness. In a later chapter, we revisit our empirical findings related to markets and market sites by understanding their performance and interaction in the context of actually existing ***market systems***, i.e., networks through which commodities flow within a given district. Market systems evolve and stabilize over time; are related to the structures and relations of production, exchange, and consumption; and are shaped by state policy and regulation.

3.6.1 Site of sale

The most common site for the first transaction of various crops across the three states is given in Table 3.9.

The contrast between Punjab and Bihar is stark: most transactions in Punjab occur inside a mandi, while in Bihar, they mainly take place at the farmgate. The empirical evidence is also clear that in Odisha—which has a marketing board and claims to have mandis as per the government's agricultural marketing web portal—most transactions take place at the farmgate and not in mandis. Here it is important to note that a mandi in Odisha is essentially the Regulated Marketing Committee (RMC), which is only really active as a site during the paddy procurement season. The majority of transactions are essentially village level. Claims that Odisha is also making progress on the electronic trading platform eNAM are unsupported by our data, which clearly shows that an overwhelming fraction of transactions are being conducted either at the farmgate or informal local markets (haats).

Table 3.9 Most common site of sale by crop

	Punjab	Bihar	Odisha
Paddy	Mandi (97), farmgate (2)	Farmgate (85), mandi (5)	Farmgate (63), mandi (20)
Wheat	Mandi (80), farmgate (10)	Farmgate (94), mandi (3)	.
Maize	Mandi (74), farmgate (19)	Farmgate (84), mandi (9)	Farmgate (59), haat (31)
Mustard	-	Farmgate (89), mandi (6)	Farmgate (62), mandi (35)
Potato	Mandi (75), farmgate (25)	Farmgate (90), mandi (7)	Farmgate (44), haat (52)

Note: Percentage of total transactions is provided in parentheses.

A second point worth noting in Table 3.9 is that despite the presence of a strong mandi system in Punjab, many transactions related to non-MSP crops—about a fifth for maize and a quarter for potato—are carried out at the farmgate. Our ethnographic research shows that farmers often sell their crop without harvesting it to contractors, who then bring their labor, harvest the crop, clear the field, and take the crop from the farmgate.

3.6.2 Primary buyers and their relationship with farmers

Next, we turn to identifying the primary buyers of famers' output. Table 3.10 gives us a snapshot of the principal buyers, across states and crops. The predominance of ***arhatiyas*** and commission agents is manifest in Punjab; traders overwhelmingly dominate in Bihar; while traders also dominate in Odisha, in the case of paddy, Primary Agricultural Cooperative Societies (PACS) and cooperatives account for about a quarter of the market. Despite the very large quantities of paddy and wheat procured in Punjab, farmers rarely interact directly with officials of the FCI or state procurement agencies. Their point of contact is the arhatiya who intermediates between the seller (the farmer) and the state agency charged with procurement. In contrast, when farmers sell to the PACS, as in Odisha, they directly interact with them.

The almost complete absence of government procurement of crops in Bihar and only somewhat less so in Odisha is noteworthy, especially in contrast to Punjab. While we discuss this absence in greater detail later, here we want to highlight that even when farmers sell to government agencies in Bihar and Odisha, they get a lower price than the MSP. Government agencies in these states buy from farmers at prices lower than what the government itself mandates. The reasons for this are further investigated in Chapter 5.

Since vegetables are sold multiple times during a season, we were unable to get robust data on the primary buyers. However, our ethnographic research found that in Punjab, potatoes are mostly sold via commission agents, while in Bihar and Odisha, they are sold mostly to traders. Fresh vegetables are sold both at the village and mandi levels, and we will investigate these dynamics in Chapter 6, which looks at marketing systems across multiple commodities.

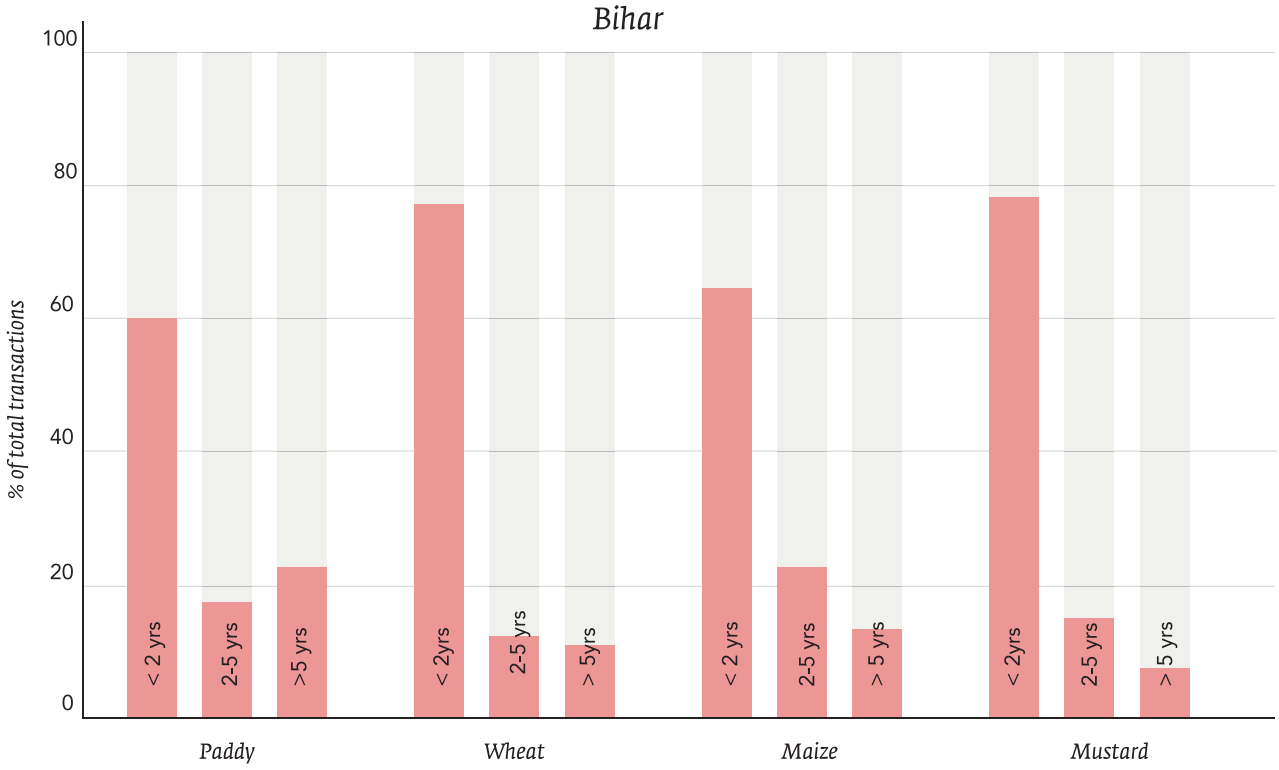
Table 3.10 Most common primary buyers by crop

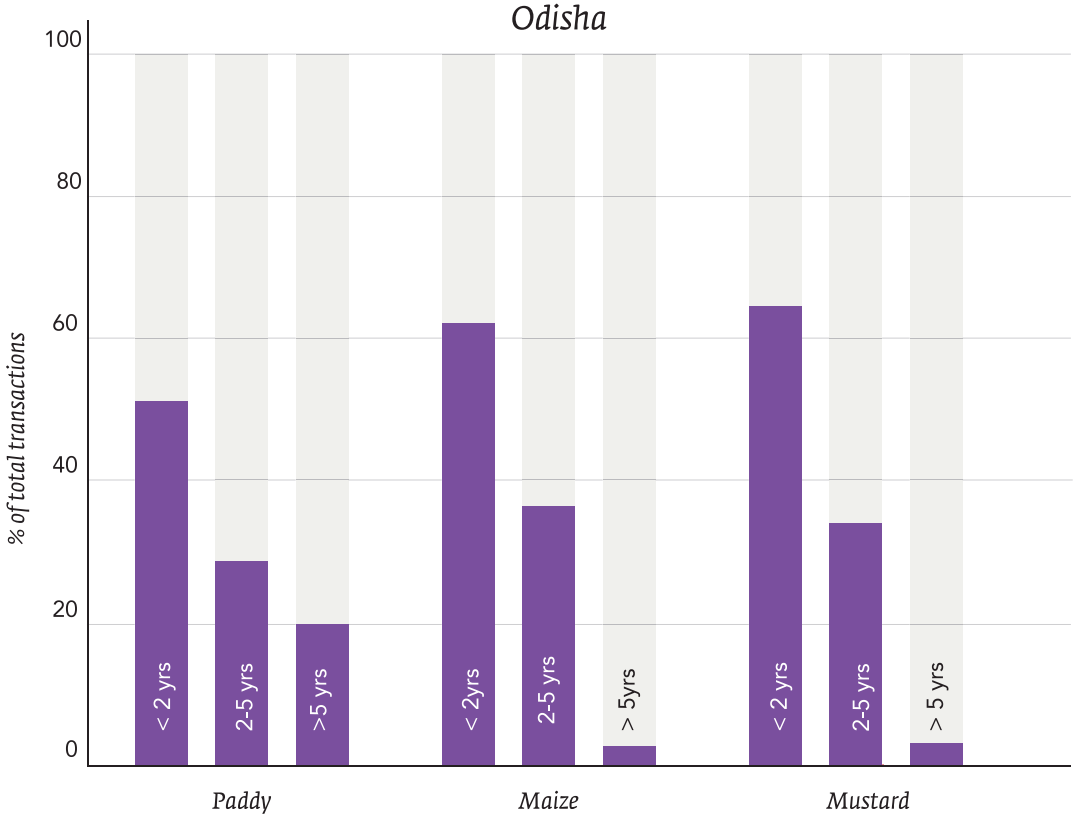
	Punjab	Bihar	Odisha
Paddy	Arhatiya (99)	Trader (91), PACS (4), input dealer (3)	Trader (72), PACS (12.4), cooperative (12)
Wheat	Arhatiya (90), final consumer (9)	Trader (94)	-
Maize	Arhatiya (52), trader (9), final consumer (10)	Trader (97), input dealer (2)	Trader (91), PACS (5)
Mustard	-	Trader (98)	Trader (92), processor (4)

Note: Percentage of total transactions is provided in parentheses.

In Punjab, the relationship between the farmer and his arhatiya is long term. In contrast, farmers in Bihar and Odisha find a new buyer almost every season, selling to the trader offering them the best price. This can be seen in figure 3.6. One reason for this is that arhatiyas in Punjab are not competing on price, which is fixed at the MSP. In Punjab, the state procurement agency does not pay the arhatiya immediately, with payments often delayed by several months. The arhatiya, however, pays the farmer partly out of his pocket, and the long-term relationship ensures that the farmer trusts that the arhatiya will make the balance payment in due course.

In Bihar, on the other hand, payments are made at the point of purchase and there is intense competition amongst traders seeking to buy the produce of farmers. Market relationships between buyers and sellers are transactional rather than long term.





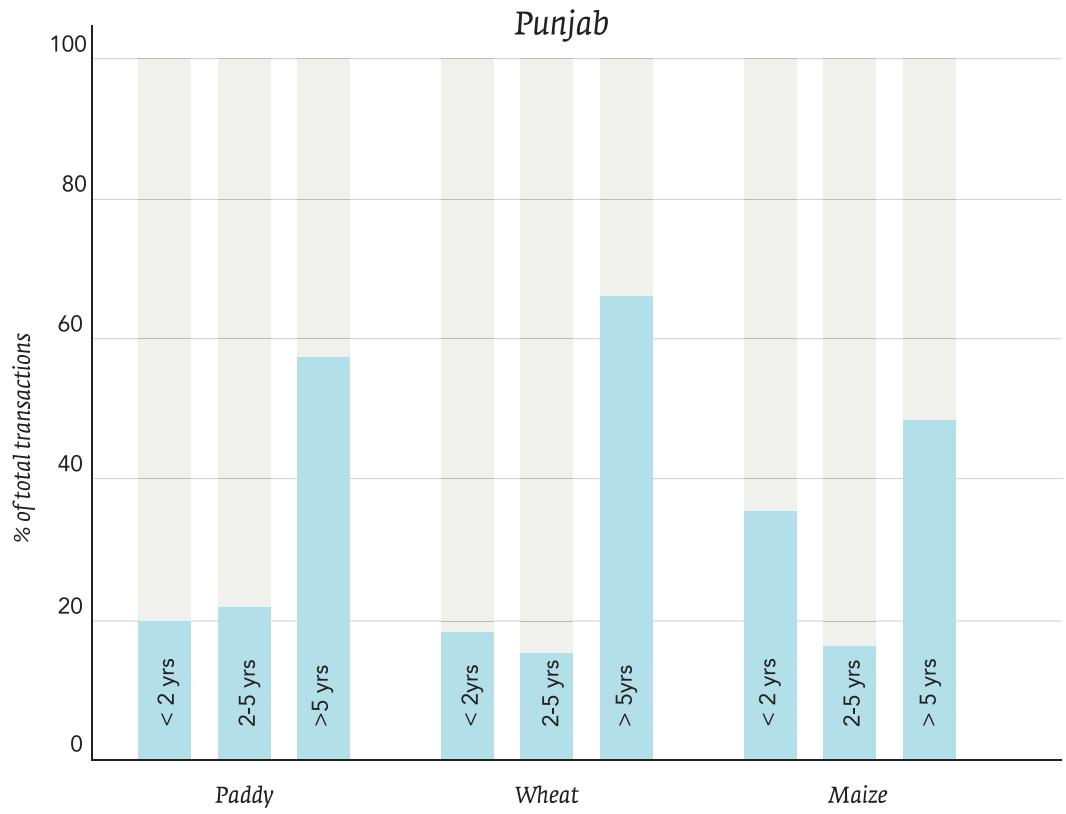


Figure 3.6 Persistence in the buyer–seller relationships

A central assumption about Indian agricultural markets has been that a significant number of transactions are interlinked.[4] While this is true to a considerable extent in Punjab, we find little evidence to support this in Bihar and Odisha. Over the year, 40% of total transactions in Punjab, 16% in Bihar, and 17% in Odisha were with a buyer with whom the farmer had a credit relationship.

We also asked farmers the main reason behind choosing to sell to a particular buyer (see figure 3.7). This provided a check on the degree to which the choice of buyer was driven due to ease of access to other inputs and thereby on price competition for the farmer's outputs. While in Punjab, the key reason was either assured prices or the absence of any other buyer, in Bihar and Odisha, the farmers primarily chose to sell to the buyer who offered the best price. Access to inputs and credit does not appear to be the main reason that drives the choice of seller in any of the states. Therefore, even though farmers in Punjab have a credit relationship with arhatiyas, it is not the primary reason why farmers choose to sell to particular arhatiyas.

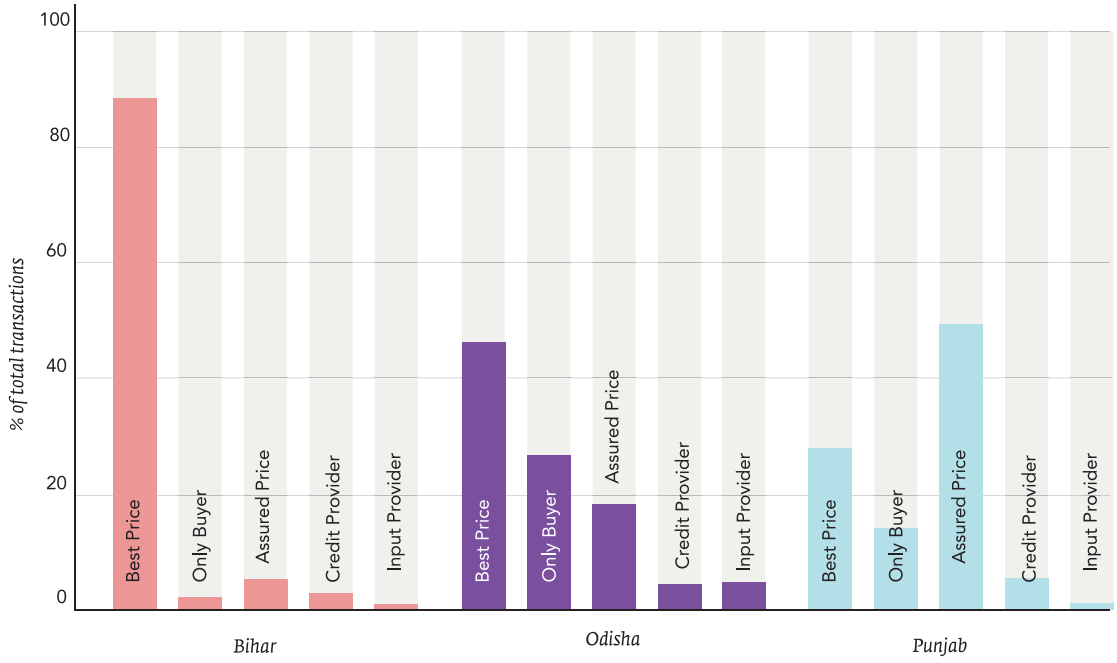


Figure 3.7 Main reason behind famers' choice of particular buyers

[4] P.K. Bardhan (1980), "Interlocking Factor Market and Agrarian Development: A Review of Issues," *Oxford Economic Papers*, 35 (2): 262 –80; C. Bell and T.N. Srinivasan (1989), "Interlinked Transactions in Rural Markets: An Empirical Study of Andhra Pradesh, Bihar and Punjab," *Oxford Bulletin of Economics and Statistics*, 51 (1): 73–83.

Thus, while some of the standard assumptions about inter-linked transactions appear to be valid for Punjab, this is not the case for the vast majority of farmers in Bihar and Odisha where relationships are short lived, with negligible inter-linkages to input markets.

3.6.3 Implications for price realization

There are three important policy questions concerning the relationship between market sites, buyers, and the price realization for farmers. First, does government procurement improve the price farmers get? Second, does the site of sale matter? In particular, does transacting in a mandi have positive externalities on the price the farmer receives? Third, does the proximity to mandis (or market sites) matter? In other words, do mandis have a spillover effect by their very presence, and hence, after we account for transportation costs, do farmers closer to a mandi benefit more than those further away?

Does government procurement improve the price received by farmers? Answering this question is moot in the case of Punjab, since almost all the paddy and wheat is procured by arhatiyas on behalf of the FCI at the MSP. Hence, we cannot make a comparison with putative market outcomes. In Bihar and Odisha, where public procurement constitutes only a small fraction of total sales, its presence does improve the prices received by farmers. This can be seen from the regression results in Table 3.8. Columns 1 and 2 in Table 3.8 show a 16% improvement in Bihar and a 17.5% improvement in Odisha in prices received by farmers when they are actually able to sell to the public procurement agency. However, as noted in Chapter 2, there is a significant selection issue, because larger farmers get privileged access to procurement agencies in these states.

Does the site of sale, in particular transacting in a mandi, affect the price the farmer receives? Prior research by one of the authors demonstrates that the presence of the mandi helps in price realization.[5] The presence of more mandis in close vicinity considerably improves the price received by farmers because of increased competition among buyers. This work shows a causal relationship between mandi density and prices using exogenous variation in mandi placement across state borders.

However, in the present study, establishing a causal relationship from the survey data is not possible for two reasons. The decision of farmers, whether or not they want to sell in a mandi, is a choice and hence endogenous. Consider a region like Hoshiarpur where the mandi system is strong and accessing mandis is not an issue for farmers. If we observe that even in such circumstances, farmers sell at the farmgate, then it is very likely that it is because they get a price (net of transport costs) that is higher than at the mandi.

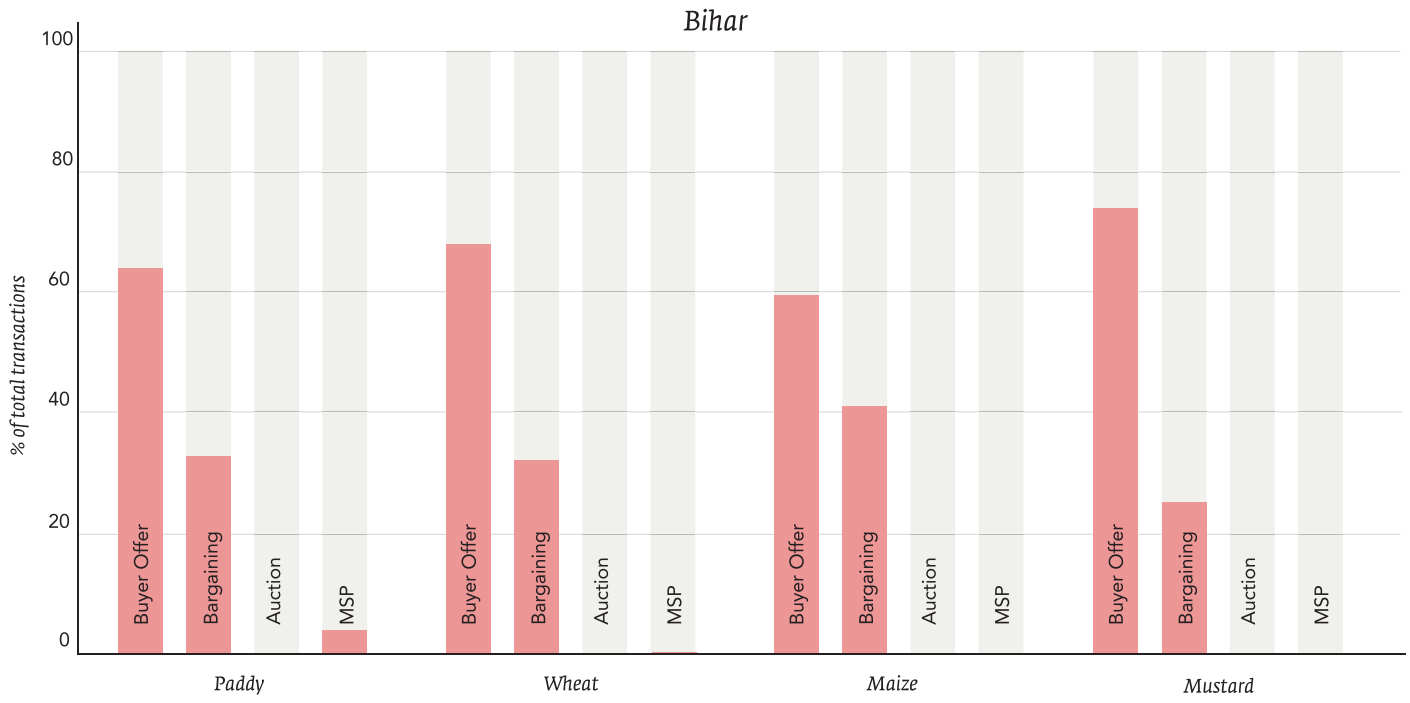
It is the opposite in Bihar, where mandis are scarce and farmgate sales are the norm. Here, farmers who sell in the mandi must do so because they get a price that is better than the farmgate. One analytical possibility was to compare farmers within the same village, some of whom sell in the mandi and others who do not. However, the variation in the decision on the site of sale between farmers within a village is negligible. Only one or two out of fifteen farmers in a handful of villages differ from the rest in their choice of the site of sale. Consequently, this comparison was statistically not possible. The differences between Punjab and Bihar (high density of mandis versus few mandis) can only be understood in the context of the evolution and stabilization of two very different market systems. This will be explored in detail in Chapter 5.

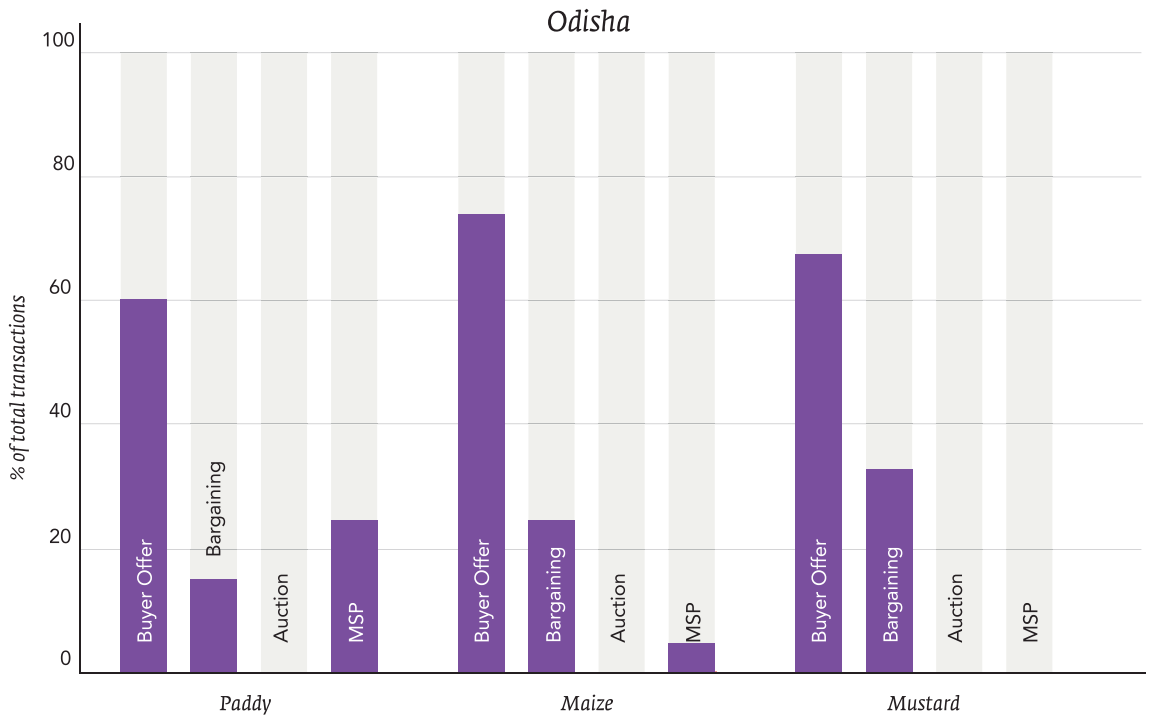
We have discussed the question regarding the effects of distance or proximity to mandis on price realization in Chapter 2.

3.7 How are the terms of exchange determined?

There is a common misperception that prices in agricultural markets in India are determined via auctions. We have already seen that the market site for most farmers happens to be the farmgate (as in Bihar and Odisha), and when it is the mandi (as in Punjab), sales are at the fixed MSP price. Figure 3.8 shows the usual practices of price determination by state and crop. There is a clear pattern: for paddy and wheat in Punjab, MSP is the key driver, while 60% of maize sales are done through auctions. Therefore, even in Punjab, in a non-MSP commodity sold largely in mandis, while the use of auctions as a mechanism for price discovery is important, it is not predominant, and up to 40% of maize sales do not involve auctions. Auctions are virtually completely absent in Odisha and Bihar, and transactions are either settled via negotiations or buyers make take-it-or-leave-it offers, which farmers accept or reject.

[5] Chatterjee, Shoumitro. "Market Power and Spatial Competition in Rural India." (2019).


Bihar
% of total transactions
100
80
60
40
20
0
Buyer Offer
Bargaining
Auction
MSP
Paddy
Wheat
Maize
Mustard


Odisha
% of total transactions
100
80
60
40
20
0
Buyer Offer
Bargaining
Auction
MSP
Paddy
Maize
Mustard

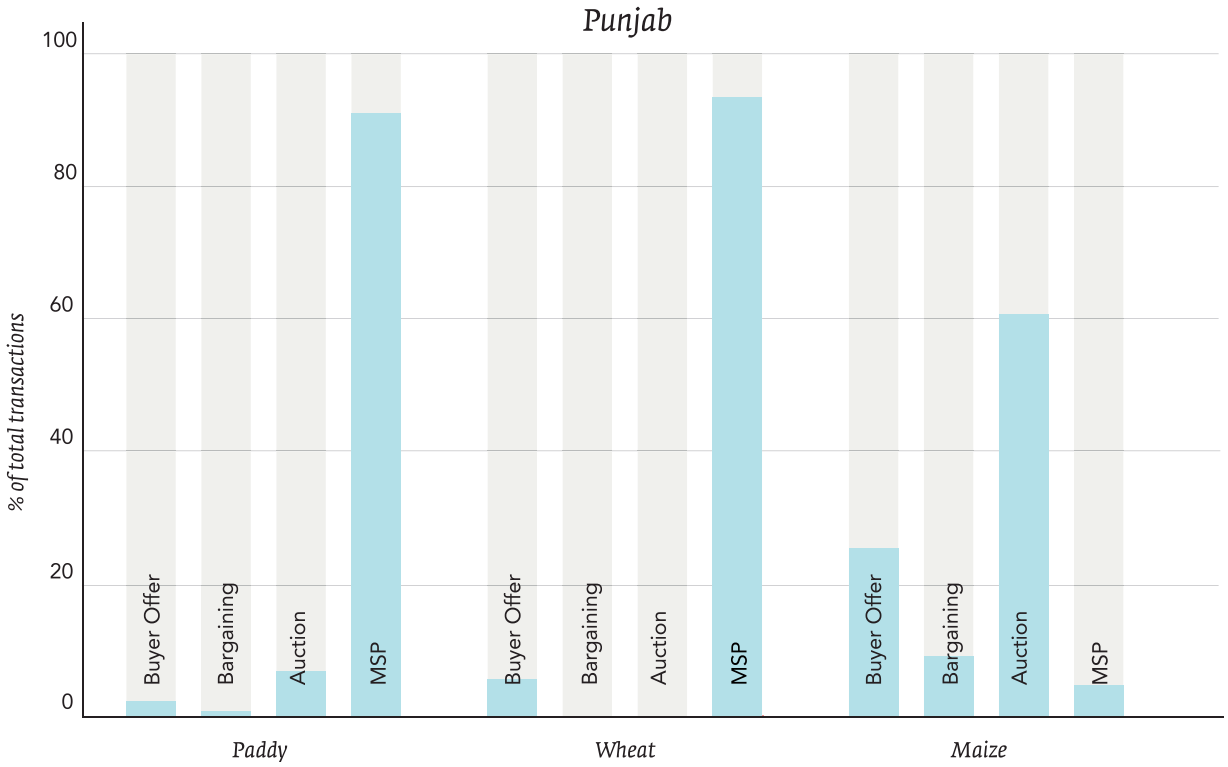


Figure 3.8 How are prices determined in markets?

To understand whether the way in which prices are determined has any bearing on price realization, we conduct two tests. In the case of Punjab, we examine whether maize prices that are determined via auctions are different from when they are determined with other sale mechanisms. In Bihar and Odisha, we check if negotiated prices are different from buyer determined prices. Since we need to control for other factors that might determine prices, we are going to build on regression specification (3.4).

The regression results are presented in table 3.11. In all three states, we cannot conclusively say whether the specific method of price determination matters for price realization. This non-finding could be for two distinct reasons. First, the way in which prices are determined has no implication for price realization. Second, it could also be that while the sales mechanisms do matter, markets are competitive enough such that if farmers not using auctions (or bargaining in Bihar) were to be offered lower prices, they would go elsewhere. The difference is that under the second explanation, abolishing or insisting on a specific mechanism as ***the*** way of price determination can have aggregate consequences. Our field research suggests that the second explanation is closer to reality. We also do not find any evidence in the data that larger farmers or those farmers who sell a greater quantity of output are more likely to bargain than smaller farmers.

Table 3.10 Most common primary buyers by crop

VARIABLES	(1) #Processes	(2) Drying	(3) Drying	(4) Drying
log land owned	0.005*	-0.030	-0.034	-0.010
	(0.016)	(0.027)	(0.045)	(0.014)
log qty sold	0.015	0.055*	0.016	0.035**
	(0.019)	(0.023)	(0.036)	(0.014)
Asset index	0.004	-0.010	0.038	0.000
	(0.014)	(0.013)	(0.027)	(0.009)
log HH size	0.028	0.069	0.047	0.049*
	(0.038)	(0.048)	(0.083)	(0.028)
Sale to FCI/PACS	0.064	0.004		-0.006
	(0.130)	(0.084)		(0.072)
log dist mandi	0.016	0.021	0.106	0.028
	(0.041)	(0.069)	(0.147)	(0.038)
log dist DistHQ	-0.133**	0.022	-0.212	-0.059
	(0.067)	(0.069)	(0.154)	(0.045)
Constant	1.579***	1.864***	1.871***	1.698***
	(0.298)	(0.346)	(0.523)	(0.209)
Observations	4,058	4,100	1,236	9,395
R-squared	0.155	0.106	0.056	0.297
Crop FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	No	Yes
Punjab	No	No	Yes	Yes
Bihar	Yes	No	No	Yes
Odisha	No	Yes	No	Yes

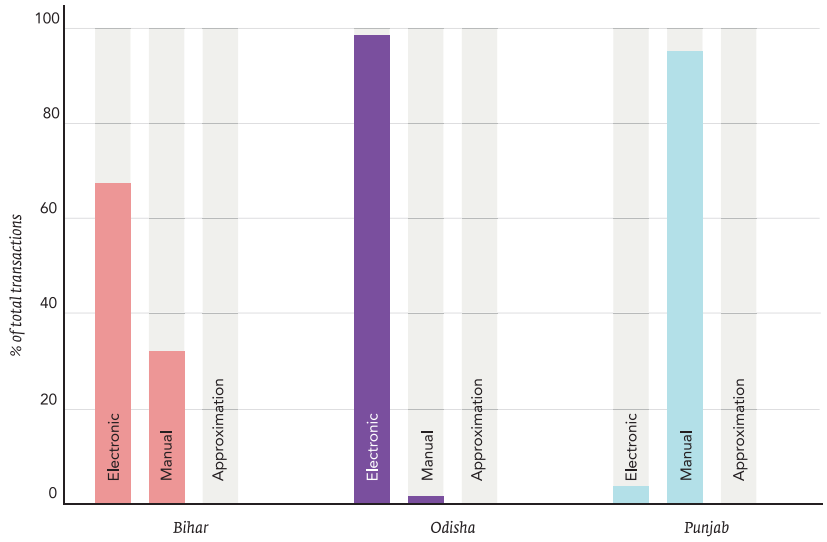
Note: Standard errors clustered by village in parantheses. *p<.05; **p<.01; ***p<.001.

3.8 Measurement of weight

Accurately measuring the weight of crops is critical to farmers getting the right price. A higher quoted price would mean little if the buyer engages in deceptive weight practices. Given how important measurement is, it was surprising to find that Punjab—which supposedly has a strong marketing system—still has manual weighing practices. In contrast, in Bihar where the intermediary has to travel from village to village, collecting produce, electronic scales are commonly used to measure the weight of the produce. Electronic weighing is even more prevalent in Odisha (figure 3.9). The absence of modern electronic weighing scales in the mandis of Hoshiarpur is a clear indication of the collusive power of the arhatiyas, who have repeatedly resisted the introduction of electronic weighing scales.

It is important to keep two further observations in mind when it comes to weighing practices. First, across our sites, farmers widely reported a lack of trust in the weighing instruments, whether they were electronic or not. In fact, in Purnea, farmers told our field teams that when they sought to make purchases of weighing scales for their own use, they were asked whether they would like the scale to be adjusted. Second, deductions in quality are routinely made in terms of weight (i.e., x kg would be deducted from the final weight to account even though the price remains fixed). This is true both for MSP crops such as paddy in Odisha (where government agencies cannot officially shave off the MSP) and for non-MSP crops. Thus, the final weight that is taken into account is often not the same as the weight measured.

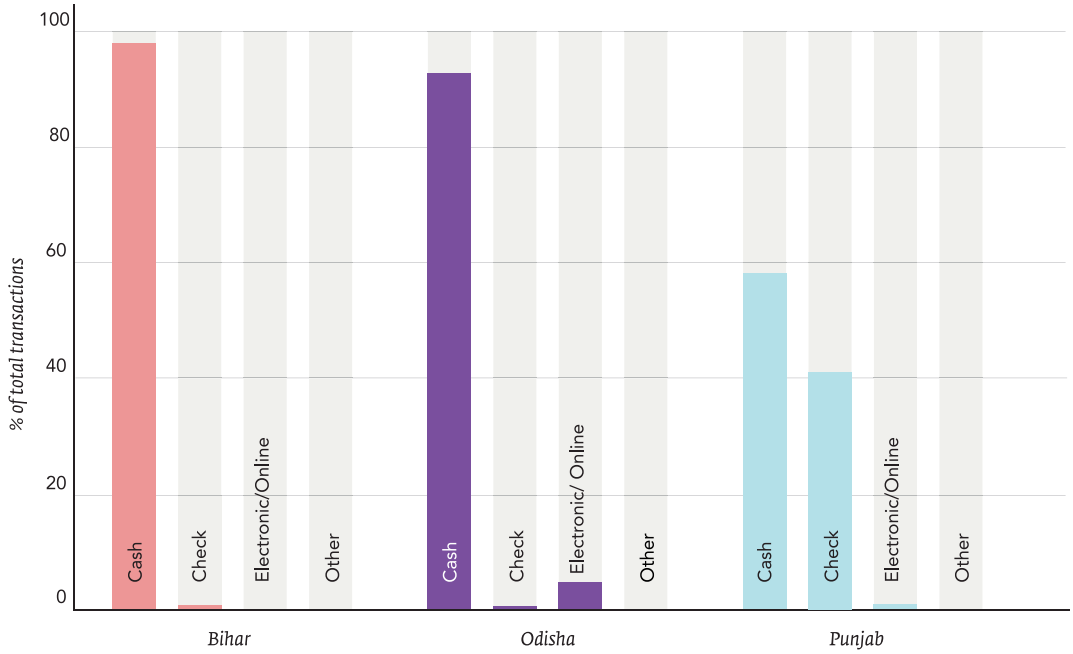
Figure 3.9 How is weight measured?



3.9 Payment: Mode and timing

We find that cash is the most common form of payment to farmers. We did not find evidence for the prevalence of digital transactions in general. A little less than 10% transactions in Odisha are paid via electronic transactions, and these are all sales to PACS/RMC. In Punjab, checks are commonly used to pay for around 40% of sales (figure 3.10).

Figure 3.10 Mode of payment



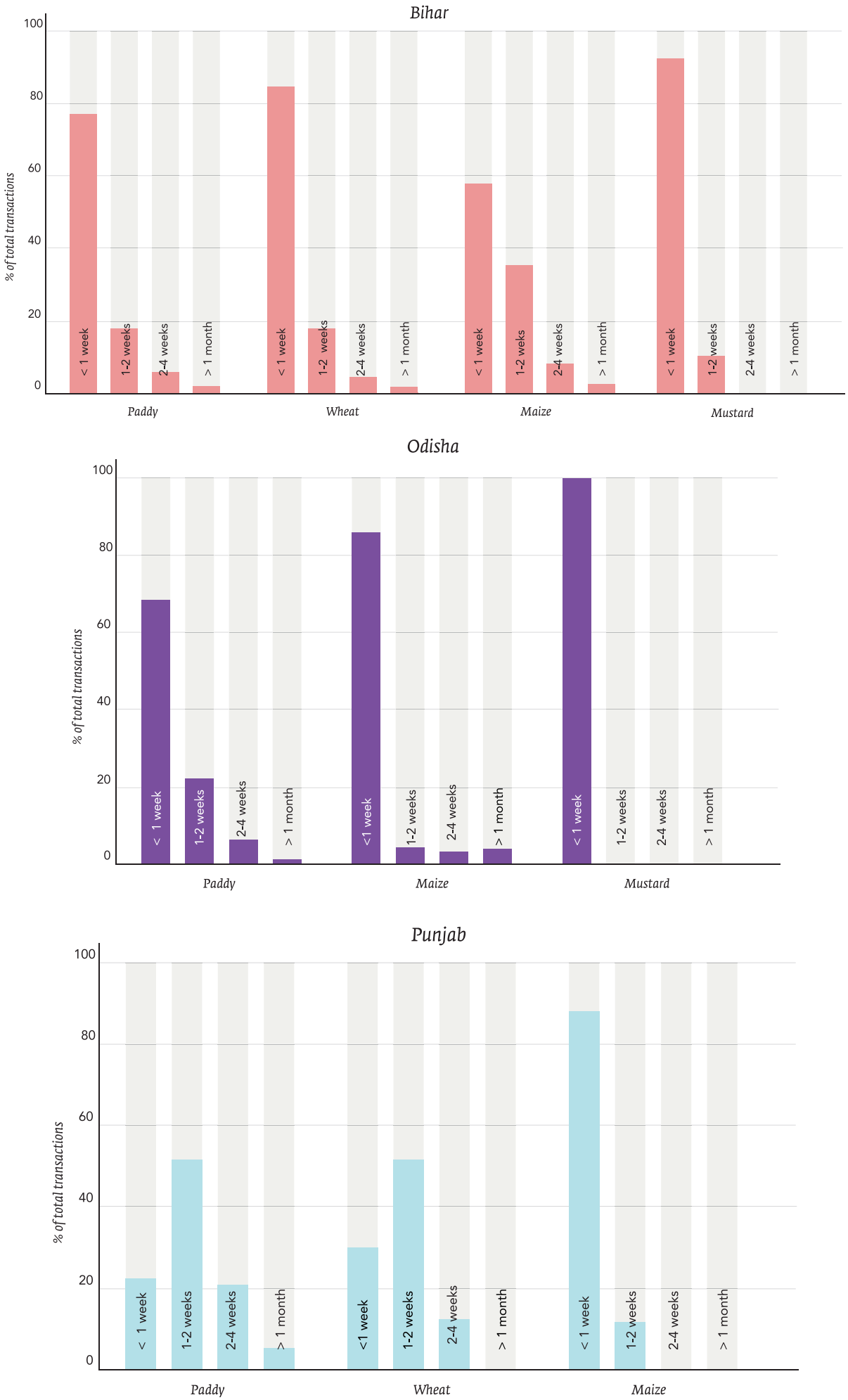
Bank account coverage appears universal (Table 3.12). While many farmers do have Jan Dhan accounts, the majority of accounts were not Jan Dhan accounts, except in Odisha. In Punjab, nearly half of the survey respondents were aware of mobile/digital payments, but only a small minority in Bihar and Odisha were aware, while actual usage was uniformly paltry.

Figure 3.12 Fraction of households (%) with access to JAM infrastructure

	Bank accounts	Jan Dhan accounts	Awarness about mobile money (e.g PayTM, RuPay)	Usage of mobile money
Paddy	98.8	38.7	16.7	2.9
Wheat	99.0	52.3	11.3	1.9
Maize	100.0	18.8	47.1	3.4

We also find that farmers get paid very quickly. Most payments are cleared within a week at most (Figure 3.11). However, in both Bihar and Odisha, the time taken to receive payments for sales to government agencies at MSP is a significant factor for small and marginal farmers to prefer immediate transactions with village traders. In Punjab, where arhatiyas clear a proportion of the farmer payments immediately, it is possible that these arhatiyas deduct an amount to compensate for the delay in receiving the money themselves from the FCI.

Figure 3.11 Duration within which farmers get paid in full



3.10 Conclusion

It is common to refer to the price farmers receive for their produce as a single, homogenous figure. In reality, there is a considerable variance across farmers and commodities. There are a range of factors (timing of sale, site, volume) and transaction processes (grading, quality assessment, price determination, weighing method, and timing and mode of payment) that impact the final price that farmers realize in any given sale.

Public policy also makes numerous assumptions about this critical first transaction. This includes, for example, the common assumption that mandis are the most important sites of exchange for farmers. While the mandi is the near-universal site of sale for farmers in Punjab, our analysis shows that the village remains the predominant site for farmers' sales in Bihar and Odisha.

Current agriculture policies assume that electronic auctions and electronic transactions are increasing significantly as banking services expand and farmers operate bank accounts. In reality, we find a widespread absence of auctions and a negligible proportion of electronic sales across sites, where cash remains the predominant medium of exchange. Hence any presumption that farmers can immediately and easily shift from open outcry auctions and cash transactions to electronic auctions and bank transfers must take this reality on board.

Our field data and analysis clearly show that public investments and interventions need to be much more sensitive to specific contexts. They also suggest that we should understand that in most cases, the lack of investment by farmers in particular processes is likely to be a rational response to market structure and price signals rather than assuming that they are low-hanging fruit that can be fixed through simple interventions and result in significant gains in price realization.

For instance, we find that drying does indeed lead to higher prices; drying is also the post-harvest process that farmers are most likely to invest their time in. On the other hand, grading, at the farm level does not seem to translate into higher prices and indeed may be disincentivized by current market practice. Expecting greater post-harvesting processing by farmers in such commodity markets is unlikely unless there is much greater demand in the form of higher prices that farmers can expect from buyers.

Similarly, while holding capacity is correlated with higher price realization in Odisha, this may be because larger farmers are able to wait for the limited paddy procurement operations by the state to open so that they can benefit from the MSP. In contrast, smaller farmers sell earlier, in cash, to village traders at lower rates. However, in Punjab, where public procurement opens on schedule and all farmers sell at MSP via arhatiyas in the mandi, there is no incentive at all for farmers, of any size, to invest in storage. Moreover, even where farm-level aggregation to increase lot sizes makes sense, given that larger volumes sold by farmers do translate into higher prices, at these volumes at least, the gains are very modest. Also, in some markets, where larger lot sizes and aggregation compromise quality (due to mixing) and quality assessment, it may in fact drive down prices for those farmers.

Finally, we find that inter-linked transactions (considered to be a longstanding feature across Indian agricultural markets) do not in fact characterize the majority of transactions between farmers and their first buyers in Bihar and Odisha. They do, however, continue to be an important factor in Punjab, where exchange is between farmers and a well-established, stable network of arhatiyas or commission agents.

The next two chapters will further consider the cost of remoteness (Chapter 4) and the impact of public procurement in these agricultural markets (Chapter 5).

Nalanda, Bihar– Weighing machine in *Mandi*

Chapter Four

Location: Distance to Markets and Mandis

4.1 Introduction

Remoteness imposes a dual marketing penalty on farmers. Greater geographical distance from markets increases transportation costs. This acts as an implicit tax on producers of goods who are remotely located from centers of population—cities and towns—that are the primary consumption sites. In addition, remoteness also reduces the mass of buyers. Producers often struggle to find buyers in remote locations, which gives intermediaries market power and the possibility of buying a farmer's output at lower prices.

"Market access" as a measure of remoteness of a village should not be confused with "access to ***mandis***." As we discuss below, although Bihar has very few mandis, it does quite well in terms of "market access." This is on account of good roads—both highways and rural roads—and proximity to population centers. It is important to analytically distinguish market access from mandi access since each issue has different implications and requires different policy prescriptions.

4.2 Remoteness

In this chapter, we try understand the costs of remoteness by introducing a spatial measure of remoteness. The international trade and economic geography literature define remoteness of a village in terms of market access. It has three features. One, it accounts for remoteness of a particular village from all other population centers—villages, towns, and cities—and not just one particular city. Two, a larger town is a larger market for the output of a village than a smaller town. Three, from the perspective of a village, between two equally sized towns, the one closer is a bigger market because it is easier to reach (assuming equivalent road connectivity).

First introduced by Harris (1956), this measure has been specially used in modern quantitative economic geography frameworks—Allen and Atkin (2016), Donaldson and Hornbeck (2016), and Chatterjee (2019).[6] Assume an economy has I locations. Let us index them (villages, towns, and cities) by $i \varepsilon \{1,2,\ldots,I\}$ The market access of any location ***v*** is defined as:

$$MA\,(v) = \sum_{i=1}^{I} \frac{Population_i}{distance_{iv}^{\varphi}}$$

where, is the $population_i$ resident at location ***i***, and is the $distance_{iv}$ between village ***v*** and location ***i***. The market access of any village is thus defined as the population at all other locations in the country but discounted by distance to those locations. i.e. further locations and smaller towns are smaller markets. The parameter φ controls the rate at which population is discounted as it gets further and further from location ***I***. Estimate of φ have been derived from gravity models and the consensus is that $\varphi=1$. To analyze the cost of remoteness, we modify the regression specification (equation 3.4) which controls for other important factors that might affect the price and introduce market access as an additional explanatory variable in equation 4.1. We also condition the sample to only market sales and exclude sales to government agencies. It should be noted that our measure of distance is not just a spatial measure. To control for road quality, we measure distance in units of driving time in hours.

4.3 Results

From Table 4.1, we can see that increased market access has a strong positive effect on the prices that farmers obtain. A one standard deviation increase in market access increases farmer prices by about 2%. This means that the village at the 90th percentile in terms of higher market access has, on an average, a 6% higher price as compared to a village that is at the 10th percentile of market access.

$$\log price_{fc} = \beta_0 + \beta_1 \log market\ access_{fv} + \beta_2 hold\ period_{fc} + \beta_3 \log land\ owned_f + \beta_4 \log qty\ sold_{fc} + \beta_5 wealth_{fc} + \beta_6 \log dist\ to\ nearest\ mandi_f + \beta_7 \log distance\ to\ district\ district\ HQ_f + \gamma_c + \gamma_d + \gamma_m + \varepsilon_{fc'} \quad (4.1)$$

[6] Chauncy D. Harris (1954), "The Market as a Factor in the Localization of Industry in the United States," *Annals of the Association of American Geographers*, 44 (4), 315–48; Treb Allen and David Atkin (2016), "Volatility and the Gains from Trade," NBER Working Paper, No. 22276; Dave Donaldson and Richard Hornbeck (2016), "Railroads and American Economic Growth: A Market Access Approach," The *Quarterly Journal of Economics*, 131 (2), 799–858; Shoumitro Chatterjee, (2019), "Market Power and Spatial Competition in Rural India".

Table 4.1 Costs of remoteness: Market and mandi access

VARIABLES	(1) Bihar log price	(2) Odisha log price
log land access	0.152**	0.142
	(0.077)	(0.143)
Hold period	0.001	0.020***
	(0.004)	(0.007)
log land owned	-0.001	0.015***
	(0.002)	(0.004)
log qty sold	0.0024***	0.027***
	(0.003)	(0.004)
Asset index	0.002	0.009***
	(0.002)	(0.002)
log dist nearest mandi	-0.004	-0.013
	(0.005)	(0.008)
log dist DistHQ	0.004	-0.017*
	(0.008)	(0.010)
Constant	6.599***	6.699***
	(0.348)	(0.601)
Observations	3,960	3.629
R-squared	0.676	0.341
Crop FE	Yes	Yes
District FE	Yes	Yes
Sale Month FE	Yes	Yes

Note: Standard errors clustered by village in parantheses. *p<.05; **p<.01; ***p<.001.

In order to better understand the costs of remoteness on our study districts, we conducted a second empirical exercise in which we computed counter-factual prices if all villages had the median market access of our study sample. The villages that are well connected and geographically well placed will do worse in this counter-factual exercise, while those that are remote stand to gain. Therefore, places where prices increase in this hypothetical counter-factual are the ones which are currently losing out on account of remoteness. The spatial distribution of this can be seen in from average price increases at the block level in figure 4.1 (a–f).

First, we note that the districts in Odisha (Balasore, Koraput, and Samastipur, all colored green) suffer more on account of remoteness than Bihar—most villages in Odisha have lower than median market access and the adjustment increases the price realization. A farm's location is a crucial determinant of the prices a farmer gets for his produce. Farmers in villages that are remotely located are doubly handicapped. First, farmers get lower prices because it is costlier to transport their commodities. Second, the buyers of their produce exercise greater monopsony power because it is harder for farmers to find alternative buyers in these remote locations.

Furthermore, we need to note the distinctive effects of market access from mandi access. Bihar Sharif is a large mandi in Nalanda district. However, it is remote in terms of access to population centers. By comparison, the northern blocks of Nalanda are closer to Patna, the state capital and a large city. This creates a wedge of 5% on an average in realized prices between the northern blocks of Nalanda and Bihar Sharif (see figure 4.1d). Similarly, the greater proximity to Patna also explains why farmers in the western blocks of Samastipur are able to get 5% higher price realizations as compared to those in its eastern blocks.

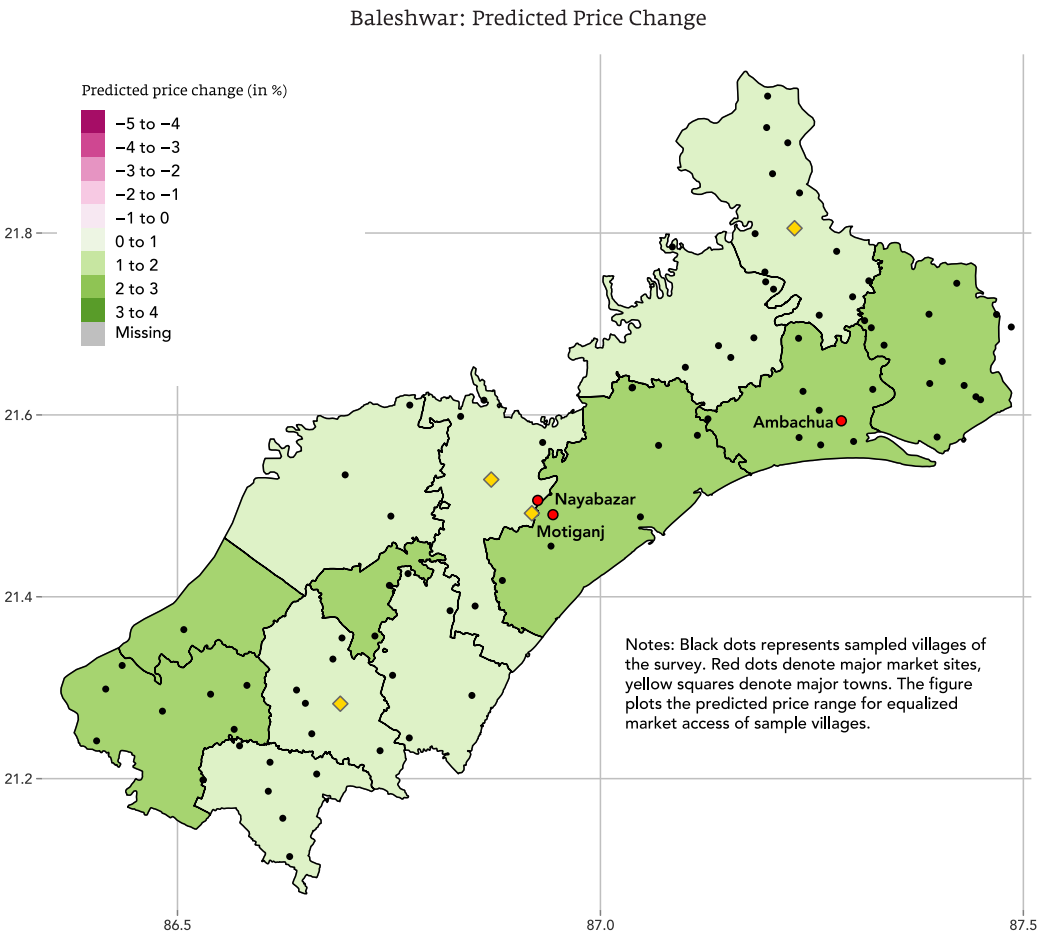


Figure 4.1a

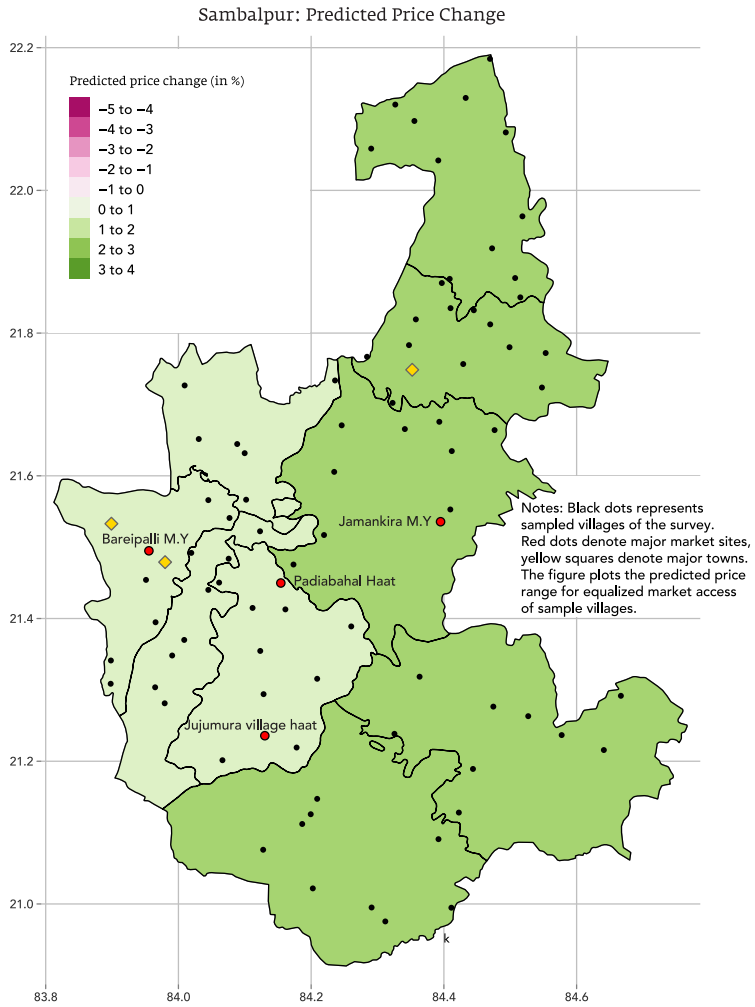


Figure 4.1b

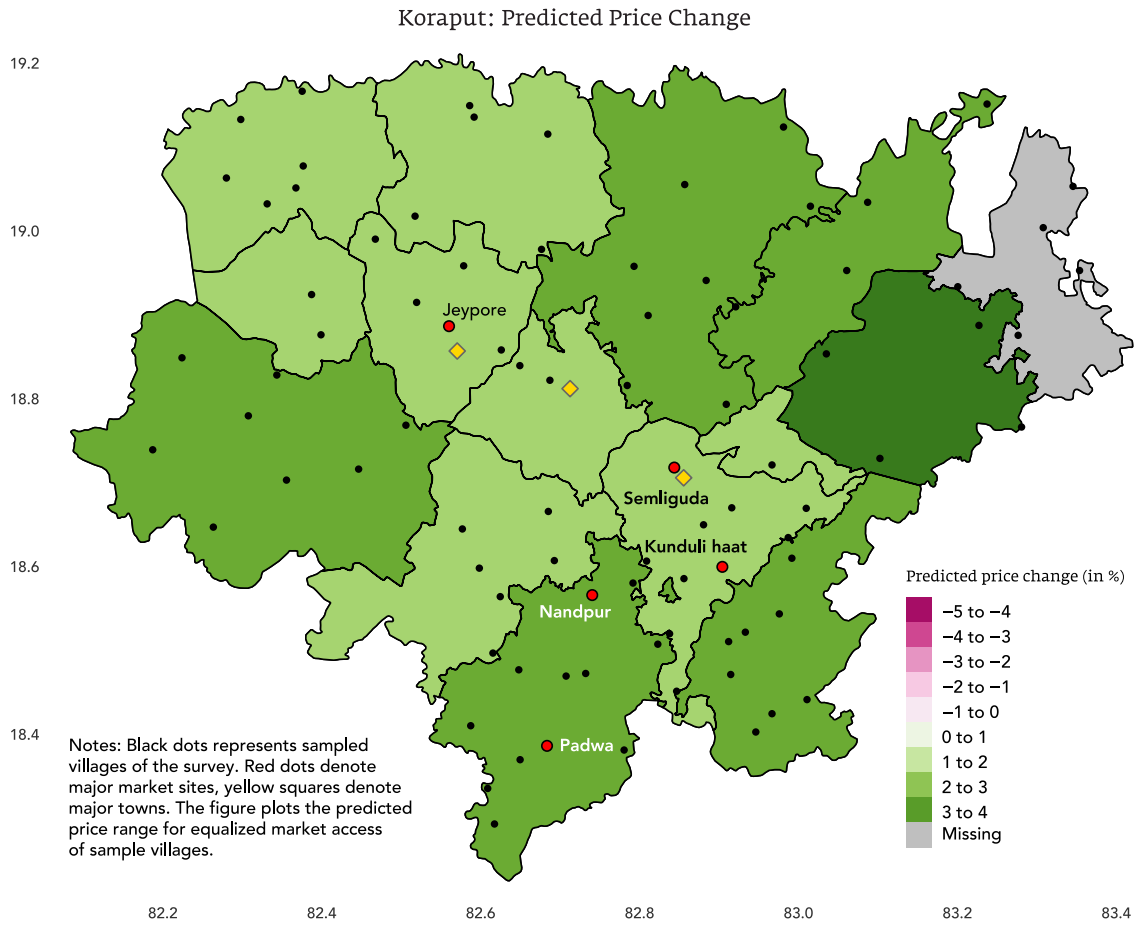


Figure 4.1c

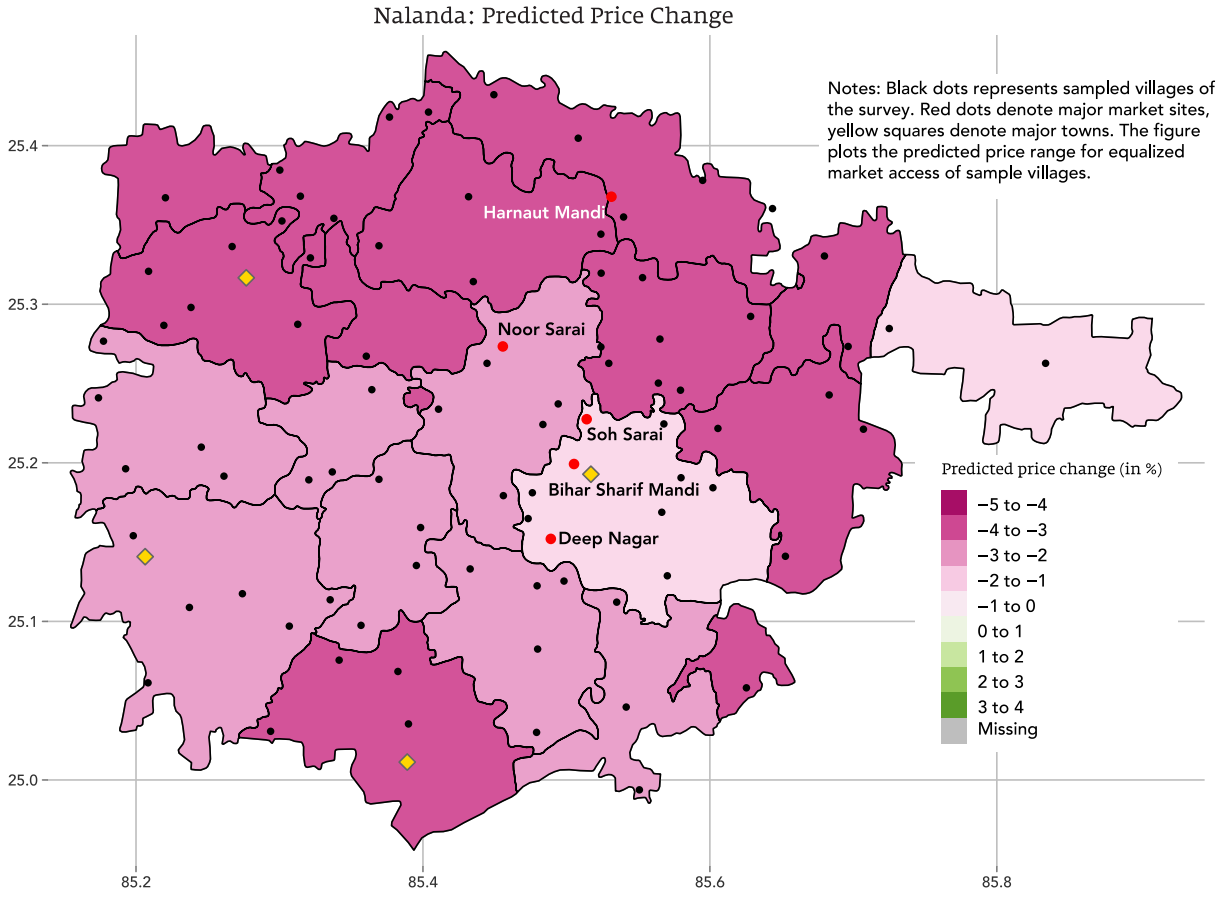


Figure 4.1d

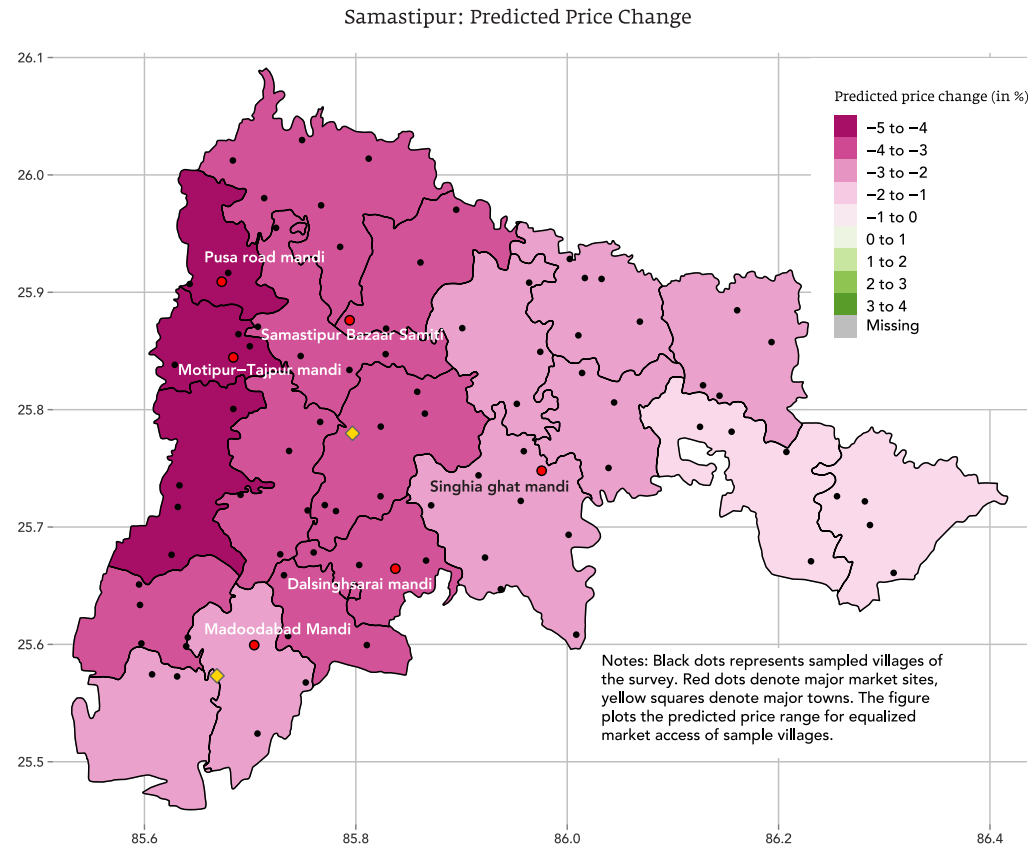


Figure 4.1e

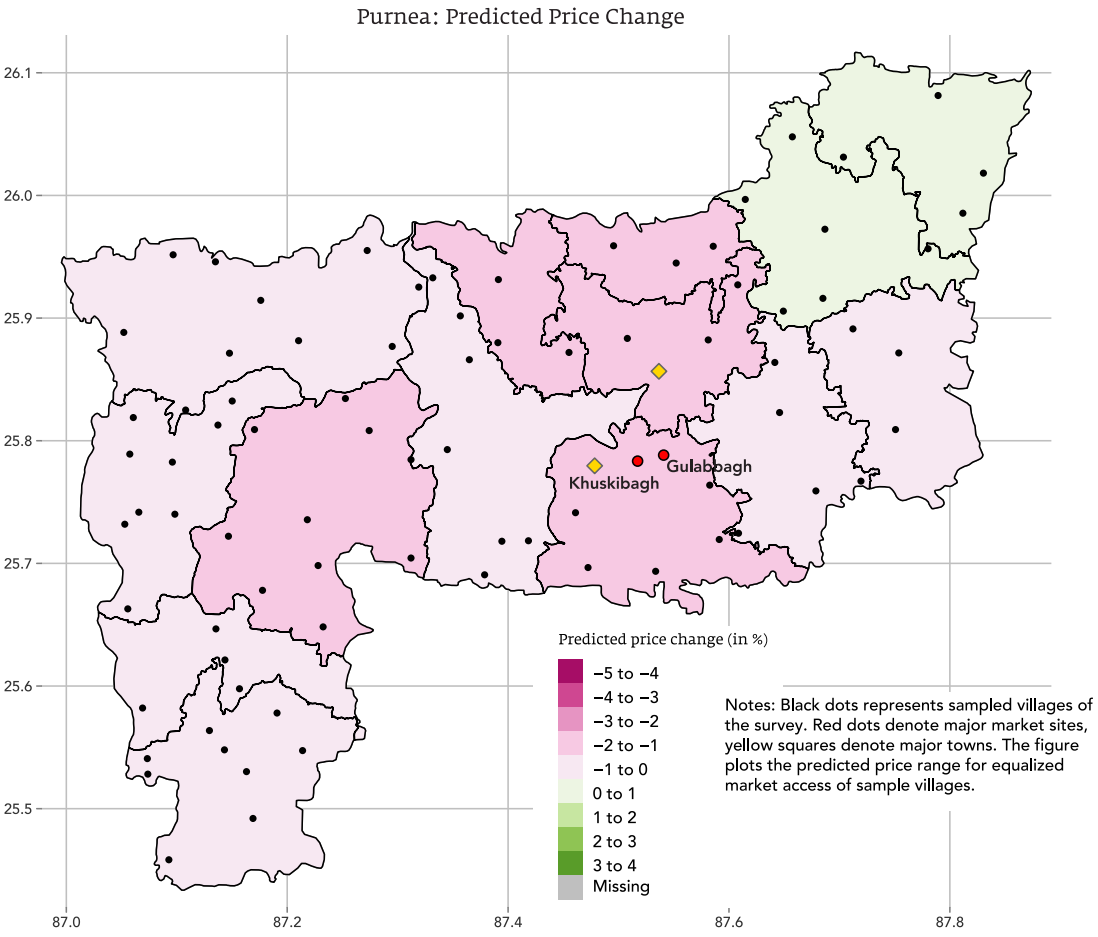


Figure 4.1f

Figure 4.1 Average Price Changes if the blocks had a counter-factual remoteness level equal to the median block.
Note: All blocks in green are currently losing out on account of remoteness because their prices increase in the counter-factual. An improvement in their market access—e.g., by improvement in road quality—will improve the prices farmers in these regions obtain.

4.4 Conclusion

A farm's location is a crucial determinant of the prices a farmer gets for his produce. Farmers in villages that are remotely located are doubly handicapped. First, farmers get lower prices because it is costlier to transport their commodities. Second, the buyers of their produce exercise greater monopsony power because it is harder for farmers to find alternative buyers in these remote locations.

In this chapter, we have provided a regression framework to analyze spatial price data and identify precisely where these locations might be. We then used this framework to identify blocks of our study districts that suffer from the additional vulnerabilities of remoteness. For such places, improving road networks and road quality would reduce transport costs. Given the "thinness" of markets in these places, ensuring better price information would reduce informational asymmetry about prices. Government MSP procurement would have a greater impact in these places, given the limited number of buyers. And policies that support the entry of small and medium enterprises as alternate buyers of agricultural commodities will further improve the prices obtained by farmers.

Koraput, Odisha– retailer purchasing in Kunduli

Chapter Five

Public Policy and Agricultural Markets: MSP, Procurement, and Risk

5.1 Introduction

In Chapter 3, we presented data and analysis on the critical elements of exchange between farmers and the first buyers of agricultural produce in primary markets. We then discussed the role of each element in the eventual price realization for farmers across states, districts, and commodities. There, we observed that although paddy is the dominant ***kharif*** crop across all seven sites, there is wide variation in paddy price realization, which in turn relates to differences in the coverage of government procurement operations in the three states: Bihar, Odisha, and Punjab.

We begin by first emphasizing that these facts are specific to paddy and paddy procurement. Table 5.1 shows the inter-state variation in the fraction of total output procured by government agencies. In Chapter 1, we had seen that most farmers in Punjab sell to ***arhatiyas*** or commission agents, who in turn sell to government agencies. This is not the case in Bihar and Odisha, where some farmers sell directly to government agencies. However, given the mismatch between farmers reporting selling directly to government agencies and levels of reported procurement, it must also be the case that local traders and intermediaries are making indirect sales to state procurement agencies.

Table 5.1 Rice Production and procurement, 2018-19

	Kharif production (LMT)	Kharif procurement (LMT)	Fraction of output procured (%)
Punjab	128.22	113.34	88.40
Bihar	60.43	9.49	15.70
Odisha	73.10	44.47	60.83

Source: Food Corporation of India and Ministry of Agriculture and Farmer Welfare, GoI.

Second, given the non-universal nature of procurement in Bihar and Odisha, we document the exclusion of small and marginal farmers from direct sales to government agencies. Note that the average size of the farmer who sells to procurement agencies is 63% greater relative to the state average. Furthermore, the likelihood of a farmer being a sharecropper or tenant is double the likelihood that they could sell to a government agency, relative to non-sharecroppers/tenant farmers.

Table 5.2 Exclusion of small farmers and sharecroppers from the procurement process

	Fraction of paddy farmers who sold to goverment agencies (%)	Average land owned (hectares)		Area under paddy cultivation		Area under paddy cultivation	
		State avg	Govt. Sales	State avg	Govt. Sales	State avg	Govt. Sales
Bihar	5.2	0.93	1.52	0.78	1.39	13.21	6.6
Odisha	11.3	1.02	2.08	0.97	1.64	12.41	5.9

Note: Statistics only for Kharif season. The government sales column gives the average among the subset of farmers who sold paddy directly to government agencies.

Third, there is considerable variation in the prices received by the farmers across districts—both the open market price and the price directly received from government agencies (figure 5.1). In Punjab, since the government does not directly buy from farmers, figure 5.1 only has one data point. In Bihar and Odisha, even those farmers that do sell directly to government agencies get a price lower than the Minimum Support Price (MSP). Smaller, marginal, and sharecropper farmers that do not sell to the government get a much lower price.

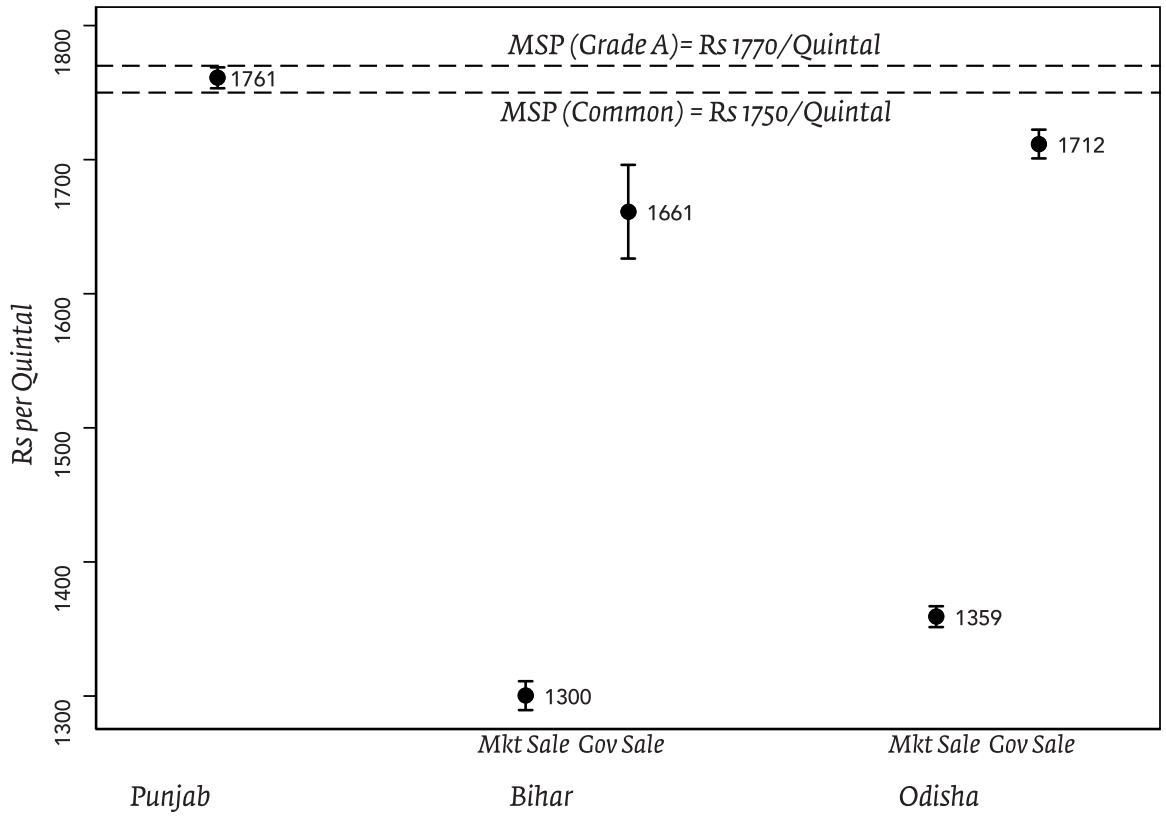


Figure 5.1 Prices received by farmers for paddy
Note: Dots are sample averages and bars are 95% confidence intervals.

In this chapter, we try and explain these differences in outcomes by situating them in the specific regional history and political economy of public procurement across states and districts. Additionally, by mapping out the state-specific paddy procurement systems and processes in each state and drawing on ethnographic data on common procurement practices in the field, we are able to identify the challenges that farmers face in selling to government agencies and securing the MSP for paddy. The MSP and public procurement occupy a high prominence in Indian agricultural policy and intervention, at least as declared official policy and intentions. Hence, it is important to have a detailed understanding of the actual workings of existing systems and processes—their scale, coverage, and performance—in order to establish different reform options and the direction that government procurement reforms should take.

5.2 Paddy procurement: Political salience, scale, coverage, and price realization

While the MSP and procurement are commonly described and debated at the level of national policy, their actual presence, penetration, and performance on the ground are profoundly shaped by their political salience in different states and districts. Punjab, Odisha, and Bihar are no exception. Indeed, they represent three distinct trajectories of the evolution of public grain procurement in India and illustrate why it is so difficult to even propose, let alone implement, serious reforms to the prevailing MSP-based procurement regime at the national level.

- ***Punjab*** has been at the centre of India's food grain procurement system since the Green Revolution in the 1960s, and the ***universal, unlimited*** procurement of paddy and wheat from farmers at MSP remains at the heart of the state's agricultural policy. The state is the largest contributor to the central pool for both commodities. Even as the Government of Punjab is completely aware of the ecological and economic consequences of long-term procurement, the political risk associated with any effort to draw down dependence on government procurement is seen by all parties as simply too great to hazard. Farmers across all districts are used to selling their paddy at the centrally declared MSP in ***mandis*** through arhatiyas or commission agents. There is a high degree of political mobilization at all levels to ensure that the procurement system works every season with ***universal*** coverage of farmers, including tenant farmers and sharecroppers. In Hoshiarpur, on an average 96.6% of farmers sold their paddy in the mandi and 97.5% sold to arhatiyas, who are the commission agents for state paddy procurement agencies.

- ***Odisha*** is a leading example of a ***non-traditional*** procurement state that has invested heavily in building up its procurement systems over the last two decades. In 1999, Sambalpur district in western Odisha, and one of our research sites, witnessed widespread agitation by farmers for the implementation of MSP-based procurement of paddy. Finally, in 2002, under pressure from a High Court judgment, the state government commenced procurement operations. Since then, paddy procurement has come to represent a key developmental strategy and has attracted considerable investment. In 2014–15, the Government of Odisha set up the Paddy Procurement Automation System for real-time monitoring and has continued to expand the use and implementation of this system. In spite of the

political commitment to paddy procurement, however, on the ground, as we see from our data, paddy procurement is significantly more prevalent in western Odisha (where farmers are also better mobilized) than in central and coastal districts of the state. In Sambalpur, on an average, 28.5% of farmers reported sales to government; in Koraput this figure was 15%; and in Balasore 18%. In all three districts, medium and large farmers are significantly more likely to participate in public procurement, in part due to the ambiguous legal status of cultivators who are sharecroppers and tenant farmers. Sharecroppers who want to register in Odisha's paddy procurement system have to overcome barriers set by the need to get consent from landholders, certification from ***sarpanchs***, or verification by district agricultural officers. In contrast to Punjab, Odisha can be described as a ***partial procurement state***, where paddy procurement is based on registrations, per-farmer limits, and district procurement targets, and is therefore by design not universal in coverage. However, the government's high-profile commitment to paddy procurement by the public sector has meant that the considerable private trade in paddy is widely construed as illegal and is driven underground. This will be further discussed later in the chapter.

- ***Bihar*** may be categorized as a ***low procurement state***. Although the state government has sought to continuously expand its procurement operations since 2011, paddy procurement has always fallen well short of procurement targets. On the ground, public procurement does not seem to influence the actual organization of farmers' sale; these continue to remain overwhelmingly between farmers and private traders at the village level. In our sites, on an average, only 5.5% of all farmers reported sales to government agencies. This ranged from 10.9% in Nalanda (the Chief Minister's district and therefore a political priority for public procurement) to 3.5% in Samastipur and only 2.3% in Purnea. Unlike both Punjab and Odisha, paddy procurement has not gathered any significant political salience in Bihar, and therefore while locally some well-connected cooperative officials, large farmers, and traders are benefiting from the procurement system, its overall effect on paddy trade and price realization for farmers remains very limited.

We next turn to the impact of procurement on price realization in Bihar and Odisha. Since both states have partial procurement and only some privileged farmers get access to the system, we ask two questions:

i. What is the private benefit of farmers who sell directly to the government agencies?
ii. Are there any spillover benefits to those farmers who do not get to sell directly to the government?

To answer both these questions, we resort to the regression model (4) introduced in Chapter 3 that has been our benchmark for predicting price realizations thus far. However, in table 5.3, we condition the sample to paddy sales (as compared to all crops in Chapter 1). In this regression, the indicator of sales to public agencies—Food Corporation of India (FCI)/ Primary Agricultural Cooperative Societies (PACS)—will help us estimate the percentage increase in average price for those farmers who sell directly to government agencies.

To answer the second question, we restrict the sample to those farmers who sell in the private market but include as a predictor the number of farmers in their village who sell to the government directly. This will help us estimate the spillover effects—i.e., the percentage increase in the price realized by those farmers in a village who do not sell directly to the government, while other farmers in their village do. Is there a price spillover from the latter to the former?

We rewrite the regression model below, with the additional predictors and representing the old predictors in vector notation.

$$\log \text{price}_{fv} = \beta_0 + \beta_1\{\text{sold to FCI/PACS}\}_{fv} + \beta_2\{\#\text{ of village farmers who sold to FCI/PACS}\}_{fv} + X'\beta + \gamma_c + \gamma_d + \varepsilon_{fc} \quad (5.1)$$

Figure 5.3 Effects of MSP on price realization

VARIABLES	(1) Cleaning	(2) Grading	(3) Drying	(4) Any
Sale to FCI/PACS	0.157***	0.170***		
	(0.017)	(0.007)		
#others sell to gov			0.011**	0.001
			(0.004)	(0.003)
Hold period	0.008**	0.023***	0.006	0.022***
	(0.004)	(0.004)	(0.004)	(0.004)
log land owned	-0.001	0.021***	-0.000	0.022***
	(0.003)	(0.004)	(0.003)	(0.004)
log qty sold	0.022***	0.033***	0.021***	0.037***
	(0.003)	(0.003)	(0.004)	(0.003)
Asset index	0.005**	0.007***	0.005**	0.009***
	(0.002)	(0.001)	(0.002)	(0.002)
log dist mandi	-0.005	-0.013**	-0.008	-0.012*
	(0.006)	(0.007)	(0.006)	(0.007)
log dist DistHQ	0.000	-0.015*	0.006	-0.017*
	(0.009)	(0.008)	(0.008)	(0.009)
Constant	7.118***	7.254***	7.099***	7.255***
	(0.038)	(0.032)	(0.036)	(0.036)
Observations	1,567	3,219	1.479	2,802
R-squared	0.480	0.443	0.426	0.272
Crop FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes

Note: Standard errors clustered by village in pareantheses. *p<.05; **p<.01; ***p<.001.

Columns (1) and (2) of table 5.3 show that when farmers in Bihar or Odisha are directly able to sell to government agencies, they are on an average able to realize a 15.7–17% higher price, after controlling for other farmer and sales characteristics. This is the direct benefit of getting access to public procurement. Column (3) shows that in Bihar, if one other farmer in the village sells directly to the government, then even those making private sales realize a 1.1% higher price. These are spillover effects of public procurement and the magnitudes are strong.

However, we must be mindful of the mechanism. The cash-constrained smaller farmers have to sell before procurement begins and the traders (or larger farmers) then sell it to the government agency for a higher price. We did not find evidence for spillover effects at the village level for Odisha (column 4), nor did we find these effects at the block level for either state.

The median farmer waits on an average 20 more days if he sells to a government agency rather than in the private market. The implicit cost for holding on to his harvest for nearly three more weeks is worth the price markup he gets by selling to a public agency.

5.3 The role of millers: Levy system to custom milling of rice (CMR)

In contrast to wheat, paddy must be first processed into rice before it can be stored and distributed via the Public Distribution System (PDS). Rice millers therefore play a crucial role in any paddy procurement system. Historically, two systems have existed simultaneously.

- The first is where the government buys paddy directly from farmers at MSP through commission agents and agricultural cooperative societies. The paddy is then sent to registered mills for **CMR** on fixed terms.
- The second is the **levy system**, under which the government procures rice from local millers, who are expected to procure paddy directly from farmers at MSP, and then give the government a fraction of that (the "levy") as milled rice.

In practice, until 2015, a combination of the CMR and levy system was used by the government for procuring rice. Millers were required to sell a certain percentage of the rice to the government for use in food security and other welfare schemes. The levy system was enacted with the view that it would help maintain an adequate supply of rice and secure equitable distribution and availability of rice at fair prices.

The Orissa Rice and Paddy Procurement (Levy) and Restriction on Sale and Movement Order, 1982, called for the procurement of 75% of the rice milled by the miller. The Bihar Rice and Paddy Procurement (Levy) Order, 2005, required the rice millers to sell at least 40% of the rice produced out of the paddy purchased by them from farmers at MSP. In 2009, the percentage of rice required to be sold by the millers to the state was fixed at 50%. The Punjab Rice Procurement (Levy) Order, 1983, required mills to sell 75% of the rice under the levy system.

The levy system, however, was believed to be full of irregularities. First and foremost, there was no assurance that millers were paying the MSP to the farmers at the time of procurement. Second, it was commonly reported that the millers were diverting the better-quality rice to the open market

and supplying poor-quality rice for the PDS.

Punjab was one of the first states to abandon the levy system in 2013. Then in Kharif Marketing Season (KMS) 2014–15, there was a decision across states to reduce the levy rice to 25%, and the following year KMS 2015–16, the levy system was completely abolished. The state now sought to utilize the expertise of its agencies in procurement to safeguard farmers' interests and provide proper weighment, grading, storage, and payment services to the farmers.

The abolition of the levy system, in turn, raised its own concerns on two counts. First, that many small farmers would not be able to access public procurement centers and would continue to be forced to sell to village intermediaries, who would benefit from the MSP. The second was that millers would now have to completely switch to CMR and would have restricted access to open market rice, impeding their profitability. This would drive millers' private procurement channels underground.

This problem is most vividly illustrated in Odisha, where the government's paddy procurement policy has had wide-ranging effects on the entire system of paddy marketing and milling, even though coverage at the farmer-level remains partial at best and excludes the majority of farmers from participation.

During KMS 2018–19 this came to a head with the All Orissa Rice Millers Association (AORMA) leading a strike and millers across the districts refusing to participate in custom milling operations. This led to a significant delay in the opening of procurement centers in the state. Millers demanded the revision of transport charges, custody and maintenance charges, milling charges, and rice out turn ratio. They also demanded formulation of a suitable policy to ensure the functioning of rice mills in both single and double crop districts for a minimum of 10 months a year to maintain the economic viability of mills.

All the rice millers that we interviewed discussed in detail the problems that private mills face as a result of government policy. In addition, a few government officials who were interviewed also conceded that the milling charges had not been regularly revised and that other states like Telangana and Chhattisgarh offered better CMR rates to millers. Consider the following account given to our field team by a miller in Balasore regarding the government's rates:

> The milling charge was set at Rs 20 per quintal, but the electricity charge for milling 1 quintal is 4 units which costs around Rs 40 itself. The gunny charges are set at Rs 12 per bag, when in reality each bag costs over Rs 25 during season. For transport, the rate for 10 km is Rs 780 per 100 quintals, when in fact it costs me Rs 2,000 for that amount. On top of that, the paddy in Odisha is never of fair average quality (FAQ). 68% rice out of every quintal of paddy is impossible, and only 64% can be realistically managed. So, each year, up to Rs 20,00,000 is spent out of pocket to cover up that 4% extra demanded by the government. The capacity of the mill is around 32 tons per shift, which is never fully utilized by the target set by the government. Only 40% of capacity is utilized in a season, but workers must be paid for a longer period to make them stay in the mill so that they are ready to work when the season comes. Furthermore, Balasore is a single-crop district, which means the mill is running at a loss for half of the year.

Another miller that we interviewed pointed out that the government rules demand that the CMR be completed before private milling can commence. This severely affects the credit rotation in the rice trade, leading to blocking of payments to millers. Furthermore, the government's price policy does not allow millers to buy paddy at a price lower than the MSP, even when the market rate is lower. This miller expressed the view of the larger milling community in Odisha, arguing that the government should not make policies only conducive for the PDS, as millers produce rice for the non-PDS rice-consuming population as well.

In reality, we know from both the survey and our ethnographic research that there is a high proportion of private sales at the village level before, during, and after government procurement centers open for farmers. As we shall see later, a proportion of this paddy is then resold to the state agencies at MSP, while some of it makes its way directly to mills for private milling and further sale. However, the entire process of private sale, exchange, and milling is rendered invisible by the government's current paddy procurement policy. This makes it near impossible for the government to take steps that can improve farmers' terms of exchange in the existing private market for paddy even as private paddy sales remain the reality for the vast majority of farmers, especially for small and marginal cultivators in Odisha. A close study of the public procurement system reveals why this continues to be the case in spite of considerable and sustained effort on the part of the government. It is also reveals why even those farmers who sell directly to the government do not always receive the full MSP.

5.4 Paddy procurement process maps

PUNJAB PADDY PROCUREMENT PROCESS MAPPING

Procurement Preparation → Miller Registration → Farmer Facing Processes → Mill Facing Processes

PROCUREMENT

Procurement Preparation

The Food, Civil Supplies and Consumer Affairs Department allots purchase centers or *mandis* to each of the participating state procurement agencies, including:
1. Pungrain
2. Markfed
3. Punsup
4. PSWC
5. PAIC
6. FCI

→ Market committee associated with the *mandi* makes the required equipment available. District Civil Supplies officer and *mandi* officer ensures presence of the required infrastructure. Procurement agencies verify the presence of these arrangements

Miller Registration

Millers wanting to participate in custom milling operations have to register with the Food, Civil Supplies and Consumer Affairs Department. A Rs.10,000 registration fee is deposited by them. For selection, the following aspects are taken into consideration:
- Milling capacity
- Past track record
- Storage Capacity
- Minimum CIBIL score of 600
- No legal disputes/obligations
- Documentation like identity proof of mill owner, Pollution Control Board certificate, income tax returns

↓

District Allotment Committee (DAC) issues the list of selected millers and begins the agreement and security deposit collection process. The DAC comprises of:
- District managers of all purchase agencies
- Deputy director of Food, Civil Supplies and Consumer Affairs Department

→ Millers are allotted to a single procurement agency based on the share of agency in paddy procurement

→ Selected millers make the following security deposits in favour of the attached procurement agency to participate in custom milling:
- A bank guarantee equal to value of 5% of acquisition cost of paddy stored in their mill
- An amount of Rs. 100/- MT of paddy allotted to the mill
- Purchase a minimum of 150 MT of paddy on their own account or deposit Rs.5 lakh with Pungrain (irrespective of attached agency)
- A cheque in favour of the concerned procurement agency @ Rs.45 lakh for every 2000 MT of paddy stored in the mill

→ DAC also decides which *mandi* will be linked to a mill keeping in view minimization of transport cost and milling capacity

→ Paddy allocation to mills based on following considerations:
- New mill – Maximum of 4000 MT tonne
- Existing mill – On the basis of milling performance in 2017-18

Farmer Facing Processes

All farmers take their crop to the *mandi* to a licensed commission agent or *arhtiya*

→ The *arhtiya* gets the farmer's heap cleaned. Unclean heaps not confirming to the FAQ norms are not made available for auction

→ Auction is held twice a day in the presence of civil supplies, state procurement agency and market committee representatives

→ Lifting of the produce from the *mandi* to the mill facilitated by the attached procurement agency within 72 hours

→ Online payment done by procurement agencies to *arhtiyas* who keep their commission of 2.5% on the entire produce cleaned and auctioned by them and transfer the MSP amount to farmers @ Rs. 1770/- quintal for Grade 'A' variety of paddy

→ Procurement agency pays the market committee 3% of the price of total paddy purchased by them each towards market fees and Rural Development Fund

Mill Facing Processes

Millers get 20% of their total allocation of paddy at any given time for milling

→ A procurement agency official does a continuous physical verification of the paddy stocked in the mill

→ Area manager of FCI tags millers to FCI storage depots where millers deliver the custom milled rice (CMR)

→ Millers transport the CMR to the FCI depot

→ Millers ensure that all necessary documents are uploaded online to claim payment for CMR, milling charges and reimbursement for the cost of transportation within 7 days of delivery

→ FCI conducts a quality check to ensure the delivered rice matches the FAQ norms before releasing the payment of the millers to the concerned state procurement agencies

→ Millers receive their payment and settle all accounts with the concerned agency within 15 days from the date of completion of hundred percent delivery of CMR

BIHAR PADDY PROCUREMENT PROCESS MAPPING

Procurement Preparation → Miller Registration → Farmer Facing Processes → Mill Facing Processes

PROCUREMENT

Procurement Preparation

Cooperative Department selects
- Primary Agricultural Credit Societies (PACS) at Panchayat level
- *Vyapar Mandals* (VMs) at Block level

to handle the paddy procurement operations for the Kharif Marketing Season

Adequate publicity regarding the procurement operations of the selected PACS and VMs at the paddy purchase centres and in public spaces by the Cooperative department

Cooperative department responsible for online farmer registration.
The documents required are as follows:
For land owning farmers:
- Photo identity card
- Copy of bank passbook
- Land Possession Certificate

For non-land-owning farmers:
- Photo identity card
- Copy of bank passbook
- Self-Declaration Certificate (signed by ward member/Panchayat-appointed farmer advisor)

This database is uploaded online by the Cooperative department

District magistrate responsible for ensuring full preparation and functioning of all selected paddy purchase centres

Cooperative department makes the required equipment, storage and manpower available at the PACS/VMs

Miller Registration

Millers are selected by the district cooperative officer taking into consideration:
- Milling capacity
- Past track record
- Storage Capacity
- Documentation like Pollution Control Board certificate, District Industries Centre certificate, GST registration certificate

District cooperative officer makes a visit to the mill to ensure that the mill has no legal obligations.
He ensures the presence of a functional mill premises with adequate covered storage and milling equipment

Meeting organized with the mill owners of the shortlisted mills under the district cooperative officer's chairmanship

Security deposit made by the selected miller in the form of Custom Milled Rice (CMR) in advance of delivery of a proportionate amount of state-procured paddy to the miller

All registered mills are connected to the procurement software

Policy Focus: New delivery of paddy is made to the millers only when CMR from the previous lot of paddy is received from them to avoid any instances of foul play

Farmer Facing Processes

Paddy procured only from the farmers registered in the online database

Paddy procurement limits:
Land owning farmers - 250 quintals
Non-land owning farmers - 75 quintals

Paddy procured if it's clean, dry with a moisture level of no more than 17%

A receipt is provided to the farmer containing the following details:
- Quantity of paddy purchased
- Due amount for payment
- Estimated date of payment

Payment of Rs.1750/- quintal for common variety and Rs. 1770/- quintal for Grade 'A' variety of paddy made by the PACS/VMs within 48 hours of purchase of paddy from the farmers via Public Financial Management System (PFMS)

Farmers receive SMS notification once payment is made via PFMS

Mill Facing Processes

PACS/VMs responsible for transfer of procured paddy to the registered mill tagged to them

Bihar State Food and Civil Supplies Corporation (BSFCSC) tags the PACS/VMs to mills and state godowns based on considerations of distance and required milling and storage capacity

A government officer is deputed at the mill premises for overall monitoring of milling and delivery of paddy and CMR

PACS/VMs responsible for taking the delivery of CMR from the mill and transferring it to the BSFCSC godown.

BSFCSC makes the payment for the CMR using the e-procurement software

BSFCSC responsible for the distribution of the CMR under Food Security and Other Welfare Schemes

ODISHA PADDY PROCUREMENT PROCESS MAPPING

Procurement Preparation → Miller Registration → Farmer Facing Processes → Mill Facing Processes

Procurement Preparation

District collector appoints (in order of priority)
- Primary Agricultural Cooperative Societies (PACS)
- Large Area Multi-Purpose Cooperative Societies (LAMPCS)
- Women Self Help Groups (WSHGs)
- *Pani Panchayats* (PPs)

to participate in paddy procurement operation as 'commission agents' to operate Paddy Purchase Centres (PPCs)

Regulated market committee (RMC) makes the required equipment available at the PPC

Adequate publicity and awareness among farmers about MSP, quality specifications of paddy, days and time of operations of PPCs ensured in the areas covered by such centres

Delineation of jurisdictional area among the selected PPCs

Farmer registration done through the PPC in their area using an ID proof, which may include
- *Kisan* Credit Card
- *Biju Krishak Kalyan Yojana*
- Electors Photo Identity Card

The details are digitized through a web-based application and uploaded on www.foododisha.in

Policy Focus: Include actual tillers including sharecroppers and small and marginal farmers. Their registration is subject to verification by District Agriculture Officers

Miller Registration

Miller registration is done online at www.foododisha.in. Millers are appointed taking into consideration:
- Financial Capacity of mill
- Past track record
- Storage Capacity
- Documentation like Pollution Control Board certificate, District Industries Centre certificate, GST registration certificate

Security deposit made by the miller in the form of a bank guarantee in favour of OSCSC

Custom mills are tagged to PPCs, taking into consideration:
- Milling capacity
- Storage capacity
- Past Performance of the miller

Policy Focus: Allocation done to ensure lifting of procured paddy on the same day and minimum expenditure on transportation from the PPC to the mill

PROCUREMENT

Farmer Facing Processes

Farmers informed through SMS, 7 days in advance, the date to bring their marketable surplus of paddy to the PPC

Marketable Surplus: 18 quintals per acre from irrigated land and 12 quintals per acre from non-irrigated land

Quality analysis of paddy sample

Paddy does not meet the Fair Average Quality (FAQ) specifications

Farmer takes the paddy back, improves the quality and brings it to the PPC another day

Farmer gets the quality improved at the PPC on payment basis

Paddy meets the Fair Average Quality (FAQ) specifications

Mill Facing Processes

Delivery of paddy to the custom miller on the same day from the PPC. Transport is managed by the custom miller and reimbursed by the OSCSC

Miller acknowledges the paddy receipt by uploading the details on the miller mobile app. This is necessary to ensure timely payment to the farmers

Payment of Rs.1750/- quintal for common variety and Rs. 1770/- quintal for Grade 'A' variety of paddy made through the Paddy Procurement Automation System (P-PAS) into the farmer's bank account

Delivery Certificate issued to the miller by OSCSC for delivery of rice to the Rice Receiving Centre (RRC) or the Food Corporation of India (FCI) depot

Delivery of custom milled rice by the miller begins within 7 days of lifting the first batch of paddy from the PPC

Delivery in order of priority:
1. Food Security and Other Welfare Schemes in the district
2. Food Security and Other Welfare Schemes in the neighboring deficit district
3. Surplus rice goes to the Central Pool (FCI depot)

Policy Focus: Mills are tagged to RRCs and FCI depots to ensure minimum transportation cost and maximum utilization of godowns

Central Pool

FCI issues documents in support of delivery of rice within 3 days

Custom miller collects and submits documents to the OSCSC

OSCSC submits bills to FCI in 10 days

FCI releases miller payment within 5 days

State Pool

Sample is drawn from the rice arriving at the RRC for quality confirmation to the FAQ norms

FAQ norms met

Mobile (SMS) reporting by the custom miller regarding rice delivery for release of payment from OSCSC

FAQ norms not met

Rice sent for replacement to the custom miller

Security Deposit returned to the miller within one month of the complete delivery of custom milled rice

5.5 Paddy procurement in Bihar and Odisha: Critical gaps and bottlenecks

As we have already noted, the proportion of farmers directly participating in the government's MSP- based paddy procurement operations in eastern India remains low. Even in Odisha, where the situation is relatively better than Bihar, sales below MSP are still the norm rather than the exception. Why is farmers' participation such a persistent problem even after years of investment by the state and the building up of an impressive database of farmers and an automated real-time tracking system to reduce leakages? We draw on our ethnographic research to identify the following critical gaps and bottlenecks:

a. Irregular and poorly timed procurement windows: In both states, paddy procurement is routinely delayed by several weeks after the harvest. Even short delays can mean that small and marginal farmers, who need to sell immediately after the harvest, are excluded from the procurement process. In KMS 2018–19, the millers strike contributed to the delay. In many cases, our field teams also observed centers closing before the marketing season was over on account of procurement targets having been met, forcing farmers to sell to private buyers at below MSP.

b. Delays in payment: Many farmers, especially small and marginal cultivators, require immediate cash-in-hand and are not in a position to wait for government payments to be credited to their accounts.

c. Local influence at the village procurement center: In Bihar, it was often reported that only larger farmers with connections to the PACS officials were able to participate in the procurement system.

d. Well-connected traders do participate in the procurement process: Our field teams observed numerous instances of local traders buying from farmers at below MSP but using the farmers' documents and accounts to sell at the PACS and claim payments from farmers at a later date.

e. Exclusions due to incorrect data: Some farmers in Odisha reported that their land was entered as unirrigated in the system, thereby reducing the volume they could sell to the state at MSP.

f. Exclusion of tenant farmers and sharecroppers: In Odisha, although the state government has put in place a system for tenant farmers and sharecroppers to be able to register in the paddy procurement process, subject to verification by district agricultural officers, in practice, high transaction costs in obtaining the verification certification has led to their continued exclusion from the procurement process.

g. Quality deductions, over and above FAQ, are negotiated at the procurement center: In Odisha, in all three districts, our teams noted a marketing-center process where the Regulated Marketing Committee RMC or Large Area Multipurpose Society (LAMPS) official made a standard deduction for quality (known colloquially as katni-chhatni) in consultation with local millers. Only in Sambalpur did farmers participate in this decision. This figure varied from center to center (e.g., it was 2 kg per quintal in one center and 4 kg per quintal in another). Since the rate for FAQ paddy was set at Rs 1,750 and could not be procured under this price, this was the way in which millers compensated for below-FAQ paddy by deductions in weight. This meant that even in government sales, the actual price realized was often below the MSP.

5.6 Paddy procurement in Punjab: The problem of direct payments

In Punjab, the mandi-level procurement operations for both paddy and wheat are entirely handled by the commission agents known as arhatiyas. Given the high volume of arrivals and the multiple field-level coordination challenges (from space to gunny bags, labor, storage, transportation, and payments) the overall process is stressful and conflict-ridden. The arhatiyas play an important role in buttressing this entire process for which they receive weekly payments from the state procurement agencies. From these monies, they are expected to deduct their commission (2.5% per transaction) and disburse the remaining amount to farmers' bank accounts. In practice, since most arhatiyas maintain long-term relationships with farmers, often involving some amount of credit advanced, they may make further deductions before settling payments with farmers. In many cases, arhatiyas also make at least partial, if not full, spot payments to farmers in the peak procurement season.

For over a decade, the central government has been trying to bypass the arhatiyas and make payments directly to farmers with little success. However, in advance of the KMS 2019–20, the Center put pressure on the Government of Punjab to implement a Public Finance Management System (PFMS) for direct payments to farmers for paddy procurement against the strong arhatiya lobby by holding back payments for the previous Rabi Marketing Season (RMS). The arhatiyas initially went on a strike during the first week of paddy procurement to sabotage the move under which they were required to upload farmers' bank details on the PFMS. The arhatiyas would separately be paid the 2.5% commission in their bank accounts for cleaning and other mandi-related services supplied.

Out of the 22,000 active commission agents in the state, 6,314 had registered themselves on the PFMS for KMS 2019–20. Most of the arhatiyas did not upload farmer details, stating that farmers are unwilling to supply personal information like bank details, which resulted in the Center holding back their commissions. The state procurement agencies were responsible for training the arhatiyas on the use of PFMS software and assisting them in uploading the bank account details of the farmers and linking them with arhatiya bank accounts on the PFMS. The government released 33% of MSP payment via the PFMS during paddy procurement.

The partial implementation led to a relaxation of the use of the PFMS in KMS 2019–20. The Center has made it clear that no such relaxation will be offered for the upcoming wheat procurement and payments will be made directly into the accounts of 16.5 lakh farmers. In case Punjab does not implement the system, procurement charges running up to Rs 3,000 crore will not be

released by the Center, which the cash-strapped state is not in a position to bear.

Meanwhile, the State Food and Civil Supplies Minister has assured the ***arhatiya*** lobby that agriculture is a state subject and they will make the necessary modification to the PFMS to retain their role. Simultaneously, the Punjab Agricultural Produce Markets (General) (Amendment) Rules, 2020, does require arhatiyas to make payments to farmers via electronic transfer as soon as the weighment is over for any amount over Rs 10,000 that a farmer receives in a calendar year. As of now, over 40% farmer accounts have been registered for RMS 2020–21.

The Covid-19 crisis has now cast extraordinary uncertainty over the upcoming RMS 2020–21 wheat procurement operations, and as it stands now, the PMFS implementation and plan for direct payments has been put on hold as the state moves into emergency planning to secure the wheat harvest using existing systems.

5.7 Market failure, risk, and rice

At one level, rice production in India represents a successful face of India agriculture. India's rice output rose from about 20 million tons (MT) in 1950–51 to 54 MT in 1990-91 to 116 MT in 2018–19. In this period, while population increased 3.6 times, rice production rose almost sixfold.

However, from a different view, the massive growth of rice production is also a failure of Indian agriculture. India now produces much more rice than it can consume. Not only is some of this rice wasted but also its production, storage, and distribution impose a heavy cost on the public exchequer. Furthermore, its production is causing increasingly negative environmental externalities, ranging from rapid depletion of groundwater tables, pollution from stubble burning, degradation of soil quality, etc. [7]

Why does India grow so much paddy, much more than it needs for domestic consumption, even as fiscal and environmental costs mount? An important factor appears to be public procurement, which keeps paddy production sub-optimally high. However, since public procurement of paddy varies significantly across states and districts, why do farmers continue to grow large quantities of paddy, even in states and districts where public procurement is absent, as is the case for most farmers in our study states of Bihar and Odisha? [8]

Our explanation centers on perhaps the most salient structural feature of agriculture: risk. Farming is a profession of hope—hope against a cornucopia of risks, be it weather, pests, plant diseases, and input and output prices. Since a farmer's income depends on the price and quantity of the crop produced, the underlying risk to it comes from two sources. First, how robust is the expected yield to production shocks (e.g., weather shocks)? Cereals, for instance, are more robust to weather conditions than oil seeds and even more compared to vegetables. Consequently, they are likely to give farmers a more assured yield. Second, how pervasive are incomplete markets, both spatial and temporal? When markets are not integrated spatially and temporally (in the sense of the existence of well-functioning insurance and futures markets), prices are subject to greater annual variability, increasing the farmer's uncertainty about his potential income.

Drawing on related economic research on the subject, this section argues that risk aversion is the key reason why farmers in India continue to grow paddy even in places where there is little procurement. We use district-level data over half a century (1966–2015) on crop production and farm-harvest prices to show that

i. rice has one of the lowest levels of yield as well as price volatility among 18 other crops in the last 50 years and

ii. during this period, the share of cropped area has increased for those crops that have the lowest yield risk in specific agro-climatic zones. This implies that rice becomes an obvious candidate for a risk-averse farmer trying to minimize unexpected shocks to his future income.

5.6.1 The recent evolution of rice cultivation in India

Before the Green Revolution, rice was mainly cultivated in the coastal belts of the country (see figure 5.2. Following the onset of the Green Revolution, the cropped area under rice started increasing in the central and north-western parts (see figures 5.3, 5.4). Figures 5.2, 5.3, and 5.4 plot the share of rice in gross cropped area. The figures visually under-represent the importance of rice in Punjab, Haryana, and the Gangetic belt as compared to the eastern districts in Odisha, for example, because although Punjab and Haryana have year-round cultivation of crops, many eastern districts are left fallow in the *rabi* season.

The spatial growth of rice cultivation represented by the district-level average annual rate of growth of cropped area under rice cultivation is shown in Figure 5.5. We can see that in the last half- century, the largest increases in rice cultivation have been in the north Indian states of Punjab and Haryana (figure 5.5). Here the story is a familiar one. The Green Revolution pushed through the provision of high-yielding variety (HYV) seeds, assured supplies of irrigation (initially canal but increasingly tube well), and guarantees of rice procurement by public

[7] See, for example, S. Chatterjee, R. Lamba and E. Zaveri (2017), "The Water Gap: Environmental Effects of Agricultural Subsidies in India," *Working Paper*; R. Barker, D. Dawe, T.P. Tuong, S.I. Bhuiyan, L.C. Guerra (1998), "The Outlook for Water Resources in the Year 2020: Challenges for Research on Water Management in Rice Production," in *Assessment and Orientation towards the 21st Century, 19th Session of the International Rice Commission, Cairo, Egypt, 7–9 September 1998*. Rome: FAO, pp. 96–109; S.K. Lohan, H.S Jat, A.K. Yadav, H.S. Sidhu, M.L. Jat, M. Choudhary, and P.C. Sharma (2018), "Burning Issues of Paddy Residue Management in North-West States of India," *Renewable and Sustainable Energy Reviews*, 81: 693–706.

[8] S. Chatterjee and D. Kapur (2017), "Six Puzzles in Indian Agriculture," in India Policy Forum 2016, Vol. 17, p. 13.

agencies. However, we should note that the growth of rice is not limited to these two states. Many parts of Uttar Pradesh, Bihar, Jharkhand, and Andhra Pradesh have also seen increases in cropped area under rice. To understand this, we use historical data to learn about crop choices and associated risks.

Share of Gross Cropped Area under Rice
1966-1970

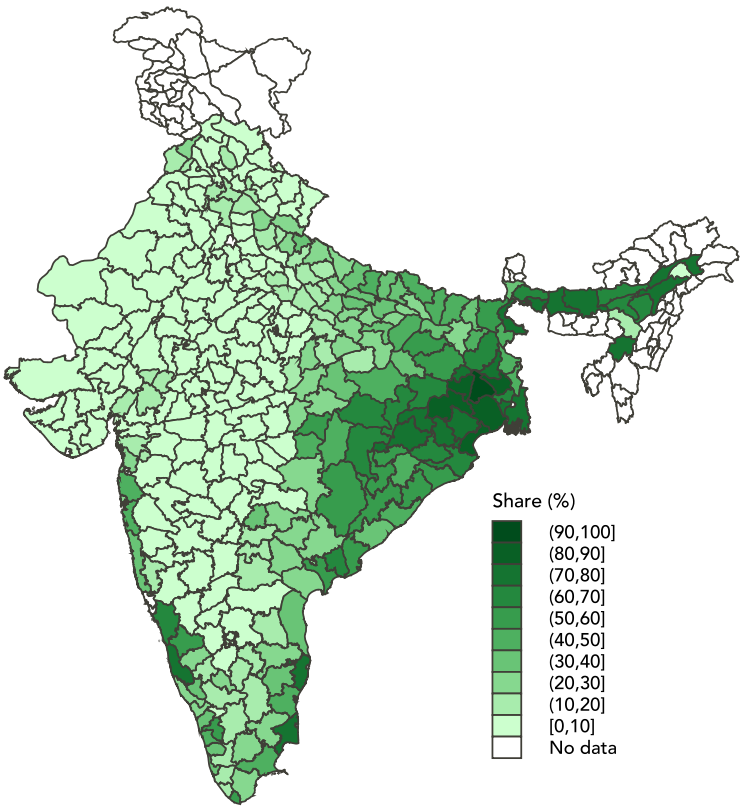


Figure 5.2

Share of Gross Cropped Area under Rice
1986-1996

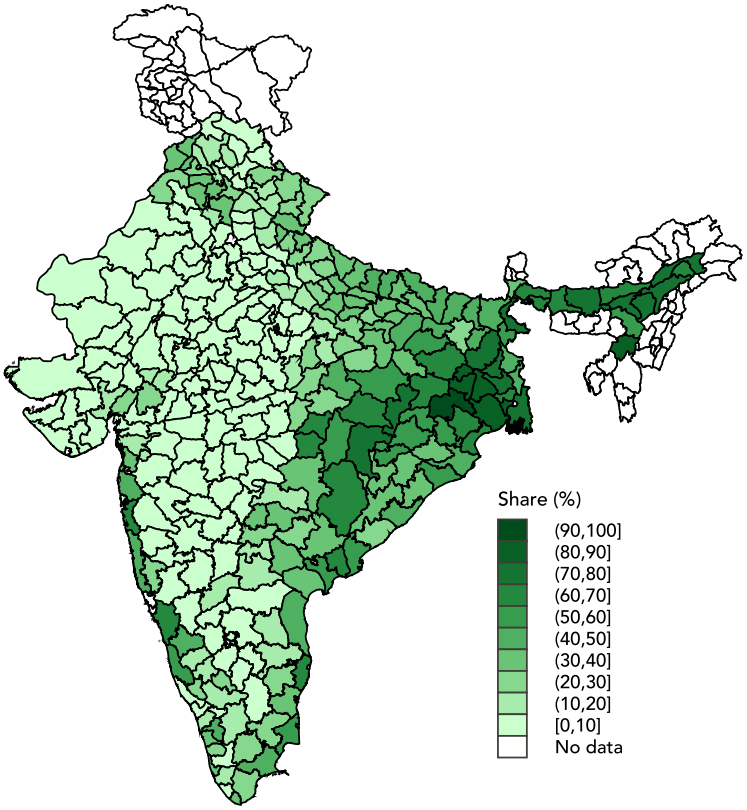


Figure 5.3

Share of Gross Cropped Area under Rice
2006–2015

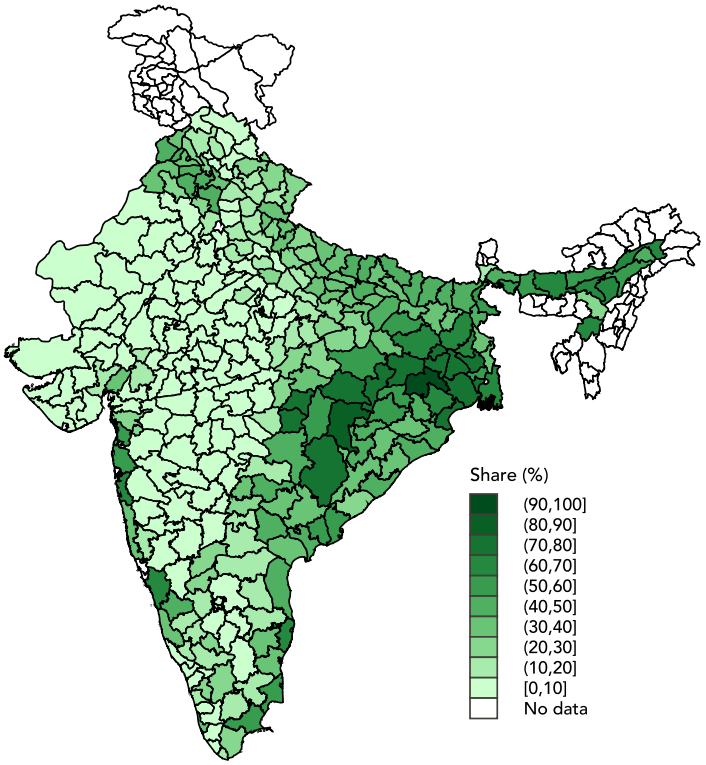


Figure 5.4

Annual Rate of Growth of Rice Cropped Area
1966–2015

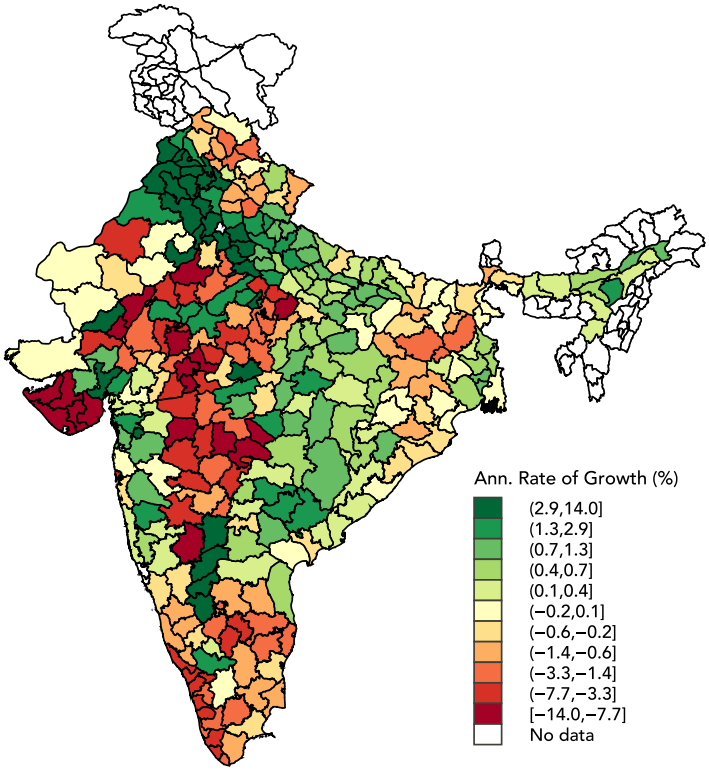


Figure 5.5

5.6.2 Risk in crop cultivation

When risk-averse farmers choose which crops to grow, they want to maximize returns while minimizing uncertainty on expected returns, conditional on agro-climatic suitability (which would affect average crop yields). The returns depend on productivity or yield of the crop chosen and the post-harvest price realization. The uncertainty over expected returns

depends on the volatility of productivity, which in turn reflects a crop's sensitivity to weather and other production shocks (such as pest infestations). It also depends on the volatility of post-harvest market prices, which is a function of the completeness of markets, both spatial and temporal. In a spatially integrated market, for example, one that it linked to global supply chains, we would not see local prices respond to local supply or demand shocks as the world price would be the primary determinant of the local price. Temporal variability (over time), in such markets, will result from temporal variability in world prices. This variability can, however, be smoothened in the presence of thick (and accessible) insurance markets.

To study the risk associated with cultivating rice vis-à-vis other crops, we divide our half-century time period into ten quinquenniums, i.e., ten five-year periods. For each quinquennium, we compute the rank of rice as compared to 18 other crops, where a lower rank is associated with lower risk. The 19 crops available in the dataset are: barley, castor, chickpea, cotton, finger millet, groundnut, linseed, maize, mustard, pearl millet, pigeon pea, rice, safflower, sesamum, sorghum, soybean, sugarcane, sunflower, and wheat. [9]

The measure for yield risk is the coefficient of variation in the yield of a crop in the given quinquennium. The coefficient of variation adjusts for the average yields of various crops as compared to the standard deviation. Borrowing from the finance literature, we measure price risk as the average annual variance of the detrended price series. We compute both these measures—yield risk and price risk—for each crop, district, and quinquennium. Then for a given quinquennium and crop, we get the median (across districts) measure for the country, following which we rank crops in the increasing order of their risk—the lowest rank implies lower risk (figures 5.6 and 5.7).

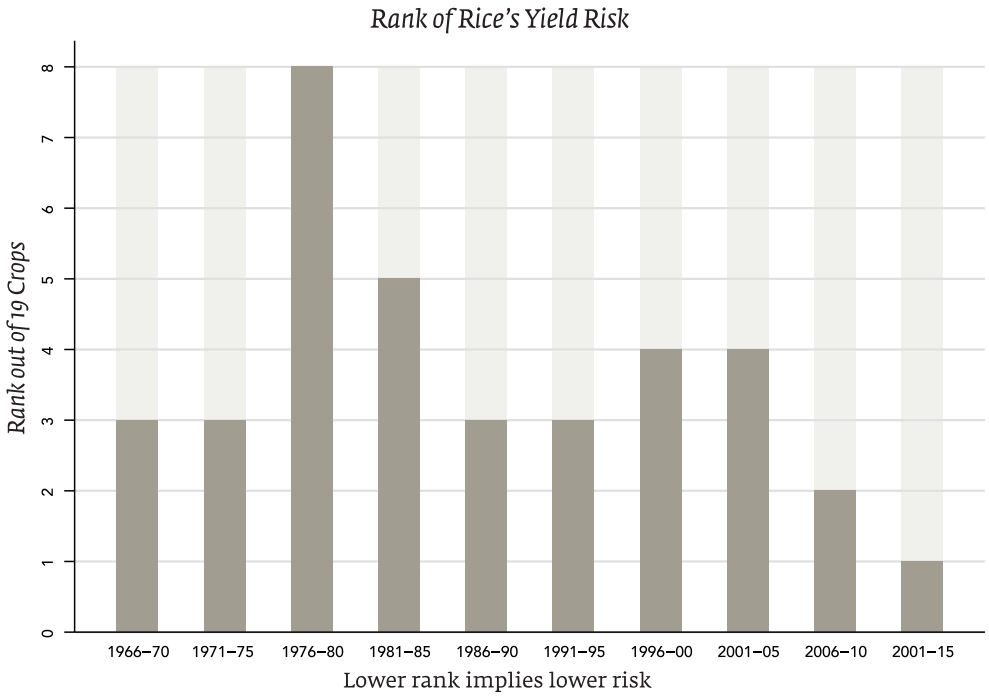
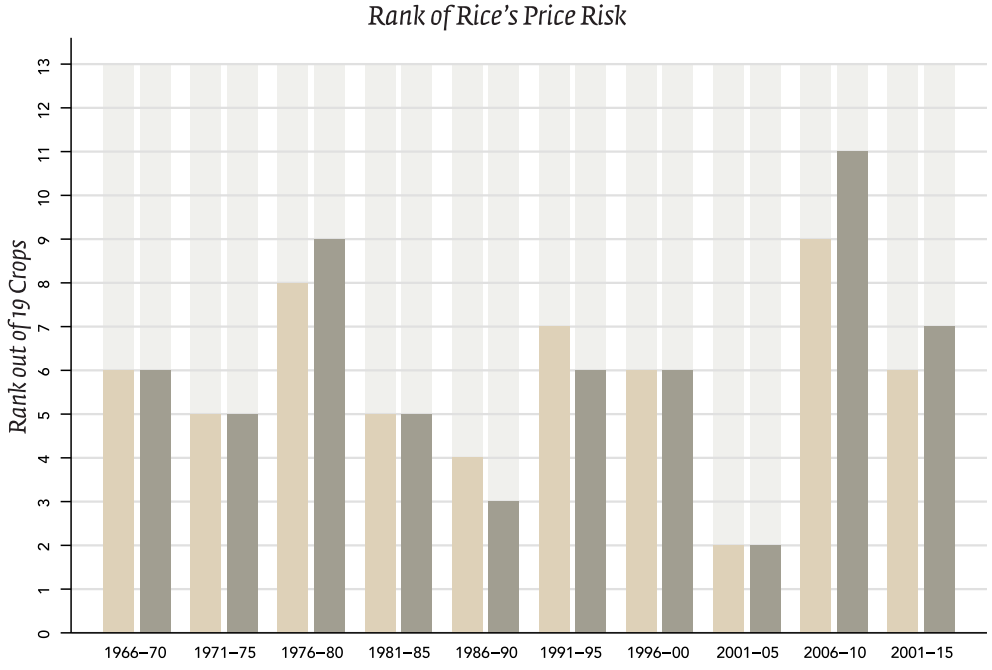


Figure 5.6



Gray bars exclude Punjab and Haryana. Lower rank implies lower risk

Figure 5.7

From figure 5.5, we can see that over the last 50 years, rice consistently has one of the lowest yield risks, and in the last 15 years of this period, it has the lowest risk among the 19 major crops. The rise in yield volatility in the period 1976–80 captures the jump that resulted from the initial adoption of HYV seeds. This essentially implies the robustness of rice to weather and other production-related shocks as compared to other competing crops. Similarly, figure 5.6 shows rice's lower risk in terms of price realization, ranking in the bottom third for most of the period. Since this can be explained in part by access to MSP, we also compute the price volatility excluding data from Punjab and Haryana, which are the main states for rice procurement. Even in states other than these two, we see relatively lower annual volatility in rice prices.

The combination of low yield risk and low price risk makes rice an attractive crop for farmers. However, a couple of other crops, notably sugarcane and maize, also share these attributes. But rice has an additional advantage over these crops. Notably it has a higher value for home consumption, which makes it a more desirable crop for farmers. The next section provides explicit causal evidence for this mechanism.

5.6.3 Implication for crop choices

To empirically test the relationship between risk and crop choice, we focus on how volatility in a crop's yield affects the share of cropped area for rice in a district. Note that since price and price volatility are endogenous, we will not estimate models which project crop choice on price volatility. We begin by showing that in the long run—over the last half-century—districts expanded the share under crops that had a lower yield risk. The unit of observation for data that generates figure 5.7 is a crop-district-year and we estimate the following long-run regression:

$$\Delta\theta_{cd}=\beta_1 \ln\mu^{y}_{cd}+\beta_2 \ln\Sigma^{y}_{cd} + \gamma_c + \gamma_d + \varepsilon_{cd'}$$

where

$\Delta\theta_{cd}$ = change in the share of cropped area in for crop c in district d between 1966 and 2015

μ^{y}_{cd} = mean yield of a crop c in district d over 1966–2015

Σ^{y}_{cd} = standard deviation of the yields of crop c in district d over 1966–2015

γ_c = crop fixed effects that capture unobserved crop-specific effects common to all districts that might influence crop choice such as national demand for the crop, pest resistance, etc.

γ_d = district fixed effects that capture unobserved district-specific crop-invariant effects like district- specific income levels, urbanization levels, cultivable land, etc.

The results of this regression are in figure 5.8. The x-axis is the yield volatility of a crop within a district over the 50-year period, while the y-axis is the change in the share of cropped area in a district over the same 50-year period. Instead of plotting the raw scatter plot, we show binned means that allows us to see the non-parametric relationship visually. It is evident that crops that had higher yield volatility lost the largest shares in cropped area in districts, i.e., share of crops with lower yield volatility increased.

Figure 5.5 shows that in contrast to districts in the North West and the Gangetic belt, central India, and Kerala saw a decline in rice production. How does this square with our argument above? The evidence is consistent with our argument, which is conditional on agro-climatic ecology. Small amounts of rice were grown for self-consumption in central India, which is relatively dry. Without irrigation (as in Haryana and Punjab), rice is a riskier crop in this agro-climatic zone, if the rains fail. As an all-India market for rice developed, along with a PDS system where rural households could get rice cheaply, farmers moved away from rice to crops that were more suitable for the region,

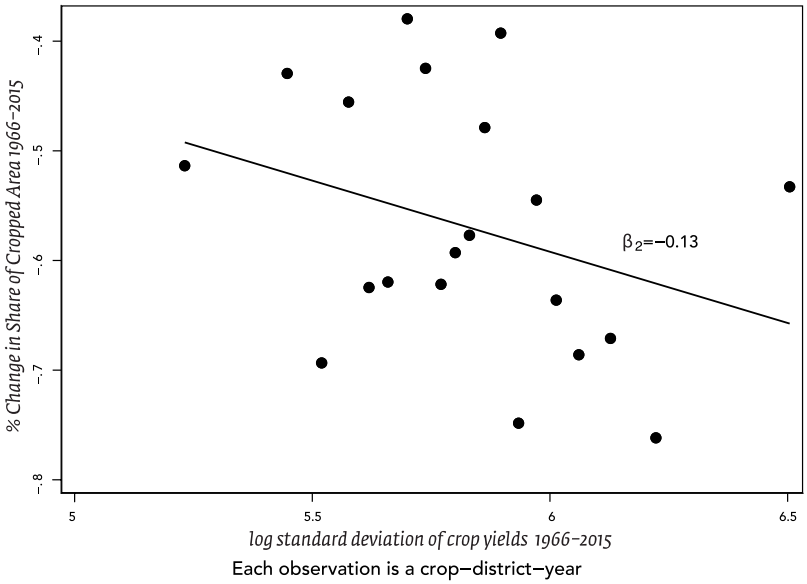


Figure 5.8 Long-run relationship between yield risk and cropped area

[9] For this chapter, we have used district-level data time series data on crop cultivation and farm harvest prices from ICRISAT. This data has been harmonized and apportioned to the 1966 districts, which facilitates the time series analysis.

such as soybean and wheat. Everywhere, farmers have been adapting and shifting to crops with lower production and price risks.

The long-run regression cannot control for all unobservable effects and hence we short-run variants of (5.1) at the decade level as follows:[10]

$$\theta_{cdt}=\beta_1 \ln\mu_{cdt}+\beta_2 \ln\Sigma_{cdt} + \gamma_{ct} + \gamma_{dt} + \gamma_{cd} + \varepsilon_{cdt'}$$

where

θ_{cdt} = share of cropped area of crop c in district d in decade t

μ^{y}_{cdt}= mean of the yields of crop c in district d in decade t

Σ^{y}_{cdt}= standard deviation of the yields of crop c in district d in decade t

We saturate the model by including crop-decade, district-decade, and crop-district fixed effects. These control for national crop-specific trends and persistent agro-climatic conditions that could bias the ß coefficients. In particular, the ß's are estimated by comparing the change in the average yield (for β_1) or yield volatility (for β_2) over time of a crop in a particular district. Since the change in average yield or yield volatility is exogenous to the farmer's choice, the ß's can be interpreted as causal estimates of increased mean returns and increased risk on crop choice. Results presented in table 5.4 confirm that increased risk reduces the share of cultivated area for that particular crop.

A 1% increase in the average yield of the crop led to an increase in its cropped area by 0.72% (β_1) compared to another crop with comparable risk. More importantly, a 1% increase in the yield risk (measured by decadal yield volatility) of a crop led to farmers decreasing its cropped area by 0.33% on an average compared to another crop with a similar yield.

Figure 5.4 Regression Table

VARIABLES	(1) Crop Choice
log yield	0.722***
	(0.155)
log sd(yield)	-0.334***
	(0.073)
Constant	3.028***
	(0.889)
Observations	19,043
R-squared	0.951
Crop-Decade FE	Yes
District-Decade FE	Yes
Crop-District FE	(0.007)

Note: Standard errors clustered by district in parentheses. *p<.05; **p<.01; ***p<.001.

In this section, we examined an important puzzle in Indian agriculture: why have the country's farmers persisted with growing paddy/rice as their principal kharif crop, even in regions with low procurement? Since most Indian farmers are very small and agriculture is a high-risk activity, we hypothesized that risk-averse farmers would chose to grow less risky crops ceteris paribus. We then provided empirical causal evidence showing that rice has one of the lowest yield and price risks over the last half-century compared to 18 other crops in India. As a result, farmers have switched to growing a crop that has the lowest yield risk. In addition, government procurement and rice's inherent value for home consumption provide implicit insurance.

5.7 Conclusion

When the government actively procures paddy at a floor price, it is essentially intervening in two markets. First, in the spot market, it provides the farmer with a higher than market price. Second, in the inter-temporal market, it reduces the relative risk of growing paddy versus other commodities.

If we are concerned only about today's farmers, then those who have access to the public procurement machinery unequivocally benefit both from a higher price and lower uncertainty in their income stream. Even when there is partial procurement, there are some spillover benefits to farmers who do not get to sell to the government. However, when there is limited procurement and the operation of the procurement process is left to local actors, the policy is regressive. The benefits accrue disproportionately to well-off farmers in the region as they have both more financial and political power to take advantage of this limited opportunity.

If, however, we take a long-term view that incorporates the welfare of future generations of farmers in India as well as agroecological sustainability, then procurement at MSP fares poorly. By providing a price floor in one crop, the government is actively not letting farmers respond to market signals. And by growing greater quantities of a crop whose domestic demand is slowing and which guzzles a critical life resource—water—the opportunity cost of its overuse is rising rapidly.

In principle, India's farmers could shift to growing crops that bring higher average incomes but are riskier, if they could hedge against those risks. However, missing insurance market keeps farmers from hedging risk. According to our survey data, the awareness of the Prime Minister's Crop Insurance Scheme (Pradhan Mantri Fasal Bima Yojna [PMFBY]) is limited at best. Only 41% and 27% of farmers in Bihar and Odisha, respectively, were even aware of PMFBY, while just 5.5% and 8.8% of all farmers in the two states actually used the PMFBY.[11] Although awareness is higher in Punjab (70%), the actual utilization of the scheme is negligible (0.3%), in part because the state government in Punjab had rejected the central scheme. The availability of free electricity for farmers in Punjab means that they already have an implicit insurance against drought and hence production risks. Furthermore, farmers in Punjab get implicit insurance on price risk from the MSP.[12] As long as

[10] This regression model was originally proposed and estimated on a smaller set of crops in T. Allen and D. Atkin (2016), "Volatility and the Gains from Trade," NBER Working Paper (No. 22276). National Bureau of Economic Research. Our results are similar.

[11] The statistics from our survey data are only representative for the study districts. We use the names of states for brevity.

[12] It is possible that farmers in Punjab have lower output and price risks and the indemnity level is not high enough to justify the premium. However, since our study did not examine crop insurance specifically, this is simply a conjecture.

agricultural markets remain incomplete temporally, paddy will continue to be a very attractive crop for farmers to grow.

Changing this dynamic is as essential as it is difficult. In addition to an entrenched political economy, our analysis points to two issues that need to be kept in mind when considering policy options. First, there is lack of clarity on the economic problem that MSP and procurement are trying to solve. What started out as an instrument to increase production morphed into the goal of keeping consumer prices low. More recently, increasing farmers' incomes has emerged as an additional policy goal. With a single policy instrument being used to target at least three policy goals, (a violation of the Tinbergen Rule) means that achieving any one policy target will inevitably preclude achieving others.

Second, since the vast majority of farmers in India are small, they are understandably very risk averse. Indeed that is precisely why, as the analysis in this section demonstrated, they have such a strong preference for growing paddy. Hence, any policy change must take a long-term view, with gradual phase-in and provide farmers viable options before reducing government support for policies such as MSP and procurement. The phasing is extremely important as it will allow various actors in the system, including farmers, to adjust gradually as they get more information and develop greater confidence in the new policy regime.

Nalanda, Bihar sharif- vegetable mandi

Chapter Six

Market Systems: Sites, Infrastructure, and Regulation

In previous chapters, we have presented analysis on the critical elements of market exchange and its implications for price realization by farmers. We also took a closer look at the role of Minimum Support Prices (MSPs) and the differential access to public procurement within and across the seven districts under study. In this and the following two chapters, we situate our findings on the terms and sites of exchange within a detailed understanding of the existing market systems in Bihar and Odisha, with a focus on market sites and regulation.

6.1 What is an agricultural market system and how do you study it?

By an **agricultural market system,** we mean the actual network of sites and institutions through which commodities flow ***based on price signals*** within the district via *processes of exchange* in a decentralized manner. It encapsulates both monetary and non-monetary (e.g., payments in kind) transfers between the full range of ***buyers and sellers*** participating in the agro-commercial system. But market systems also include other sites and institutions through which agricultural commodities are transported, transferred, and transformed (including sites of ***storage, processing, and distribution***), and they are responsive to not only the volume of ***commodity flows*** but also the timing and direction of *credit flows* and their relations. A system of markets can therefore be analyzed as a *set of prices* sending allocative decisions to producers and consumers and at the same time can be understood as a ***mechanism for accumulation and distribution*** of physical commodities and money in a local economy.[13]

Market systems are highly ***commodity-specific***, but they also evolve with the changing and interconnected relations of ***agricultural production, exchange, and consumption***. These relations are of course embedded in specific social (especially caste and kinship networks) and *political institutions*. They are shaped and reshaped by ***state policies, investment, and institutions***, especially by marketing ***law and regulation*** (including licensing and taxation), *government procurement policies* and processes, and investments in ***critical infrastructure*** (e.g., public roads, market yards, storage facilities, communication systems). *Shocks* to the system such as weather, demonetization, or the coronavirus will change the elements, relations, and flows such that market actors, institutions, and livelihoods will be reshaped.

Institutional diversity, complexity, and dynamism are intrinsic to the life of agricultural market systems. This is precisely why these markets are so difficult to empirically specify and adequately analyze. Reliable price data is available from only a very small number of sites of wholesale or retail exchange (and these prices rarely adequately specify commodity quality and variety), and ***costs and margins*** are exceptionally difficult to capture. Moreover, even basic infrastructural, economic, and social information about the key actors, institutions, and sites of exchange is not available, let alone an understanding of the relationships between different marketplaces and participants. Capturing and contextualizing the ***distribution of risks*** is an additional, often insurmountable challenge.

To address these challenges, we have drawn on detailed economic and ethnographic research conducted over the agricultural year. This included a combination of first-hand on-site observation, in-depth interviews, and the collection of historical, geographic, and economic information and insight from a wide range of market actors.

6.2 Illustrating system diversity: The case of paddy and rice

The ethnographic research has enabled us to develop a set of fine-grained commodity network diagrams that are able to analytically identify and map out dominant actors, sites, and channels, while specifying key relations at work at different levels.

A comprehensive set of commodity network diagrams and briefs are presented in Chapter 13 of this report. In Chapters 6, 7, and 8, we will draw on a selection of commodity case studies to illuminate critical aspects of the market system, especially with regards to regulation, intermediation, and the distribution of risk.

We will largely focus our attention on the dynamics of key non-paddy crops in Bihar and Odisha. But before we do so, and as we have already analyzed paddy markets in detail, let us illustrate the diversity of market systems across regions by taking a look at the three commodity network diagrams representing the marketing systems for this single crop—paddy—in Bihar, Odisha (Balasore), and Punjab (Hoshiarpur) (see figures 6.1–6.3).

[13] See Harriss-White, Barbara. 2008. *Rural Commercial Capital: Agricultural Markets in West Bengal.* Oxford: Oxford University Press, Chapter 2

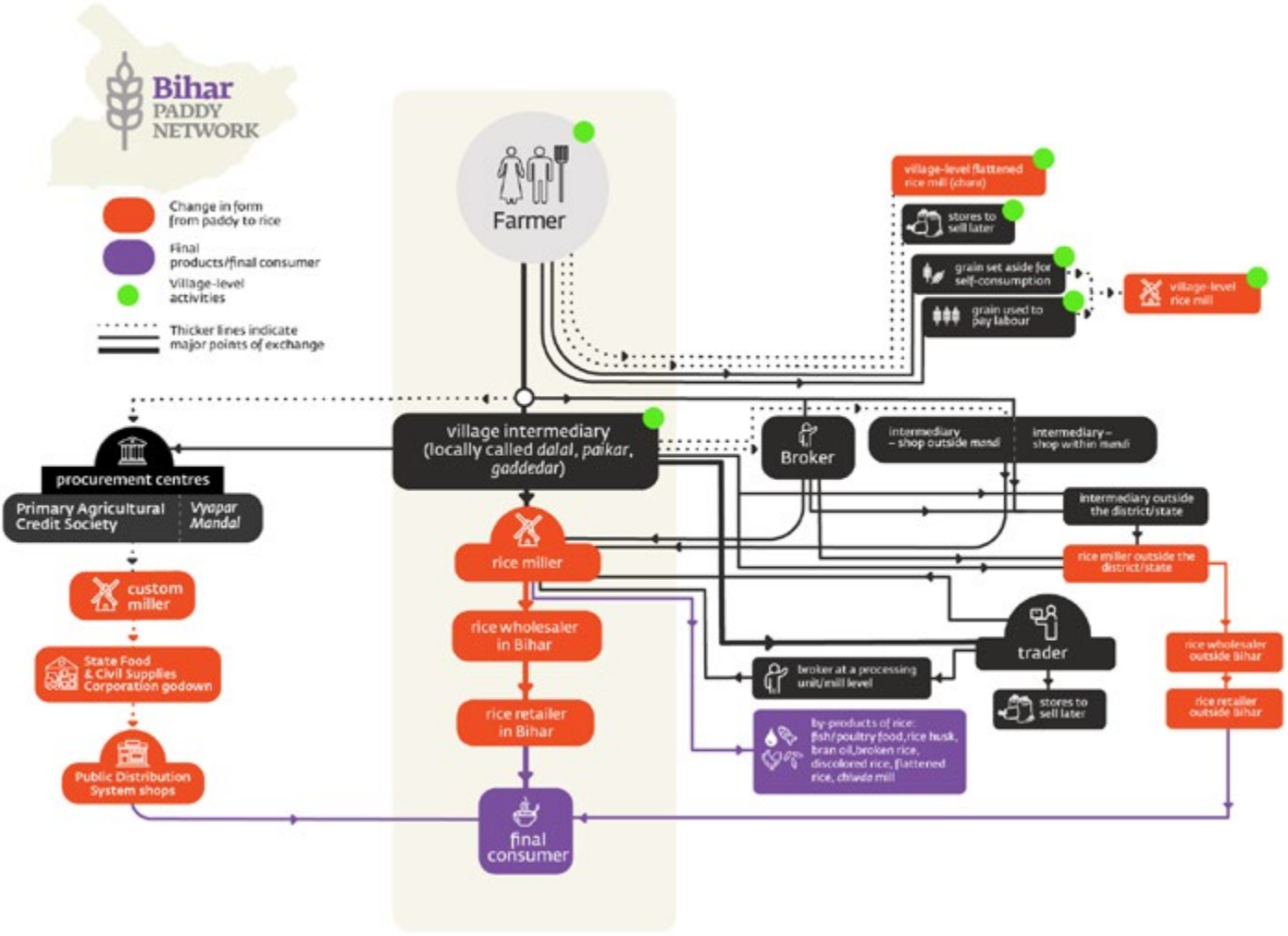


Figure 6.1: Bihar Paddy Network

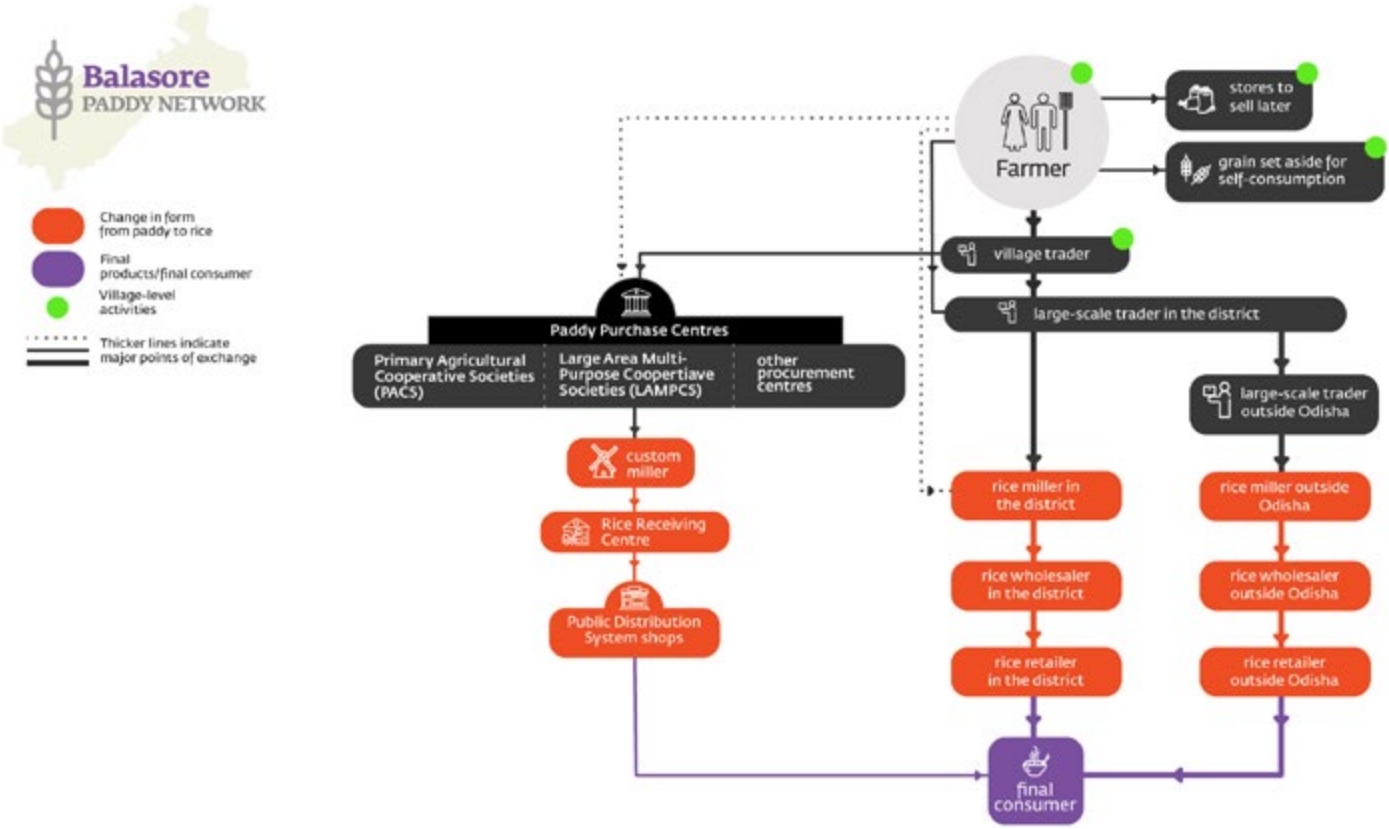


Figure 6.2: Balasore Paddy Network

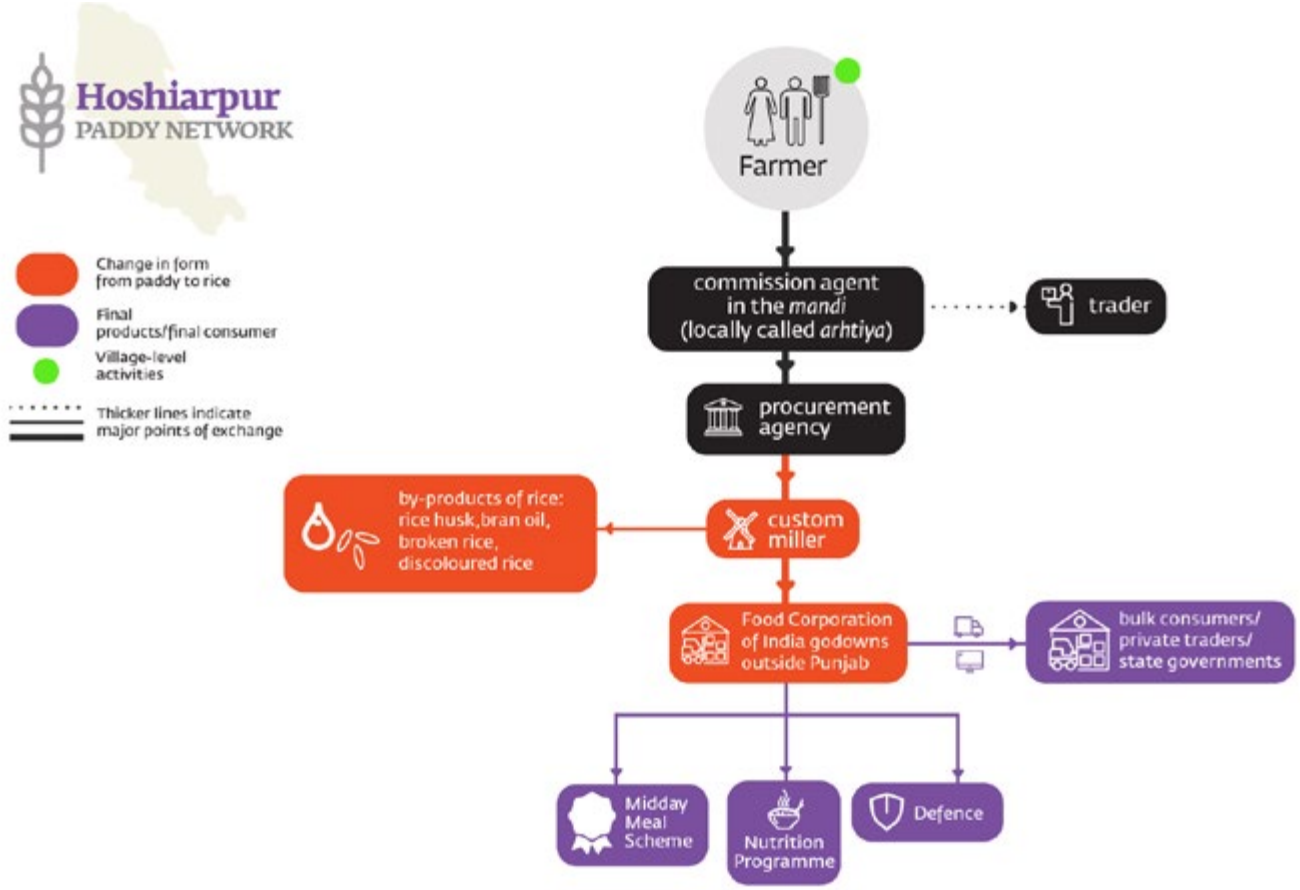


Figure 6.3: Hoshiarpur Paddy Network

It is evident from the figures 6.1–6.3 that the diversity of the commodity networks is dramatic and deeply consequential for our understanding of market structure and organization. We can clearly identify the impact of large-scale procurement in Punjab and the density of private exchange and trade in Bihar and Odisha. But even between Bihar and Odisha, we see much greater complexity and intermediation in the network diagram for Bihar.

We can further compare the paddy market systems within a single state—in a high-procurement district in Odisha (Sambalpur) with a relatively low-procurement district (Koraput)—and observe the differences both in terms of village-level exchange and in the presence and density of private markets for paddy, trading both within and outside Odisha. Here again, we can see that the network in Sambalpur (high procurement) is far more consolidated when compared to Koraput (low procurement), where there is a more well-developed presence of private channels of exchange (see figures 6.4 and 6.5).

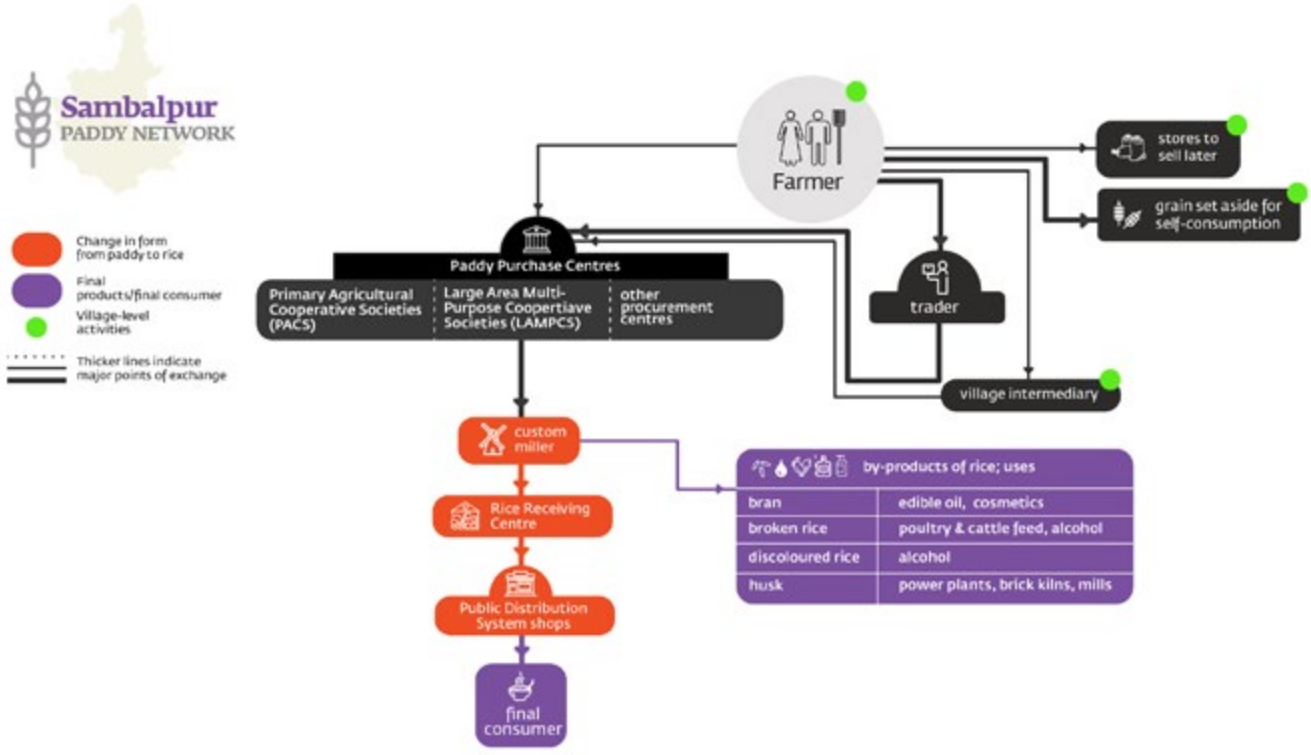


Figure 6.4: Sambalpur Paddy Network

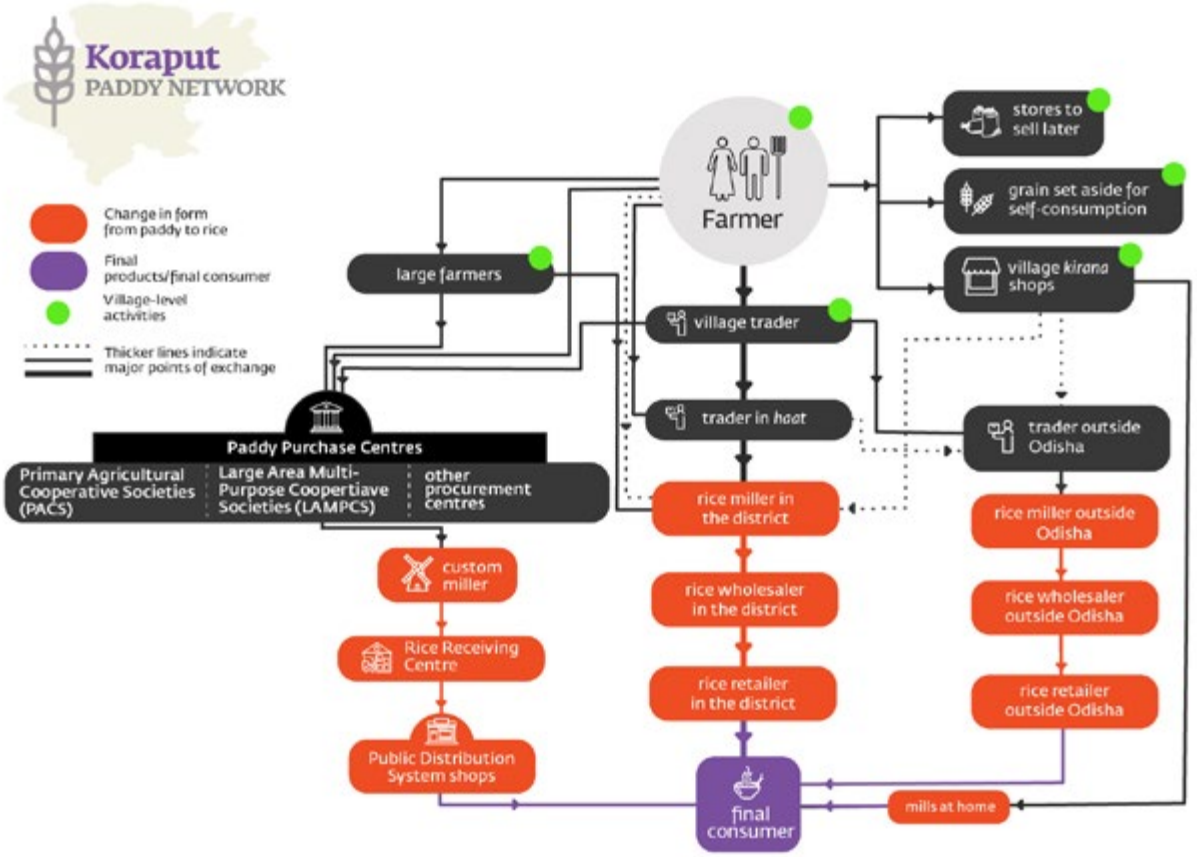


Figure 6.5: Koraput paddy network

While procurement is an important factor in shaping the network, the marketing system for agricultural produce is also influenced by the different systems of market regulation, both formal (state) regulation and "informal" regulation by private commission agents and traders. The dominant mode of regulation impacts the status and functioning of critical sites in the system (e.g., villages, ***mandis***, and mills). The rest of this chapter therefore focuses on the ***de jure*** regulation of markets and the ***de facto*** practices of regulation, and its implications for regulatory design and implementation in these states.

6.3 Market sites and regulation: Formal and informal

In India, the debate on agricultural market regulation and reform has largely revolved around the status and implementation of state-level agricultural marketing laws, commonly known as Agricultural Produce Marketing Committee (APMC) Acts. Over the last two decades, the Government of India has formulated Model APMC Acts (first in 2003 and most recently in 2017) to encourage state governments to amend their respective acts to enable direct procurement by private buyers outside the notified APMC mandi yards. In September 2020, after two decades of partial and uneven implementation of marketing reforms, three new central laws came into force, with implications for the manner and degree of State regulation over the exchange, storage, movement, and taxation of agricultural produce in India.

However, these reforms assume that the critical bottleneck impeding greater competition and better price realization for Indian farmers is monopolistic state-regulated market sites (APMC mandis). This assumption is akin to the assumption that the MSP and government procurement are a real presence on the ground for the majority of farmers in India.

The vast majority of farmers in Bihar and Odisha, as we can clearly see from the analysis in Chapters 3 and 4, sell their produce to traders at the village level itself, and that their transactions remain completely out of the direct purview of formal state regulation. Moreover, in these two states, even in the case of horticultural produce, where farmers are relatively more likely to sell in ***haats*** (local periodic markets) and in local mandis, we find that these sites also do not necessarily come under regulation by an APMC because Bihar, having repealed its APMC Act in 2006, has no state-level regulation in existence.

Odisha, which was one of the first states in independent India to adopt an agricultural marketing regulation act, does have an act in place. However, from its inception, Odisha's law allowed for a pluralistic market system with multiple licensing authorities, including private markets. So, although Regulated Market Committees (RMCs) do exist in Odisha, they have never been the only sites for exchange under the existing regulation. Further, in 2018, the state government officially dismantled market fee collection at check posts in notified market areas. As we can see from our analysis in the previous chapter, it is the government's paddy procurement policy rather than the APMC law that impacts the functioning of private trade and processing of paddy and rice. In other commodities, formal marketing law and regulation play a very limited role.

However, this does not mean that market sites in these districts are completely unregulated by the state (via market committees, panchayats, and municipalities). In addition, they are certainly regulated informally by local commission agents and intermediaries. What we see is diversity in regulatory actors and arrangements across different market sites. That regulation

usually implies the right to charge fees and taxes. Let us understand how this works on the ground in Bihar and Odisha.

6.4 Market sites, infrastructure, and regulation in Bihar

The maps below (figures 6.6–6.8) represent the major market sites in the three districts that we studied in Bihar. Detailed ethnographic research in selective sites further revealed the diverse regulatory histories and current arrangements at work on the ground and highlighted their implications for commodity trade. In particular, we highlight the critical importance of location (determined both by land availability for government sites and connectivity for private markets), the state of infrastructure and its maintenance (especially in light of deregulation), and the commodity- specificity of market sites.

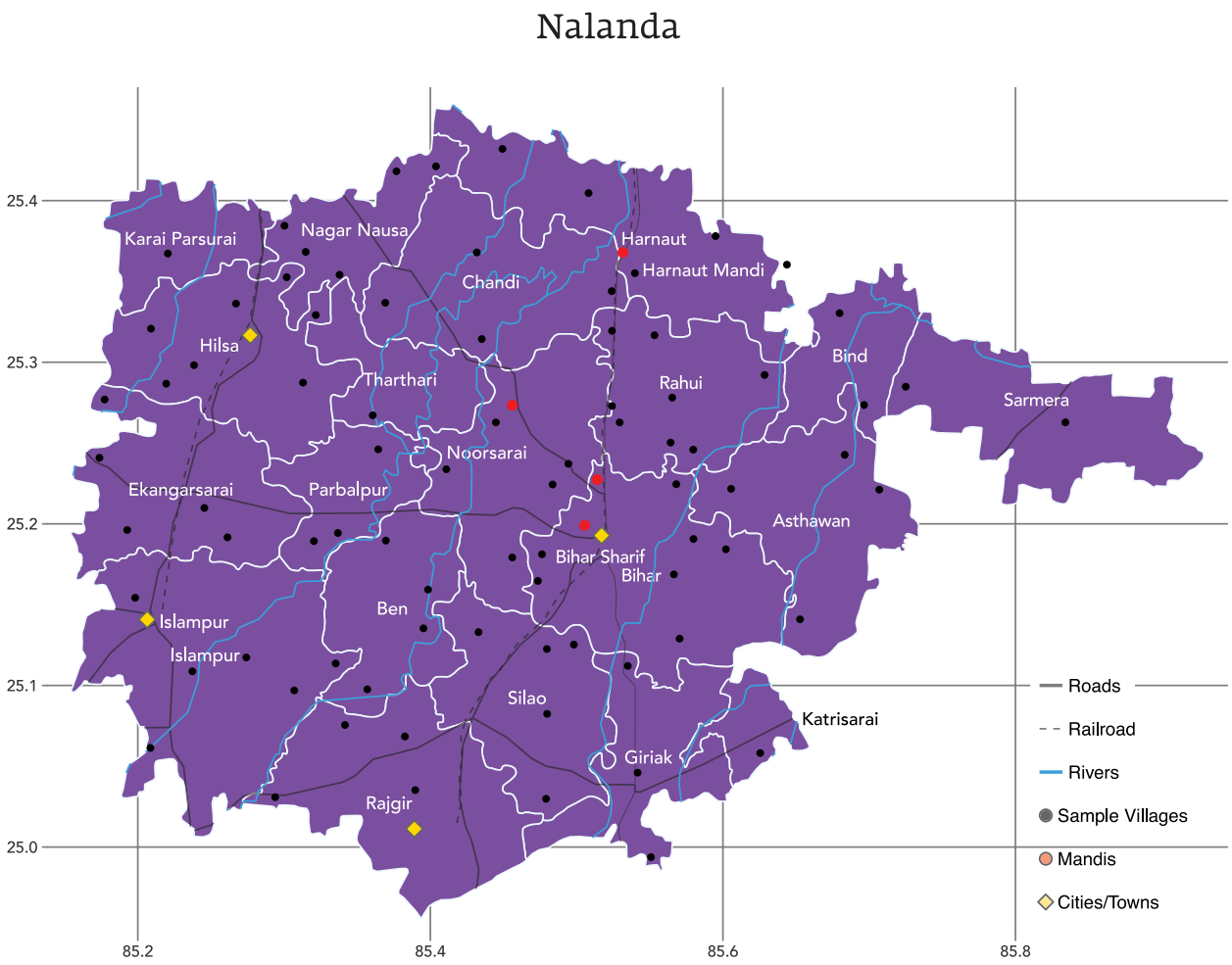


Figure 6.6: Market sites in Nalanda, Bihar

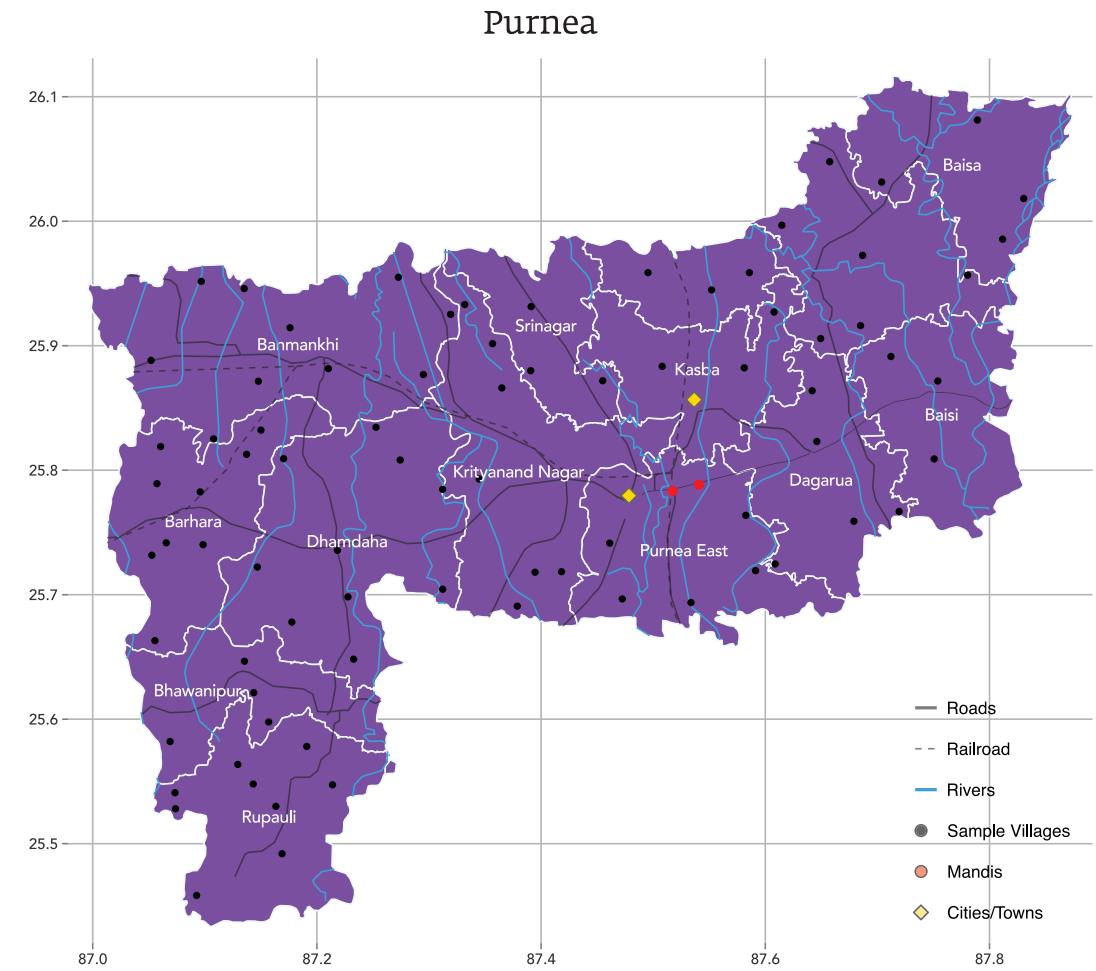


Figure 6.7: Market sites in Purnea, Bihar

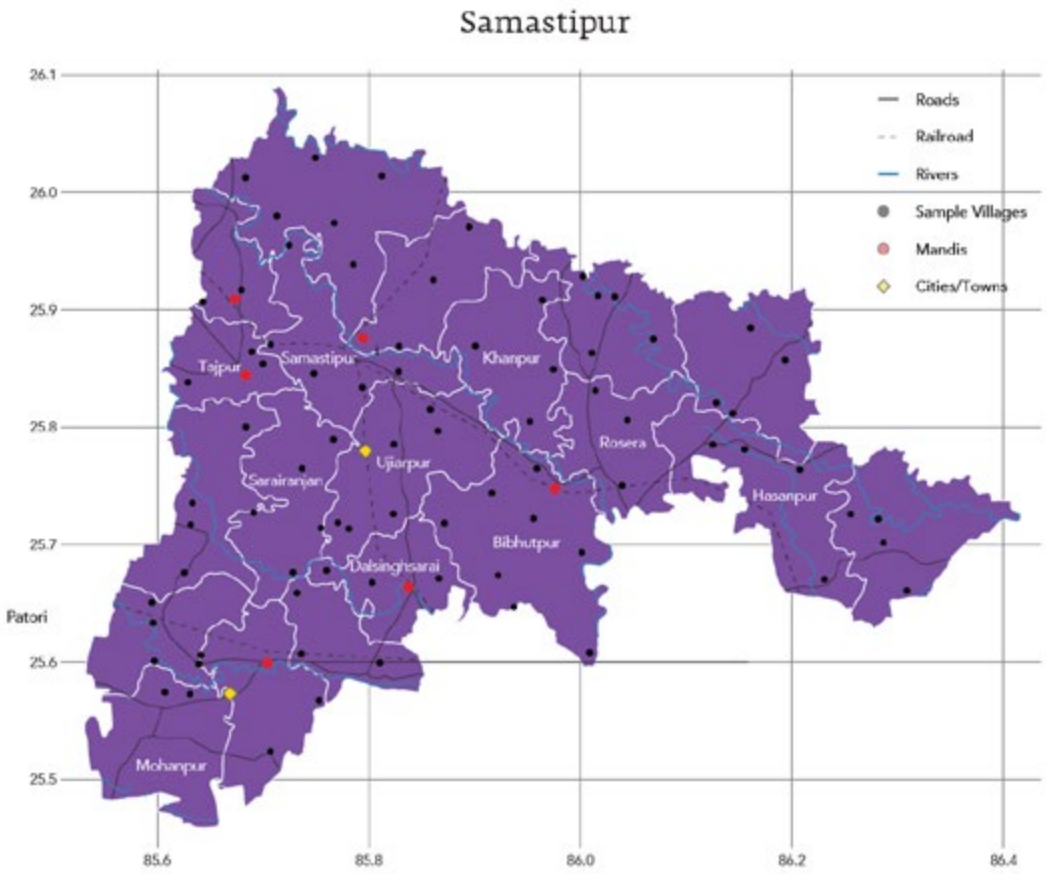


Figure 6.8: Market sites in Samastipur, Bihar

6.5 Major market sites

Three major market sites, **Gulabbagh mandi in Purnea** along with the **Bazar Samitis in Nalanda and Samastipur**, are the APMC mandis that earlier functioned as regulated mandis under Bihar's Agriculture Produce Market Act (APMA). Before the setting up of the Samitis, the empty plot in Gulabbagh served as a space for small farmers to sell their produce. Weekly haats were functional for cereals and horticultural produce. Due to the ready space available in the area, Gulabbagh was chosen as the site to set up the Samiti.

Gulabbagh mandi is spread over 56 acres today, and some of the infrastructure set up during the Samiti days (pre-2006) still remains functional. This includes a few leased-out warehouses, offices, and the restroom facilities. As the mandi grew, traders established their own offices. However, the rest of the infrastructure, including the mandi roads has seen no renovation in years. During the rains, the mandi becomes a swamp. While the traders collect Rs 50–100 fee per transaction in the name of mandi fee, the money is not ploughed back into infrastructure upgradation but goes towards donations for the temples surrounding Gulabbagh.

Both the Bazar Samiti sites in Nalanda and Samastipur have been occupied since the late 1990s and continue to function there at present. Both the mandis operate on low-lying lands which are prone to flooding and, hence, not fit for cultivation. The Bihar Sharif Bazar Samiti in Nalanda is located strategically close to NH-31, connecting the mandi to important urban centers like Patna, Kolkata, and Ranchi. Many of the first ***gaddidars*** (commission agents) at the present site include traders from the previous site of Bharaopar (located about a kilometer away and from the historic potato mandi of Nalanda in Soh Sarai. The mandi is today spread over 39 acres.

In Bihar Sharif, other than the 272 registered shops that have been set up with the permission of the Sub-Divisional Officer (SDO), who exercises administrative control over the mandi, there are 244 ***kaccha*** (unlicensed) shops built on the land that was earlier used for storage without the SDO's permission. These have been occupied after the repeal of the APMC Act. There are about 65 potato and onion *gaddis* (stalls) in the mandi, operating at varying scales. The grain traders function out of 20 shops. The rest of the shops are occupied by vegetable and fruit traders. Commission rates are standard at 3% for grain and 6% for vegetables and are only charged from the traders by the gaddidars.

The Samastipur Bazar Samiti is about 4 km away from the main town. The land on which the mandi functions is government-owned and spreads over 15 acres. The mandi is divided into fruit, vegetable, grain, and spice sections, the last occupying the largest area. The reason for this is Samastipur's place as an important spice trading center in Bihar. Before its cropping pattern shifted towards vegetables, Samastipur was also a large producer of spices. While the farmers have stopped the cultivation of spices, traders retain their contacts with spice suppliers from other regions of the country. There are about 50 vegetable gaddis in the mandi, mostly operating out of makeshift structures. In this market, the commission agents charge a 5% commission from the farmers in addition to charging commission from the traders.

The story of infrastructural disrepair, especially after the repeal of the APMC Act, is common across our study districts. The state of market infrastructure has declined in Bihar Sharif after the repeal of the Act. Erratic electricity supply, lack of functioning street lights, and improper waste management and drainage hamper the mandi's functioning. Many traders joke that the abandoned cattle that roam the mandi are the waste management workers of the complex. The problem of stagnant water and rotting vegetables hampers the functioning of the Samastipur Bazar Samiti as well. To deal with the waste, the traders have themselves created a system where they pay a daily fees of Rs 10 for clearing up of the waste.

The erstwhile Bazar Samitis in Nalanda, Purnea, and Samastipur now fall under the administrative control of the SDO. The role of the SDO includes rent collection, providing requisite licenses and permissions to traders who want to set up permanent shops, allotment of spaces to shops and warehouses, and maintenance of law and order. The SDO does not have any role in the conduct of auctions or in any market process. Across the three erstwhile Bazar Samitis we worked in, there was no initiative by the SDO to provide funds for infrastructure development or to regulate sale and purchase of produce in the mandis in any manner.

In Bihar Sharif, traders seem to occupy space to set up shops in the mandi on first-come-first-serve basis. When our team set up a meeting with the SDO, the officer had not heard of the APMC Act. The district administration certainly did not seem to have any plan in place for market development. Some traders (notably a prominent member of the Potato and Onion Traders Association) mentioned that for the last two–three years, word had gone around of there being a few crores in the SDO's kitty allocated for building infrastructure, but there had been no evidence of these funds being utilized. The SDO's office brought this up saying that Rs 9 crores have already been disbursed for construction of a proper drainage system and a *pucca* (cement) road in the market. However, in the one year that our team spent in the district, no infrastructural improvements took place in the mandi. In fact, a member of the fruits and vegetables sellers' association told us that after each monsoon season, all the shop owners pool money to fix approach roads in the part of the mandi where fresh produce is sold as these are most vulnerable to damage caused by flooding. What we did hear repeatedly was that the rents being paid by all permanent and temporary shops in these mandis should be reinvested in market development.

We were told by the traders we interviewed that the state government was planning specific interventions in market sites, especially from the point of view of infrastructure development, in order to harness the potential of these mandis to raise for the state coffers. However, we found little evidence to support this from other sources except for one news report from 2018, which reported that Rs 31 crore would be invested in the Bazaar Samitis of Purnea, Samastipur, Kishanganj, and Chhapra in order to build roads, drainage facilities, as well as waiting and parking areas. In January 2020, Chief Minister Nitish Kumar ordered an immediate renovation of the Gulabbagh mandi for which Rs 15 crore have been allocated.

The poor infrastructural conditions in the agriculture market sites in Bihar is emblematic of the difficulties of collective action in the absence of formal regulation. Although it is in the self-interest of all parties—traders, farmers, and district administration—to have decent infrastructure that improves the throughput of the market site and checks the health hazards from the poor conditions, this has not happened. A modest fee on transactions, with commensurate matching funds from the state government, would at least provide a decent foundation to make some investments, with representatives of farmers, traders, and the district administration taking collective decisions. But it appears that even self-interest is insufficient for collective action without the nudge of some central authority.

6.6 Horticultural markets sites

Moving away from the major markets known as the Bazar Samitis, we come to Soh Sarai mandi in Nalanda's Bihar Sharif, which is often described as the "first potato mandi of India" by its own traders, many of whom come from families that have been operating in the mandi since 1952. Between 1960 and 1980, it was a major potato mandi. It also has a number of onion gaddis. Similar to the Samastipur Bazar Samiti, which switched its operations to function at night to deal with large trading volumes of ***rabi*** vegetables, Soh Sarai also operated as a night mandi for potatoes, which used to be supplied all the way to Myanmar. When the Bazar Samiti was first set up in Bharaopar in 1989, many Soh Sarai gaddidars decided to relocate, with permanent spaces being given to them for free by the state at the newly set-up site.

However, in recent years, trade in the mandi has vastly reduced due to the closure of previously existing train services, decline in potato cultivation, and the division of the sales of produce between Soh Sarai and the Nalanda Bazar Samiti, and, more recently, with trade shifting to the farmgate after the repeal of the APMC Act in 2006. Traders estimated that the volumes are now only 10% of what they used to be.

Samastipur is exceptional in the number of privately run mandis in operation in the district. Many of these mandis were functional before the repeal of the APMC Act in 2006. Even in the absence of formal state regulation, these markets have standard procedures that govern processes like weighment, quality assessment, price determination, payments, and dispute resolution. This is the result of senior commission agents and traders taking a lead in organizing and regulating market affairs to keep the marketplace active and functional.

Dalsinghsarai mandi, believed to be the largest vegetable mandi in the district in terms of volumes and number of traders, is one such mandi which was started in 1981. The mandi runs on privately owned land and the shop rents range from Rs 1,200–3,000 per month but can differ based on the gaddidar's relations with the landowner. To set up their shops, gaddidars need to make an initial deposit of Rs 2 lakh, which has risen from Rs 35,000 about a decade ago, a good indicator of the rise of volumes and profits. During our time in the field, many new gaddis were coming up in the mandi. Produce from here travels to neighboring districts in Bihar and also to Nepal.

A common feature of the Dalsinghsarai mandi and the Singhia Ghat mandi of Bibhutipur block (also in Samastipur) is the role of train connectivity. A part of the Singhia Ghat mandi functions on encroached railway land and a part on private land. The railway officials do an annual drive of pushing out the gaddidars who are quick to occupy the land once again when the officials leave. One can often see traders lining up on the railway platform before the train arrives to quickly load on their produce to travel to their trading locations. The railway line connects Samastipur to Saharsa district in Bihar.

There are around 45 gaddis in this vegetable mandi, which have been in operation since 1998. Before this mandi was set up, traders would go from village to village and to weekly haats to procure vegetables. This mandi, with easy accessibility through road and railway, has made the process of aggregation much easier for the traders operating in the area. The mandi transacts with Varanasi in Uttar Pradesh (UP) and with other districts of Bihar that lie along the railway line.

The gaddidars make rent payments for their shops set up on private land, which ranges from Rs 1,500–2,000 per month. Gaddidars make an initial deposit of Rs 1 lakh as a "membership fee" to the gaddidar union that offers credit facilities and dispute resolution mechanisms to its members.

Finally, one of the features that stands out in the market sites of Samastipur is the gender diversity. While it is uncommon to witness women traders in other districts, they are a common sight across Samastipur's mandis, functioning here as traders and retailers, taking produce to locations within and outside the state. In Singhia Ghat, we also met traders belonging to the transgender community. The gaddidars of the mandi were known for transacting with everyone who brought business.

6.7 Deregulation and market exchange

For farmers, our study reconfirms that not much has changed with the repeal of the APMC Act. In the case of cereals, farmers have traditionally sold in the village to traders and continue to do so. For horticultural produce, where farmers do have greater direct access to small, local mandis and haats, our research indicates that a number of the major horticultural markets in these districts were operational even before the repeal of the APMC Act, and their proliferation in recent years in more likely due to the increase in horticultural production in these districts rather than a response to the easing of regulatory restrictions on trade, although reverse causality could be possible.

As far as traders are concerned, most traders in these districts claim that the dissolution of the APMC Act has benefited them by doing away with unnecessary taxes, which do not get invested into the mandi's development. Multiple tax points across the state, it is reported, had also previously driven away their buyers and reduced profit margins. On the other hand, as trade has become further dispersed over the years, traders in the large erstwhile Bazar Samitis (such as Bihar Sharif) have seen reductions in business in terms of volumes and commissions flowing through the principal market site. Traders across these markets, but especially in the maize market in Purnea, also discussed the proliferation of brokers as a risk mitigation response in commodity trade. This phenomenon will be analyzed in chapter 7, with a specific focus on maize.

Finally, while smaller market sites are relatively satisfied with their specific self-regulatory practices, traders in the larger mandis in Bihar expressed significant concerns with an overall lack of market governance and accountability and the lack of proper grievance redress mechanisms for mandi stakeholders. Although considerably less frequent than in earlier years, we must remember that instances of extortion (which were routine under the previous political regime) still occur and that traders across all three districts have experienced and certainly know fellow traders who have endured physical attacks and incidents of kidnapping. Large traders have dealt with this situation on their own by hiring bodyguards.

6.8 Markets sites and regulation in Odisha

After independence, the Odisha Agricultural Produce Markets Act (1956) was among the first of such legislations to be enacted for market regulation in the country. The act regulates the sale and purchase of agricultural produce in market yards that come under the jurisdiction of the RMC. There are currently 65 notified RMCs in the state, with 428 market yards.

Under the act, the market yard may be set up on municipality or gram panchayat land. Along with regulation, the RMC is also responsible for fee collection in the market area. This fee is pooled into the Market Committee Fund. This fund may be used for acquisition of market sites, maintenance and improvement of markets, construction and repair works, market committee elections, and collection and dissemination of information and statistics on crops.

The act also makes a provision for private markets to be set up by any company registered under the Companies Act of 1956 or by a cooperative society. Such entities require a license from the state government to set up private markets. These markets may deal in all commodities except common varieties of paddy and rice. The act also has provisions for contract farming, whereby the contract sponsor must register with the RMC of the area. In 2017, the Odisha Agricultural Produce Markets (Amendment) Act added a separate clause on electronic marketing as well. Thus, the ownership and structure of agricultural market sites allowed under the act is quite heterogenous. Within the designated market areas under the jurisdiction of the RMCs, there are different kinds of market sites, with varying regulatory arrangements. These range from municipal markets and gram panchayat markets to village haats and farmers' markets.

In practice, however, we found that the RMCs in all three districts limited their role to overseeing government procurement of paddy and had little if anything to do with the active regulation of other primary commodity markets. The association with paddy procurement alone is so dominant that one initially assumed that RMC stood for Rice Marketing Committee! Millers and traders, moreover, confirmed that the RMCs in their districts lay largely defunct until the government initiated decentralized paddy procurement operations in the 2000s.

Prior to this, the state's absence from the scene meant that village-level paddy trade was completely in private hands. Agents of rice millers, functioning as village-level traders, were the primary buyers of paddy from farmers. Both farmers and traders recalled that in those years they were also a major source of credit for the farmers and the leverage that came from credit-based interlinkage was used to impose high quantitative rejections of paddy on account of moisture and other quality parameters by millers of up to an astounding 30 kg per quintal.

These arrangements persist in blocks with weak procurement infrastructure and systems. Even in Sambalpur, as we have seen, the strongest of the three districts in terms of the coverage of paddy procurement, access to procurement fell significantly as you moved outside the Hirakud Dam's command area. In rainfed Bamra block, in contrast, we observed farmers, even those relatively well- off such as members of the Agria or Agharia community, were selling paddy well below to the MSP to a village-level intermediary who would then transport the produce to the Keseibahal market yard for sale. The Keseibahal market yard, operationalized in 2015, has been ineffective in bringing farmers to the mandi (i.e., procurement center) due to its sparse procurement facilities. Similarly, in rainfed Jamadarpali, an unirrigated village in Dhankauda, farmers sold their single crop of kharif paddy to an intermediary who gave the farmers a rate between Rs 1,500–1,600 per quintal and sold their produce at the Rs 1,750 MSP in the Sason procurement yard at a distance of 10 km from the village. We have described the dynamics of inclusion and exclusion in paddy procurement in detail in the previous chapter.

Beyond the village, the regulation of market sites in Odisha's districts reflects the plurality of arrangements allowed under the state's marketing act with a variety of local bodies, including municipalities and gram panchayats, involved in the management and taxation of local commodity markets. They also reflect the importance of inter-state trade in Odisha's district market sites, where a large proportion of trade and exchange is based on "imports" and exports from and to other states for local-level wholesale and retail sale and distribution.

6.9 Markets Sites and Regulatory Authority: Case Study of Sambalpur

Sambalpur district is an excellent illustration of the multiplicity of regulatory authorities in place across agricultural market sites in the state, from major market yards to dynamic weekly markets.

6.9.1 Major market yards

Bareipali market yard, located at a distance of 5 km from the district headquarters, is the most important site of exchange in the district. It is managed and regulated by the Sambalpur RMC. The RMC charges a 2% fees to the commission agents in the vegetable section of the market and collects a nominal fee from farmers during the procurement season. The commission agents also pay annual and monthly fees to the RMC for storage and other market facilities. After the introduction of MSP- based procurement operations in Sambalpur, the market witnessed dramatic transformations in the availability of required infrastructure. Weighbridges and godowns were installed and constructed, and several rice mills came up within a kilometer's radius from the Bareipali yard.

Historically, commodity trade in Sambalpur has been dominated by the Marwari community. The Marwaris of Sambalpur first started trading in wage goods like wheat flour, rice, onion, and potato and later diversified and expanded to vegetables and other commodities.

Gol Bazar was officially established in 1954, but local traders point to its existence long before this date. The current infrastructure of the market was set up over the last two–three years after repeated fires ravaged the market site. The vegetables currently traded in Gol Bazar are sold in retail. Most of these vegetables arrive here from Raipur and Bhubaneswar. A very small amount comes from the district markets of Sambalpur like Padiabahal and Maneswar. The retailers of this market pay Rs 6 per day to a "private contractor." This contractor participates in an auction organized by the municipality. The money extracted from market fees is not reinvested in market development but is "pocketed" by the contractor.

The wholesalers who were originally in Gol Bazar are now commission agents in Bareipali's wholesale vegetable markets. Five out of ten commissions agents are Marwaris, three are from the states of Chhattisgarh and UP, and one of the traders is Muslim. One vegetable wholesaler is from the Sahu community in Odisha. Auctions are conducted in the Bareipali vegetable market, and traders from the neighboring districts of Deogarh and Jharsuguda participate in auctions and purchase from this market. Every commission agent has his own godown to store vegetables. Vegetables come from as far as Agra (UP) to this market. Within Odisha, Bargarh district remains the major vegetable supplier to Sambalpur.

What is to be noted is that even after the wholesale market for vegetables shifted to the Bareipali market, the wholesale market for potato, onion, and garlic is still in Khetrajpur, which is near Gol Bazar and is a Marwari-dominated area in Sambalpur.

The **Khetrajpur market** for potato, onion, and garlic is also largely dominated by Marwari traders and intermediaries. The commodities here come to the market site from Indore (Madhya Pradesh), Nasik (Maharashtra), and West Bengal. These commodities are rarely cultivated locally. Most of the traders in this market are migrants from Chhattisgarh and Jharkhand. Marwaris had migrated to this mineral-rich area in search of jobs about 60 years ago. They found Sambalpur to be worth investing in and started trading in diamonds and textiles, moved to oil and wheat, and now trade in onion, garlic, and potato. Most traders in the market have access to cold store facilities, which they either own them or rent. The Bareipali RMC has recently taken a decision to move this market due to the traffic congestion.

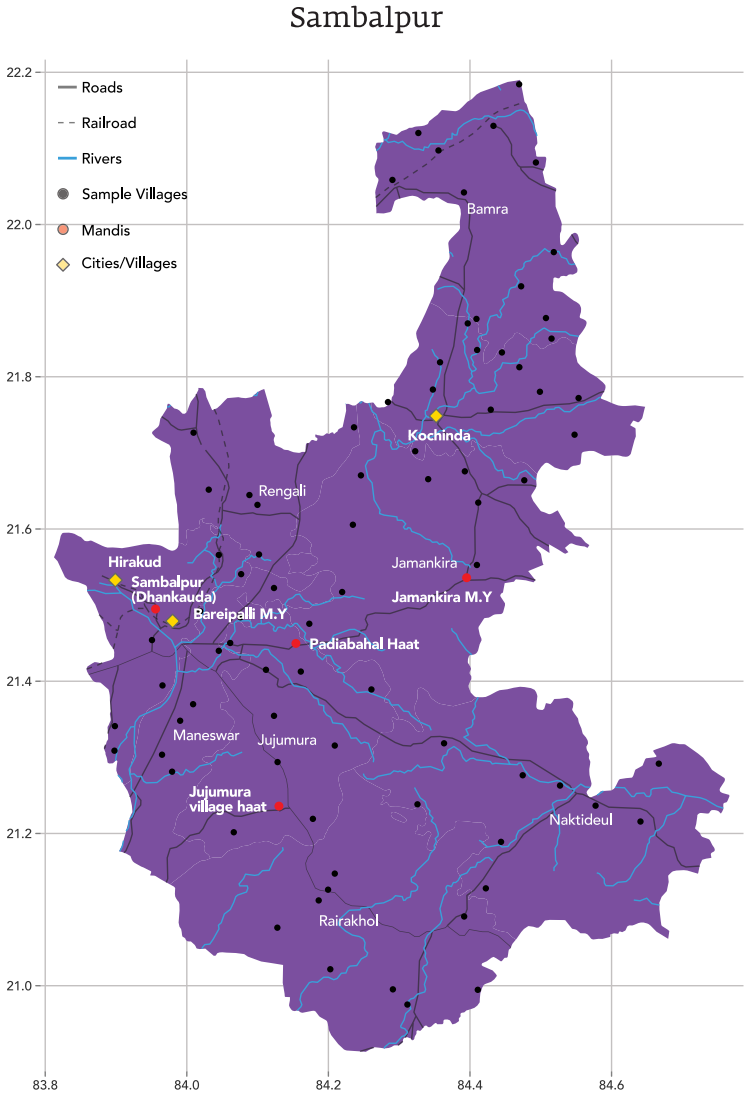


Figure 6.9: Market sites in Sambalpur, Odisha

6.9.2 Weekly markets

Sambalpur also has an active network of weekly markets across the district, especially in Jamankira, Maneswar, Rairakhol, Rengali, Padiabahal, Kuchinda, and Jujomora. These are primarily markets for horticultural produce and are typically sites for both wholesale and retail trade.

Each market functions under its own specific regulatory arrangement.

Jamankira weekly market used to be under the panchayat but in 2018 was taken over by the Kuchinda RMC for fee collection and infrastructural development. Earlier, the panchayat used to auction the right to collect market fees to the highest bidding "contractor." The contractor had to make a deposit into the panchayat's account by the end of the year. Any amount over and above the panchayat's share was the contractor's earning. Since the amounts being collected by the contractors had apparently become exorbitantly high, the panchayat willingly suspended the contract and passed on the regulatory function to the RMC. The RMC now transfers 40% of the funds collected to the panchayat and the rest goes into its own account. Officially farmers are charged Rs 10 per transaction, small vegetable traders Rs 20, and big shops Rs 30. Unofficially, small traders reported having to pay in the range of Rs 10 more than the required fee.

Located in close proximity to the block administrative offices, the Jamankira weekly market sees good demand and buyers come here weekly from Kuchinda block as well. Farmers and intermediaries also come to Jamankira from the high vegetable-producing area of Deogarh in the neighboring district. Local traders in Jamankira buy produce from Bareipali, where produce in turn comes in from Karnataka, Maharashtra, Chhattisgarh, Jharkhand, and the neighboring district of Bargarh.

The **Maneswar weekly market** also has a locational advantage. This vegetable market is situated on NH-55 heading towards Cuttack, bringing in traders from as far as Bhubaneswar. The market is believed to be half a century old and currently has approximately 60–70 trader stalls. The allotment of stalls is done on a first-cum-first-serve basis every week, unlike the arrangement followed in most other haats, where specific stalls are allotted to traders for a length of time.

The fee collection is done by a private contractor on behalf of the panchayat. The contract value for the year has been fixed at Rs 180,000 and the contractor has to pay 75% of this amount to the panchayat at the beginning of the year as security. The municipal corporation has set up some basic market infrastructure like cemented platforms and sheds in the haat; however, the traders have not yet shifted to this part of the market. They will soon be forced to do so when the construction of a new four-lane highway begins. As a result, the taxes charged from the traders in the market are going to be higher. It is unclear whether the regulatory authority is going to shift from the panchayat to the municipality when the shift takes place.

The **Rairakhol weekly market** is located in the middle of the district, which makes it a central meeting point for farmers from Rairakhol, Naktiduel, and Jujumora blocks in Sambalpur and traders from the neighboring Angul and Bargarh districts of Odisha. Most of the vegetable sellers are farmers from villages in a 35-km radius of this market. This is a vegetable market dealing in seasonal commodities. Some vegetables come in from neighboring districts.

In 2014, the Odisha government gave this market the status of "Krushak Bazar," assigning the authority of the market's regulation to the Rairakhol RMC. Until then, the Rairakhol RMC's operations were restricted to paddy procurement. The market is set up in the RMC premises. All the farmers and traders pay Rs 10 to set up their stalls. A receipt is handed to them which is put up for display at their stalls.

The "Krushak Bazar" has a lower market fee that is meant as an incentive for farmers, who were earlier demotivated by the high fees charged by the panchayat-appointed contractor. The benefits have not been restricted to Rairakhol farmers but have also encouraged Naktiduel and Jujumora farmers to participate in the market. They bring in their produce through private buses or small commercial vehicles.

The **Rengali weekly market** enjoys a wide geographic scope, with traders from other blocks and districts coming to the haat to trade. Traders from Jharsuguda buy produce from the haat to sell in Chhattisgarh. Intermediaries in the area in and around this market also go to the farmgate to purchase vegetables for sale in other districts including Khurda and Ganjam. There are approximately 70 stalls in this haat.

The market fee in Rengali haat is collected by the Rengali gram panchayat officials, who have hired employees for the collection of market fees. This panchayat got rid of the contractor system about four years ago as the contractor at the time failed to pay his dues. The tax paid by each stall depends on the amount of sales made in the case of agricultural produce. For traders of other goods, the fee is fixed.

The market is located on private land where no additional infrastructure can be set up. The panchayat has been on a look out for land to build proper haat infrastructure but is finding land in the area difficult to come by because of the high concentration of factories and industries. The area where the haat is located has a downward elevation due to which loading and unloading of produce has to be done strategically in non-elevated areas.

The **Padiabahal weekly market** for vegetables in Jujumora block receives produce from local farmers, including those living in Jamankira and Rengali blocks. The market itself is surrounded by vegetable-producing villages. It is one of the few markets within Sambalpur that supplies vegetables to the Sambalpur municipality and Gol Bazar retailers. The market is under a gram panchayat, which has given the fee collection authority to a "contractor," who collects Rs 10 per vendor. This market is located on either side of the highway and the upcoming four-lane highway construction here too is going to lead to a shift in its location by a few hundred meters. There are reports of a cold storage facility coming up in the vicinity

of the market.

The **Kuchinda weekly market** is a vegetable market with a good number of traders coming in from neighboring Deogarh. This market site has cement slabs under the shade of trees for exchange to take place. However, while farmers sell their produce in small quantities at the entrance of the market site, it is traders and non-locals who used the cemented slabs for their operations. The market is regulated by the Kuchinda panchayat and the fees range from Rs 10 to Rs 50, depending on the type and quantity of the commodity.

Finally, **Jujumora market** is a vegetable market for participants from Maneswar, Rairakhol, Jujumora, and Rengali blocks. The Jujumora panchayat invites people to an auction for the fee collection contract annually at the end of March. The current contractor has been the contractor of this market for the past 12 years. For this year, he placed the highest bid of Rs 1,80,000, of which 75% had to be deposited into the panchayat's account as security. The rest is to be deposited over the year before the next auction in March. This contractor also collects a parking fee for cycles (Rs 5), motorcycles (Rs 10), and four wheelers (Rs 20) in addition to market fees from small vendors (Rs 10), big vendors (Rs 20), and clothes and utensils vendors (Rs 50). The vendor categories are fixed based over the turnover of vendors to distinguish between big and small traders.

6.10 Conclusion

State regulation of agriculture markets or the lack of it is an important factor in shaping market systems. Bihar is a state where agricultural commodity markets are completely deregulated with no APMC Act in place. Odisha does have an APMC Act that allows RMCs and a wide range of other markets owned and operated by private actors and local authorities. In practice, state regulation plays a limited role in providing regulatory oversight in markets. Village exchange is completely outside the purview of formal regulation and even exchange in local weekly markets are not under any substantive formal regulatory authority. Market fee collection in some sites appears to be the only means by which one can observe a regulatory role for the state.

However, we note that regulation appears to be a significant determinant of the extent of investment in creating and maintaining market infrastructure, especially in Bihar. This will become even more evident in the subsequent two chapters. In Bihar, in particular, the repeal of the APMC law and the withdrawal of the state from the regulation and management of physical market yards has meant that there is currently no mechanism by which the state government can be held responsible for investing in critical marketing infrastructure. In its absence, private commission agents and traders do the minimum required to keep operations running, but overall market infrastructure at major sites has deteriorated after the repeal.

In Odisha, the APMC Act has always allowed a range of actors, in addition to RMCs to run market sites. As we can see, this has given rise to local markets (mostly periodic weekly bazaars) that charge a range of different fees and are managed by panchayats and their appointed contractors. In Odisha, there is little evidence that the market fees collected are reinvested in improving market infrastructure.

After the lifting of check points in Odisha and the repeal of the APMC Act in Bihar, neither state suffers from the problem of restrictions on who and where you can sell or buy agricultural produce, except for paddy in Odisha where the government's paddy procurement policy is interpreted as a "paddy control order," leading the extensive private trade to continue to operate but under a regulatory shadow. To this extent, agricultural trade in both states is relatively unhindered by regulatory restrictions and excessive fees and taxation. In other ways, they can be thought of as relatively unregulated and "free."

As a result, as we shall see in the next two chapters, what we have in place are complex commodity- specific networks of private trade and intermediation, well adapted to the production conditions, relatively efficient, but riddled with risks.

Purnea, Bihar- Commisson Agent Shop

Chapter Seven

Market Systems and Intermediaries: Case Study of Bihar

7.1 Introduction

As with market sites and their regulation, the story of intermediaries—their changing socioeconomic profile, their roles and scale of operations, and their collective power and associational life—varies significantly across states, districts, and commodity systems.

Moreover, we must once again confront the fact that actually existing agricultural marketing systems do not yield to stylized models and are characterized by complexity in activity and contractual diversity. Our findings concur with the long-term research of Barbara Harriss-White: "Trading firms may buy, sell, broker, store, transport, process, produce, finance production, and finance trade. There are two to the 9th possible combinations of these nine activities and there are other activities." Similarly, parties involved in agricultural markets also engage in a wide variety of contractual forms, "from spot contracts through advance, and/or futures agreements, attached, repeated or relational forms, to internal transfers."[14]

At the same time, across our sites, we did find it possible to identify and distinguish between three dominant economic actors operating at different levels of the district marketing system:

a. Village-level traders: These are local aggregators who operate in a small number of villages, buy directly from farmers on their own account, and sell to larger traders, processors, and the state. Strictly speaking, they should not be considered intermediaries but are the predominant first buyers of agricultural produce in Bihar and Odisha. However, given their status as petty commodity traders, they are often mistakenly categorized as intermediaries. They also have specific local names to signal that they are small-scale, itinerant traders (for instance, ***sahukar, paikar, or fadiya***), which distinguishes them from larger, fixed traders (***vyaaparis***). Village-level traders typically do not act as major lenders and the incidence of interlinked transactions (linking credit to commodity output) is relatively low at this level of exchange.

b. Mandi*-level commission agents:** These actors, known in Bihar as ***gaddidars and in Punjab as ***arhatiyas***, are intermediaries who operate between sellers (farmers or village traders) and buyers. They are responsible for facilitating market transactions and charge a fixed commission, either from both the seller and the buyer or just from the buyer. They function as spot financiers, paying the sellers in full or in part immediately, while their own dues are usually settled after a fixed (but often uncertain) period of time by the buyer, depending on the commodity (perishable/non-perishable) and type of buyer (miller, state agency, large trader, small retailer/vendor, long-distance party). Commission agents usually bear the up-front costs of labor, storage, handling, and transport from the point of transfer from the seller until delivery. Commission agents may also buy on their own account and engage in trading activities (wholesale, retail, or both). Commission agents are usually also creditors, although the scale and duration of their lending activities vary, and they may also be involved in input markets.

c. Brokers or *dalals*: These are intermediaries who facilitate exchange between sellers and buyers (usually between different trading firms or between traders and processors, but sometimes between farmers and large buyers). Market systems which have a stable group of commission agents operating in the mandis will have fewer brokers (e.g., Punjab), but where there is a large, dynamic market with many trading parties, both established and new entrants, brokerage activities proliferate (e.g., maize in Purnea). Brokerage works on fees, and unlike commission agents, brokers do not typically handle the produce but may deal with samples.

Overall, our research suggests that simplistic views of intermediaries as distortionary figures in agricultural commodity markets are well off the mark. Instead, we find that in complex wholesale markets for grain (and equally for other kinds of agricultural produce), "it is the presence of intermediaries and the different functions they assume that defines and characterizes the market."[15] At the same time, depending on the specific commodity market involved, our research reveals cases where market intermediaries exert considerable social, economic, and political power and represent deeply entrenched and organized economic interests.

Across the sites, the prevailing system of market exchange and intermediation has evolved in response to the existing conditions and relations of production (especially land, credit, and input markets), the need for and scale of agro-processing, and the dynamics of consumption. They are also shaped, stabilized, and disrupted by the changing relations and dynamics of particular agroecological, agro-commercial, political–economic, and infrastructural contexts. The pursuit of disintermediation without addressing these conditions and accounting for the vital and varied roles that the market actors known as intermediaries currently play is therefore futile and

[14] Harriss-White, Barbara. 2008. Rural Commercial Capital: Agricultural Markets in West Bengal. Oxford: Oxford University Press, pp. 26-27
[15] Vidal, Denis 2000. "Markets and Intermediaries: An Enquiry about the Principles of Market Economy in the Grain Market of Delhi". Dupont, Veronique, Emma Tarlo, and Denis Vidal [eds.]. Delhi: Urban Space and Human Destinies. New Delhi: Manohar, p. 128

misguided. Equally, we must understand and acknowledge the political economy of intermediation at work in each context. Institutional and regulatory interventions, especially in the domain of farmer-level output aggregation and exchange, as we will see later, must bear this in mind to have any chance of success.

In the following sections, we will present our analysis of market intermediaries in Bihar, drawing on both a survey of intermediaries and ethnographic research in the three study districts of Bihar.

7.2 The first layer of intermediaries: Village-level traders and agents

7.2.1 Sampling frame

In order to track and interview intermediary traders, we had to first build a list of intermediaries who were active in our study sites. For this, we asked the farmers in round 1 of the farmer surveys to list the potential traders/buyers of their crops. Then we arranged for the contact details of these traders from the village—asking farmers, the sarpanch, input dealers, etc. Later, when the kharif marketing season was nearing the end, we then approached every intermediary on our list for the survey. We had a response rate of about 90% and ended up with a sample size of 685 intermediaries—214 in Nalanda, 242 in Purnea, and 229 in Samastipur. Figure 7.2 shows that our data is fairly uniformly distributed across the different blocks of the three districts.

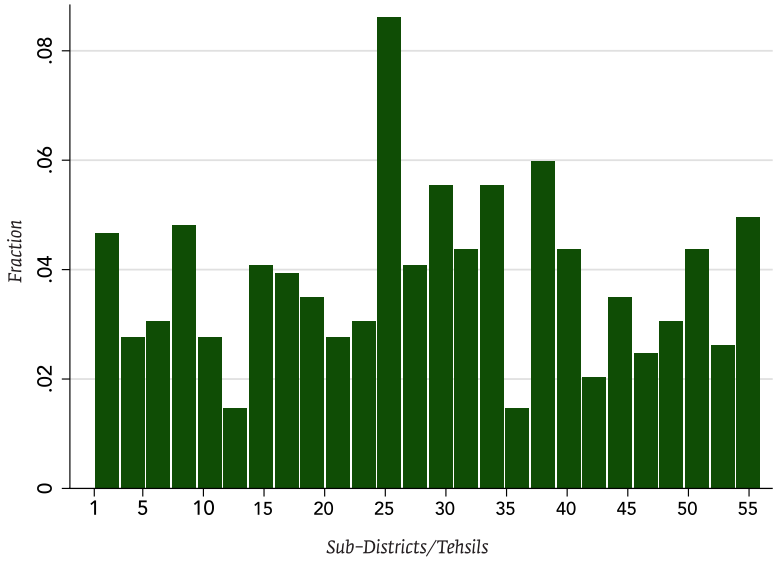


Figure 7.2: Distribution of the sample across sub-districts

7.2.2 Demography and economic status

Given our sampling technique, it is important to remember that we have captured, representatively so, a select set of intermediaries. Technically, any actor between the producer and the final consumer—commission agents, aggregators, traders, transporters, processors, retailers—are intermediaries. We have a representative sample of those intermediaries who are the *first buyers* of the produce of farmers in Bihar.

We interviewed a total of about 685 intermediaries in Bihar. Of them, 683 were men, mostly Hindu (88.6%) and the rest Muslim. The distribution of religion matches closely with that of the farmers in the sample, who are 89.5% Hindu and the rest Muslim. An overwhelming majority of both farmers and intermediaries are Other Backward Classes (OBCs). Although the percentage of farmers who are Scheduled Castes (SCs) and of the general category are marginally higher than their representation in the segment of actors who function as intermediaries (see figure 7.3). The intermediaries are also relatively young, the median age being 41 years (see figure 7.4).

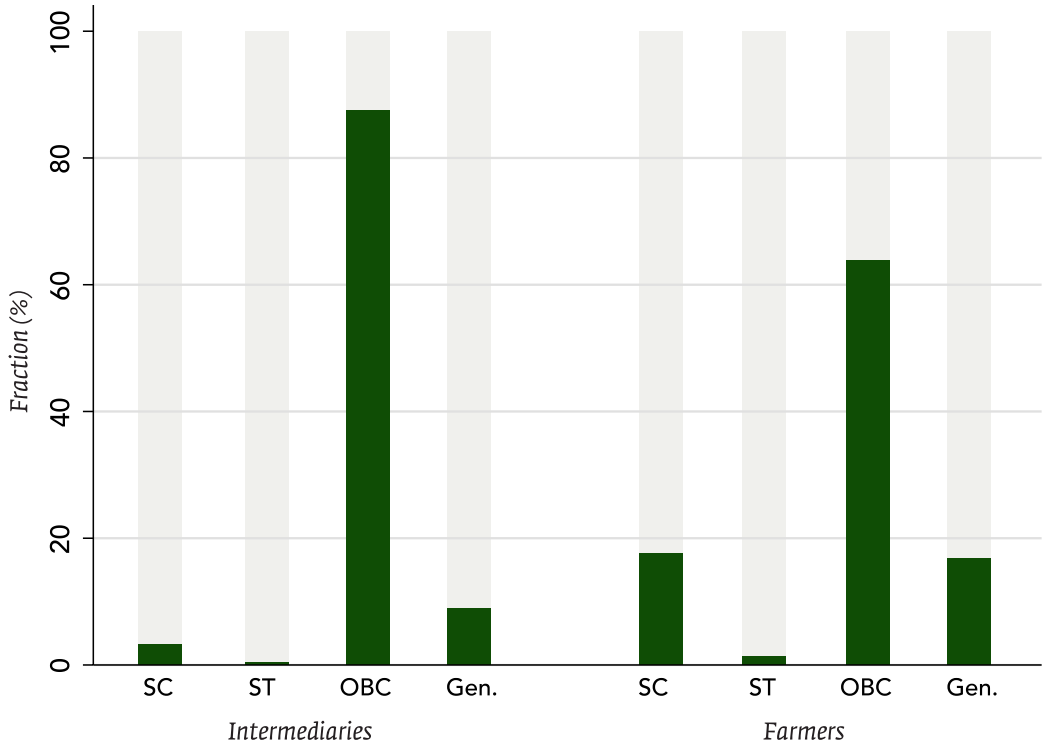


Figure 7.3: Caste distribution in Bihar

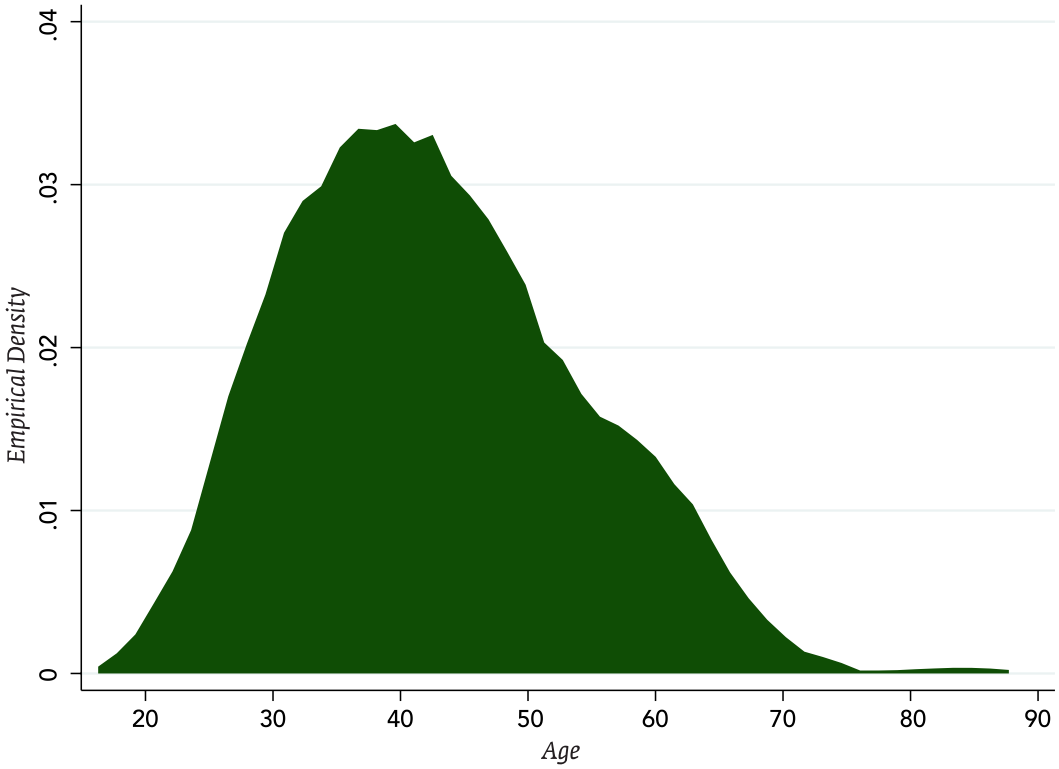


Figure 7.4: Age distribution of intermediaries in Bihar

In comparison to the farmers in Bihar, the intermediaries are more educated and have more assets. Figure 7.5 shows the distribution of the highest grade attained by intermediaries against male members of farming households. Farmers are more likely to have not attended any formal school, while a greater percentage of intermediaries are likely to have completed a high school degree or more.

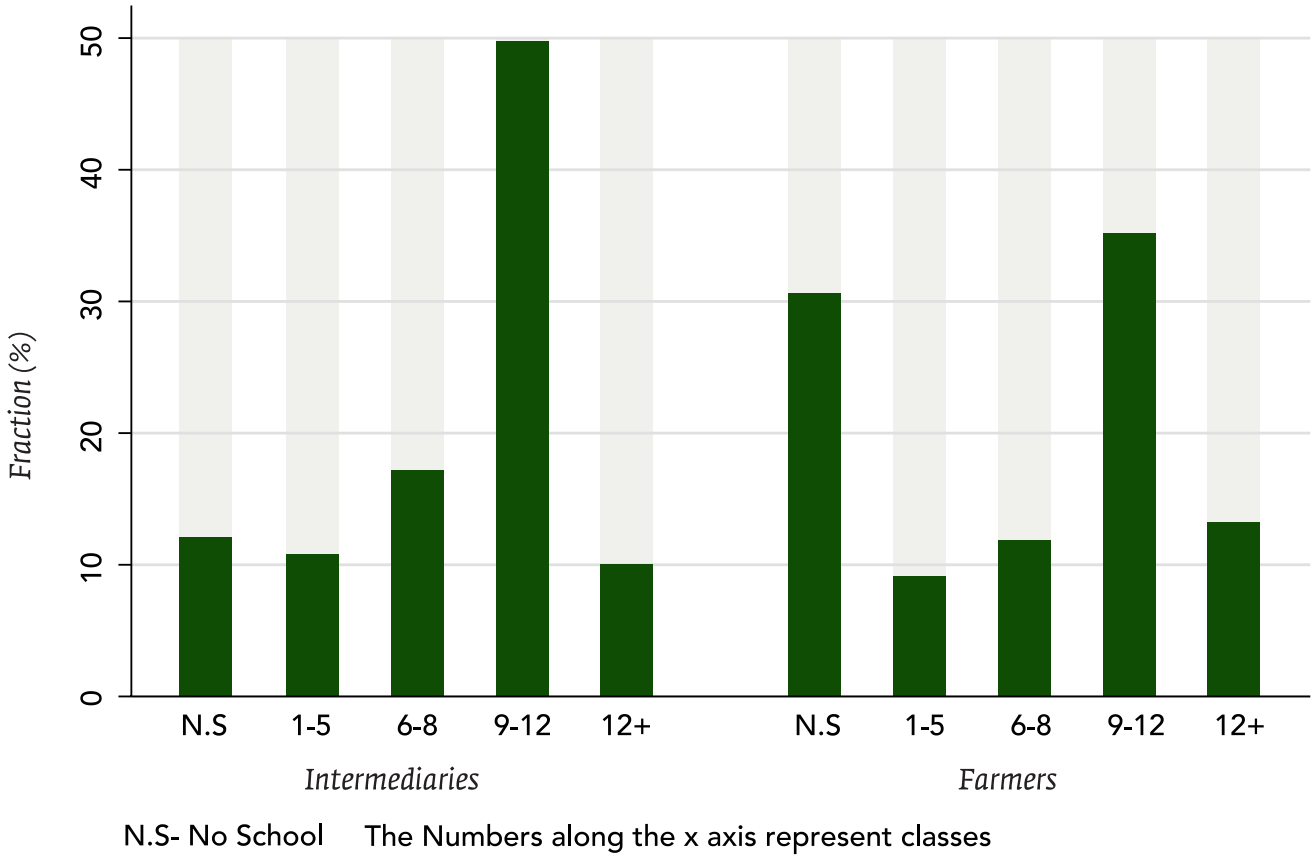


Figure 7.5: Education

Among the intermediaries, 56% own land that is used for cultivation. The median landholding size is about 1.25 ha as compared to 0.4 ha amongst farmers. Figure 7.6 shows that 66% of the intermediaries have a permanent (pucca) house—made of bricks with a concrete roof—as compared to 43% farmers.

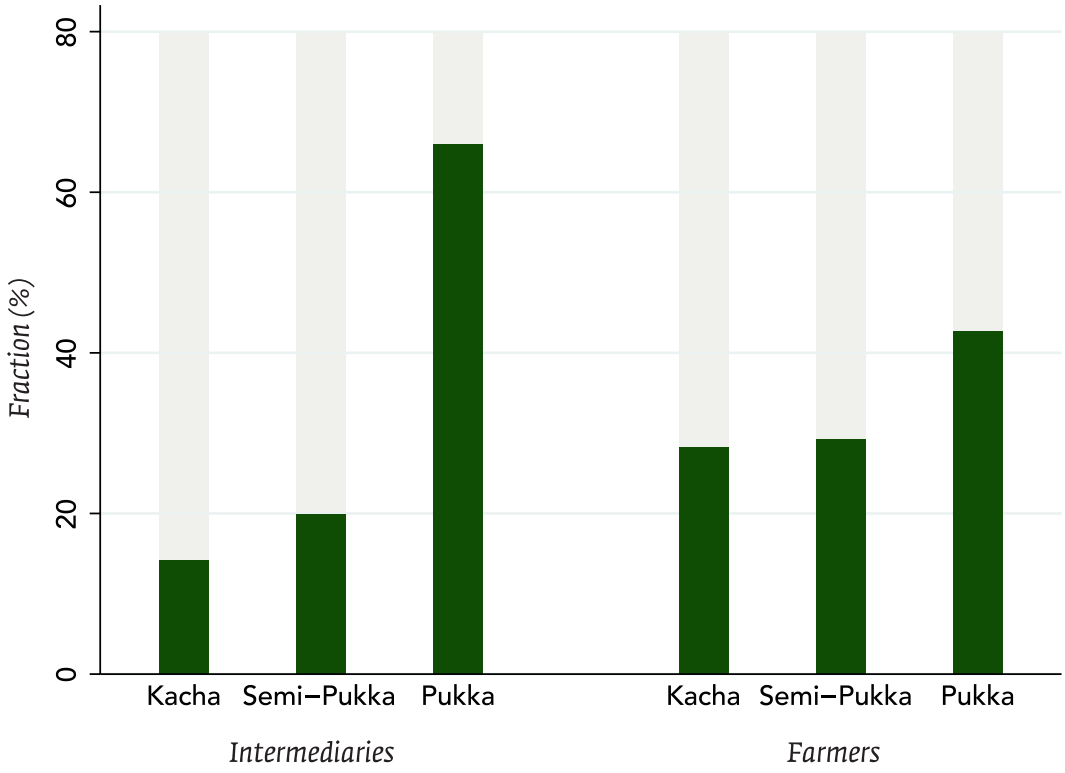


Figure 7.6: Type of dwelling: Intermediaries vs farmers

However, intermediaries do not usually own livestock. Less than 5% of intermediaries own livestock, whereas 25% of the farmers in our sample own some livestock. To get an overall sense of their socioeconomic status, we generated an SES index using a principal component analysis. Figure 7.7 shows that the socioeconomic status of intermediaries is higher on an average than farmers, though there is a considerable overlap.

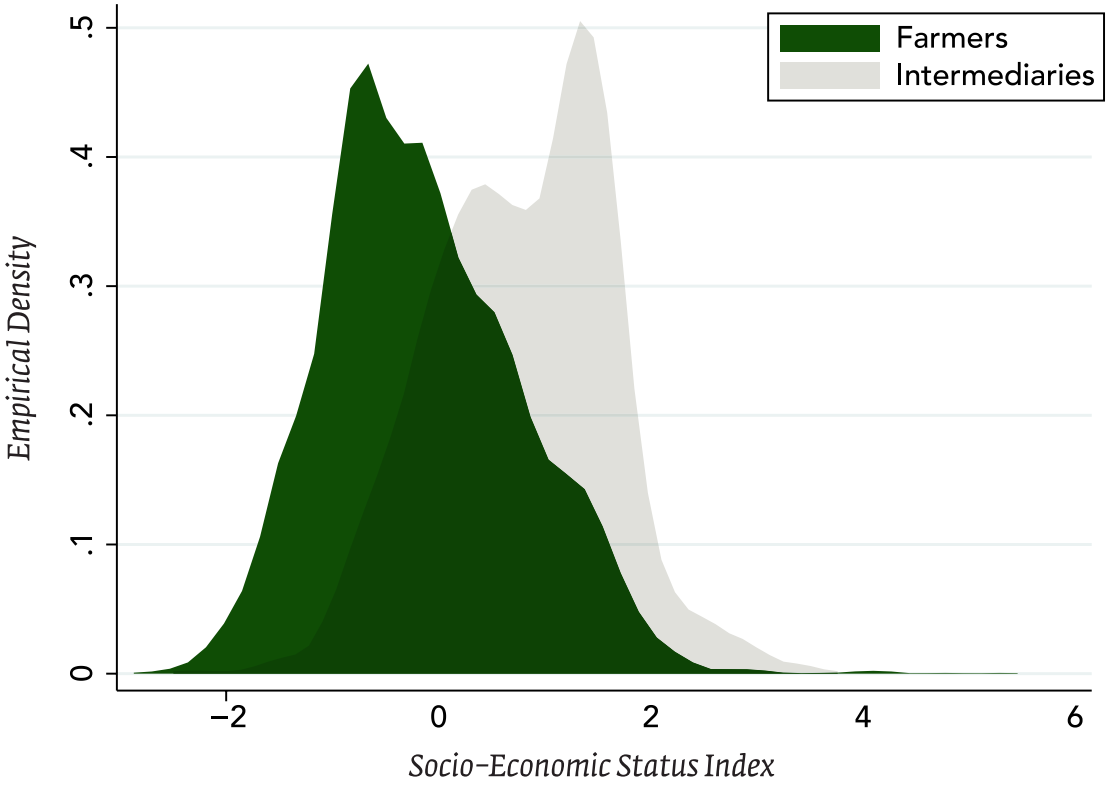


Figure 7.7: Socioeconomic status of farmers and intermediaries in Bihar

Essentially, the larger slightly well-off farmers of the village, who may also be more educated, choose to go into the business of trading. We must remember that the sample of traders comprises those who come in direct contact of the farmers—this is the ***first layer of intermediation***. As we will see, these traders, after buying from farmers will in turn sell to larger intermediaries and not directly to processors or mills.

7.2.3 Business organization

The sample consists of a uniform distribution of new and experienced trading businesses. Some are very new, where the current head is the first member of their household in the business. Others come from families which have been trading for some years (figure 7.8).

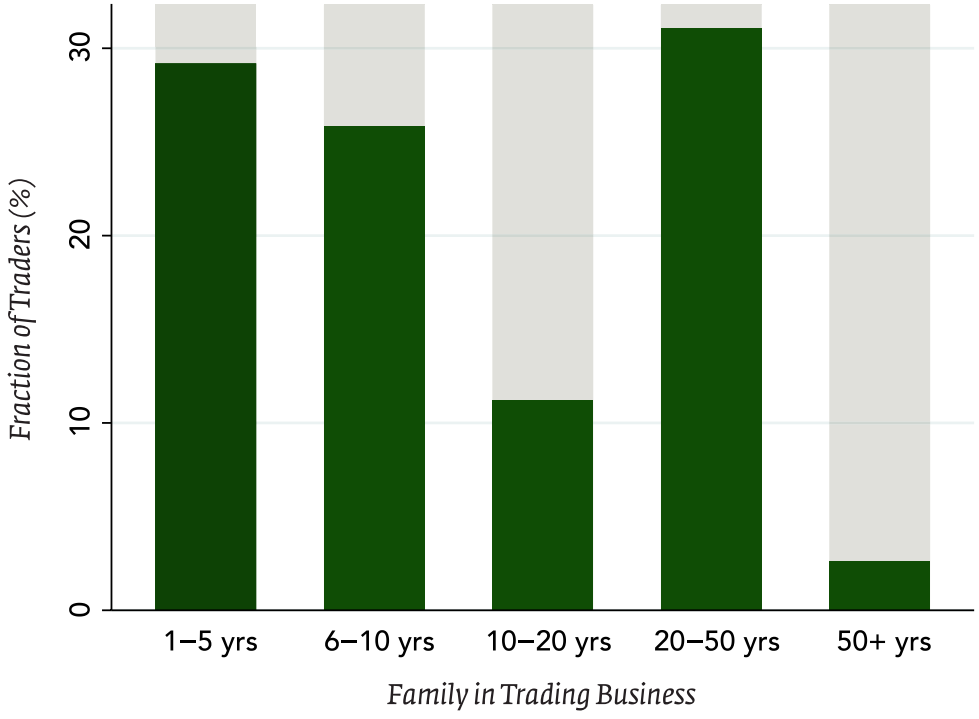


Figure 7.8 History in trading business

These respondents are petty traders buying grains from farmers at the farmgate, which is the main site of trade. The site of first trade was known from the farmers' survey and is corroborated here as well. About 39% of the traders own a shop; they trade primarily at the farmgate and also at their shops.

However, these petty traders do not have access to a proper covered storage facility. Overall, only 32% traders have access to any proper storage. This is most likely to be their own shops. It is important to note that this is the ***first site*** in the supply chain in Bihar where crops can be stored for any amount of time, safe from the elements.

Traders, even those who own shops, mostly operate without any help from family members and do not have any permanent employee. Only 45 of the 685 traders had permanent employees. Almost everyone (81%) owns an electronic weighing scale, but no one owns a grain dryer or a moisture meter. This implies that they use visual methods to verify grain quality. Thus, as we had found in the farmers' surveys (Chapter 1), the incentives are lower to improve quality.

7.2.4 Credit

Of the intermediaries, 21% took loans for their business in the past year. The two major sources of loans are other members of the community and banks. When borrowing from the community, the rate of interest is 2–6% per month, which is much higher than the bank interest rate of around 8–14% yearly. The informal interest rate for the traders is no different than that available to farmers from a ***mahajan*** or a ***bania*** ((informal moneylenders). However, farmers can also get loans at more favorable terms from self-help groups and ***mahila*** groups (at about 2% a month) and Kisan Credit Cards (6–10% a year).

7.2.5 Market thickness and competition

The traders in our sample buy crops locally. Figure 7.9 shows the distribution of the number of villages in which each intermediary operates. Three-fourths of all traders buy crops from at most eight villages, with the majority of them trading in less than five villages. However, some larger traders trade in up to 15–20 villages.

They also visit the same villages over the years. Among the traders, 69% bought from the same villages where they had been trading for more than five years and another 18% traded in villages where they had been trading for the last three–five years. However, in the villages they visited, there were at least 4–10 other traders present. Of the traders, 82% said that they knew who their competitors were.

This data along with the farmers' survey allow us to conclude that the farmers have a fair number of alternatives when choosing their buyer, and they do not sell to the same person over years (see Chapter 1 for details).

Each trader deals with multiple farmers in a village, and figure 7.10 plots this distribution. The median intermediary buys from at least 25 farmers in a village. There is also a fair number of traders with a bigger scale and dealing with more farmers in a village.

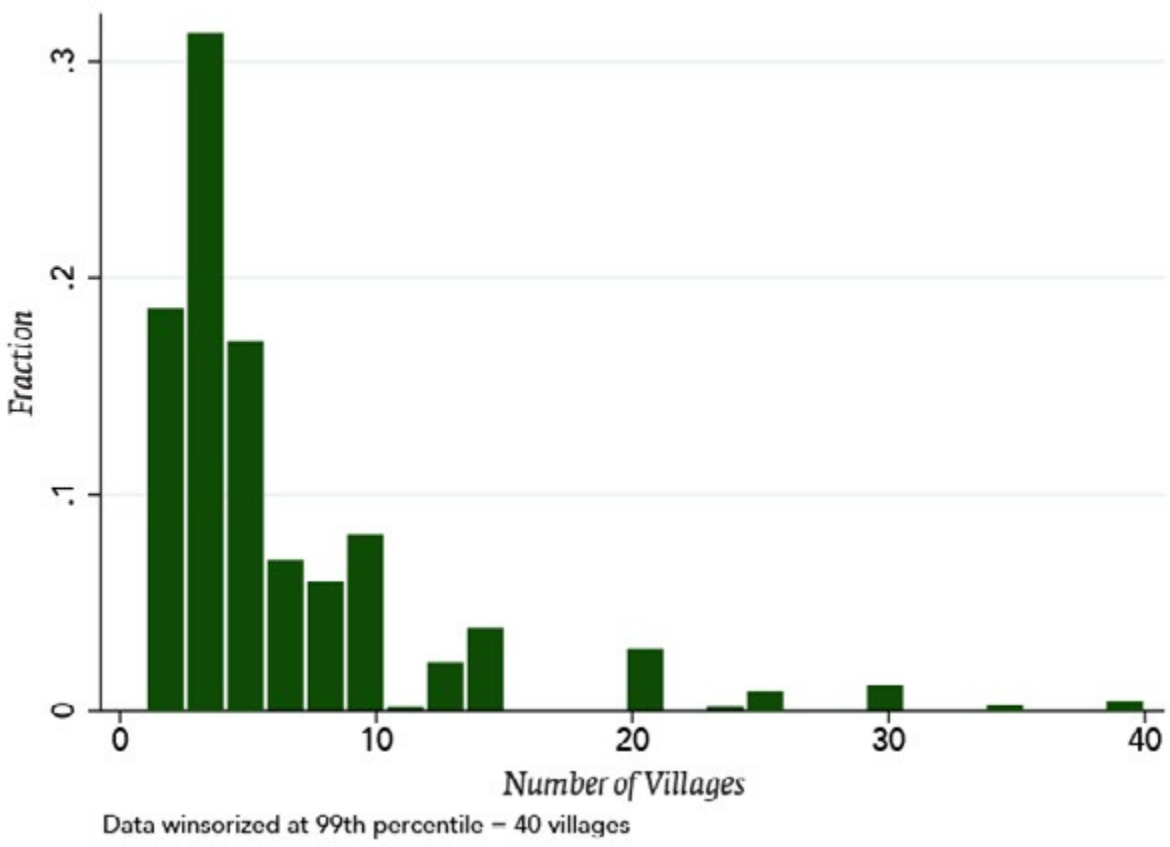
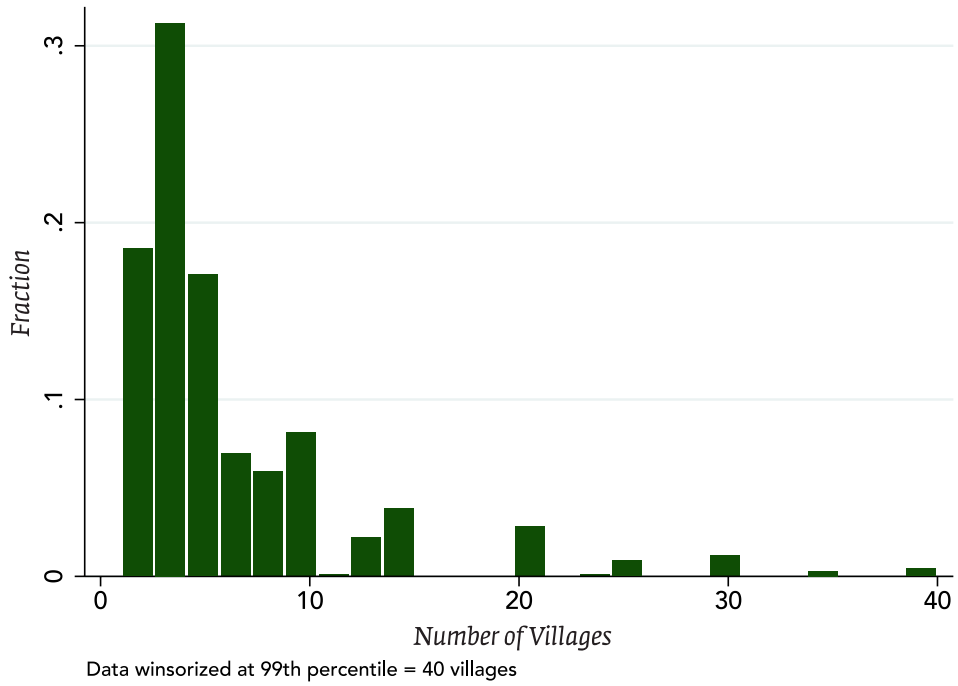


Figure 7.9 Number of villages each intermediary trades in



Data winsorized at 99th percentile = 40 villages

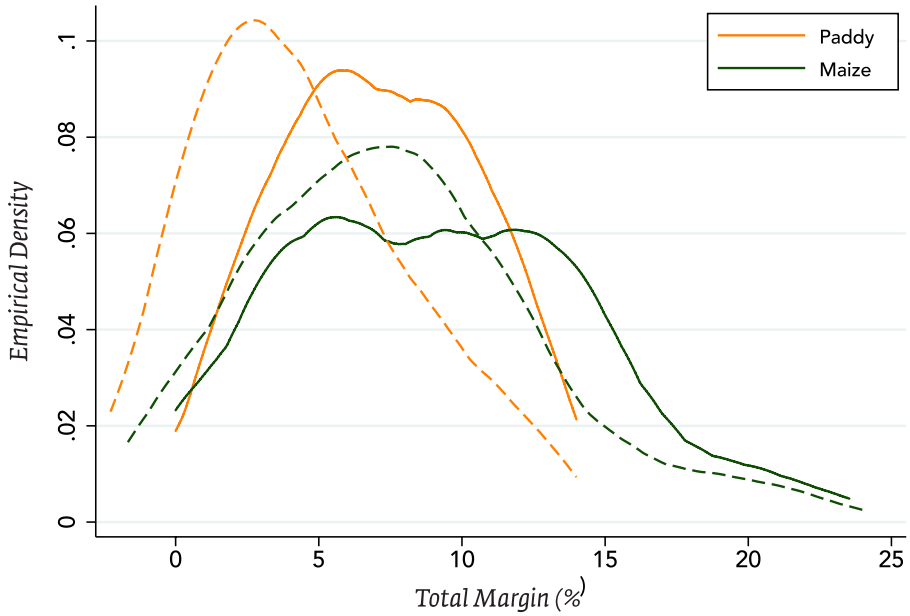
Figure 7.10 Number of farmers in each village dealing with the same intermediary

7.2.6 Margins

A large fraction of the traders in our sample primarily trade in paddy and maize, and these are the two crops we will focus on. As stated earlier, traders buy at the farmgate from the farmers and then sell mostly to other traders and sometimes to millers. Of the traders, 92% reported that they sold the produce to other traders, while only 6.5% sold to millers. This is reflective of our sample of traders comprising small petty traders. Of the traders, 75% sold the crop within four days of buying it from the farmer.

The costs associated with each transaction are hard to compute since traders pool the amounts purchased across farmers and villages. However, the basic statistic we can compute are price margins. The median margin is 7.5% in paddy is and 9.2% in maize, but there is a fair amount of variation in these margins. Figure 7.11 plots the distribution across traders. The average margins for the top quartile of paddy and maize traders are 12.85% and 16.84% respectively.
Figures 7.12–7.17 show the spatial variation in these margins across the different blocks of the study districts.

A large part of these gaps is, however, labor expenses that are explicit to transactions and hence can be accurately incorporated. The distribution of margins net of labor costs is shown with dashed lines in figure 7.11. The median margin net of labor costs in paddy and maize was 3.8% and 7% respectively.



Dashed lines incorporate labor expenses

Figure 7.11 Distribution of selling–buying price of traders

The average intermediary buys around 160 quintals of paddy and 100 quintals of maize from a village. Given that he trades in about four–five villages, the average intermediary is trading around 1,000 quintals of paddy and 500 quintals of maize in a season.

The median price of paddy was Rs 1,350 per quintal. A net of labor cost margin of 3.8% yields a trader a seasonal revenue of Rs 51,300 in paddy. Similarly, the median maize price was Rs 1,500. A net of labor cost margin of 7% yields a seasonal revenue of around Rs 52,500 in maize. There are other fixed and variable operating costs, for example, of hiring a vehicle for transport, which are harder to quantify since they get spread across transactions. However, even accounting for only the labor expenses, the margins at this level seem small, and at the village level, market exchange is fairly competitive.

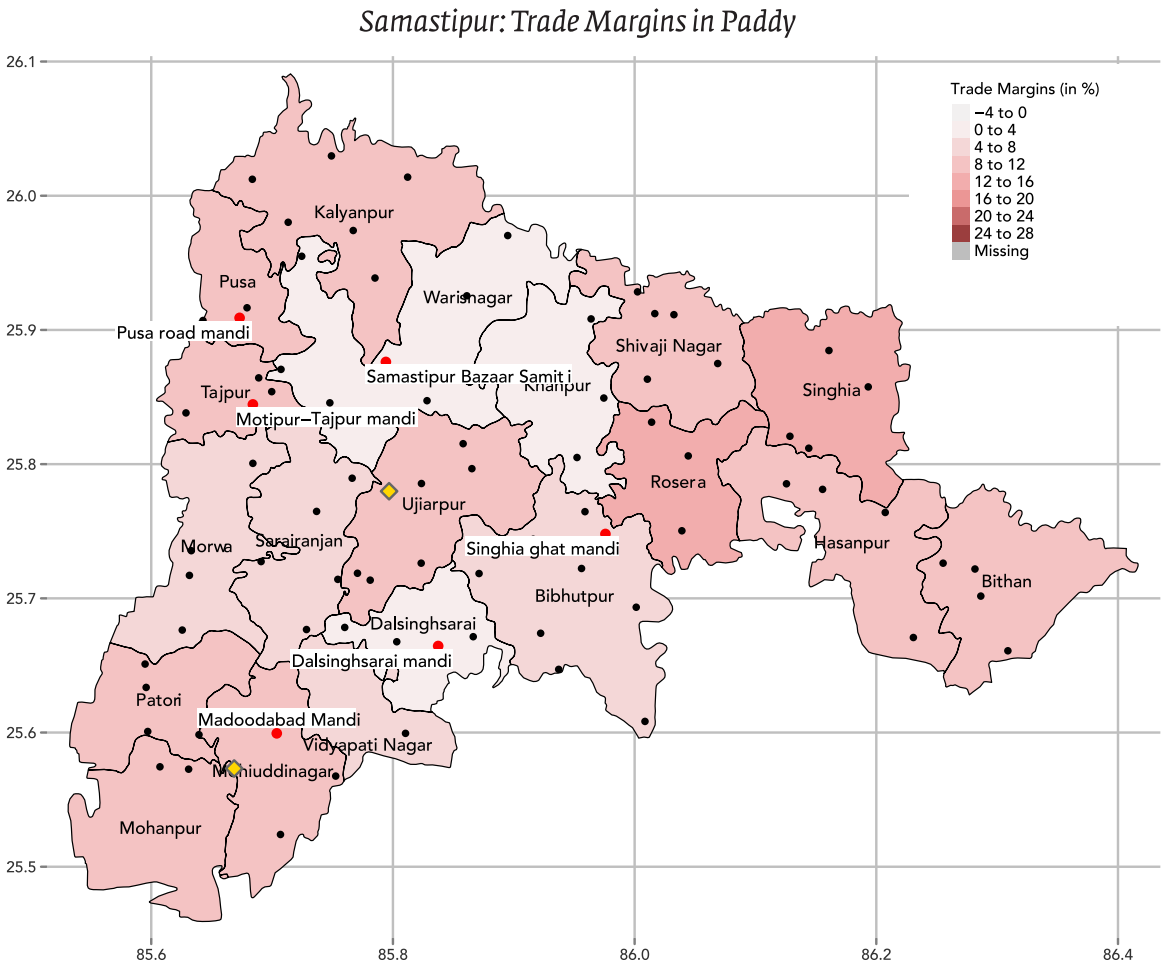
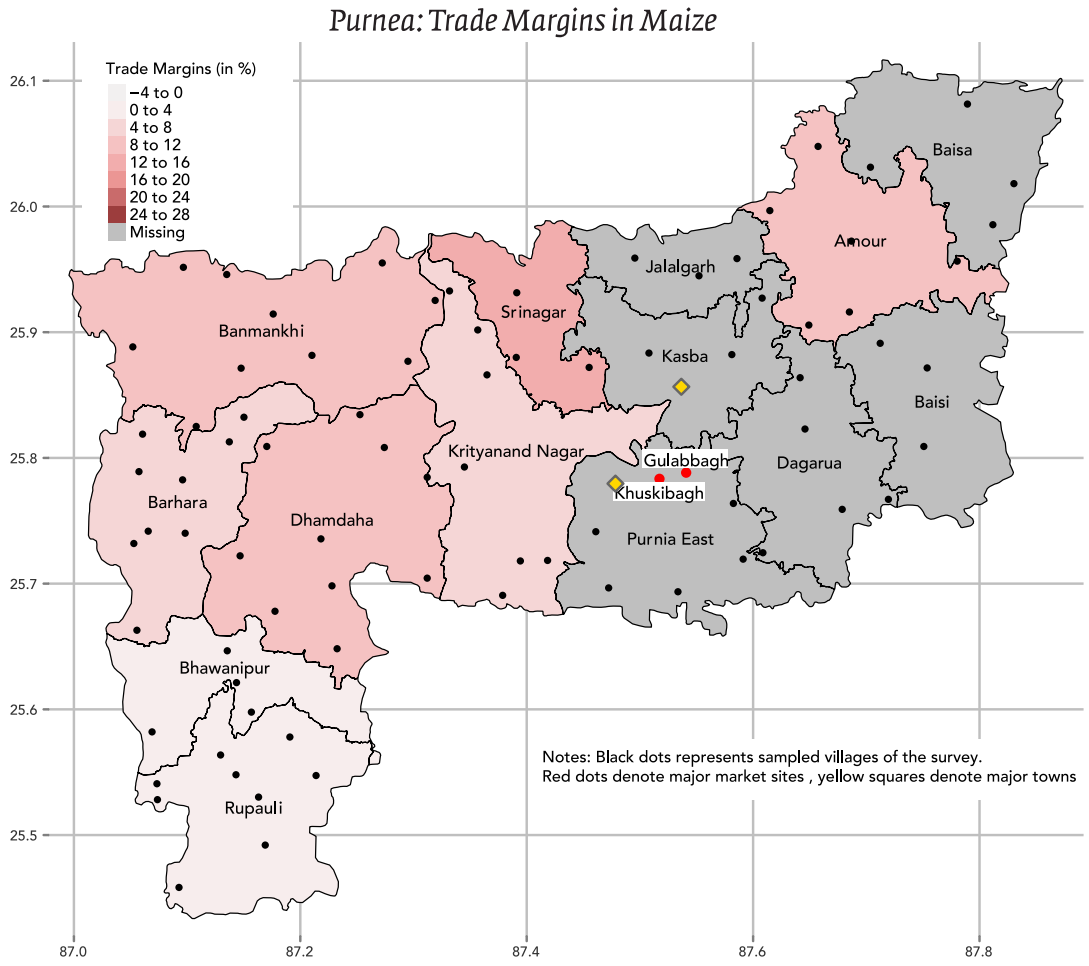


Figure 7.12



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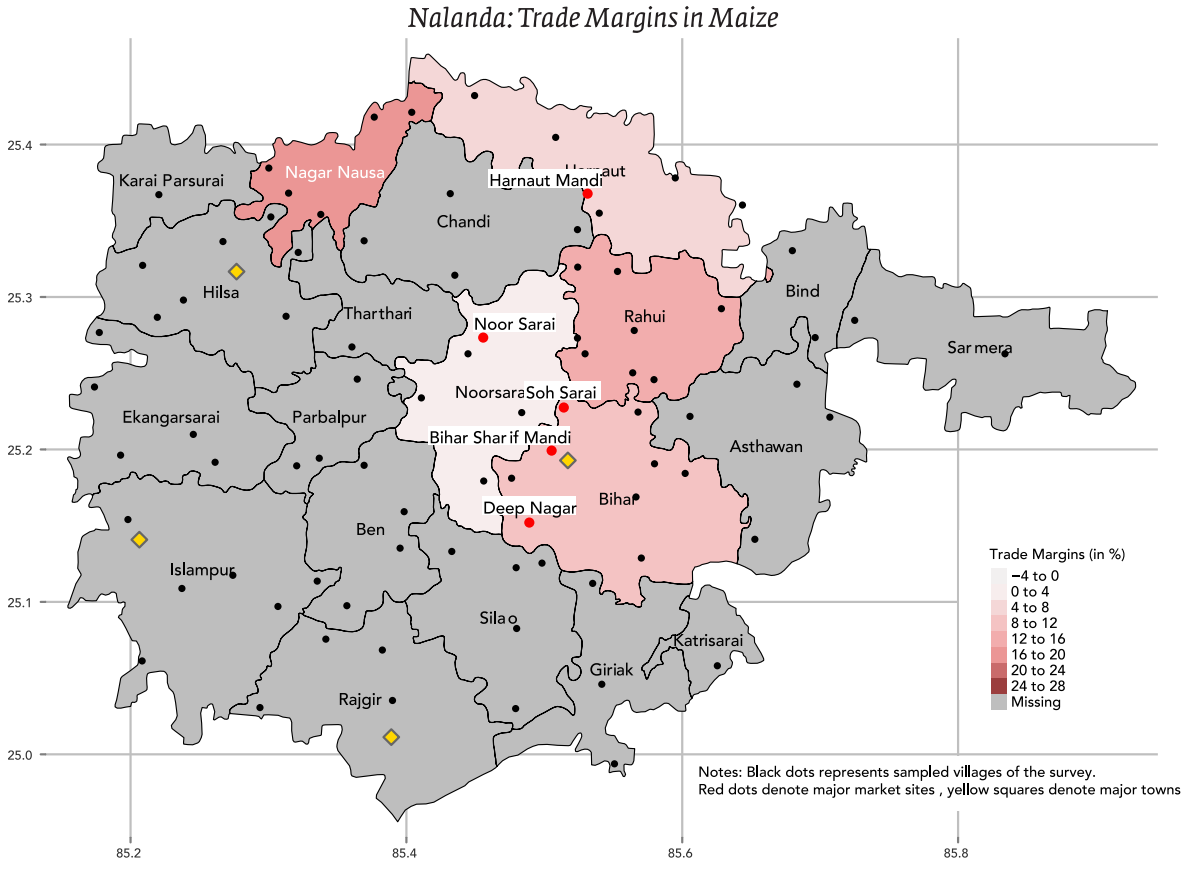


Figure 7.14

Purnea: Trade Margins in Paddy

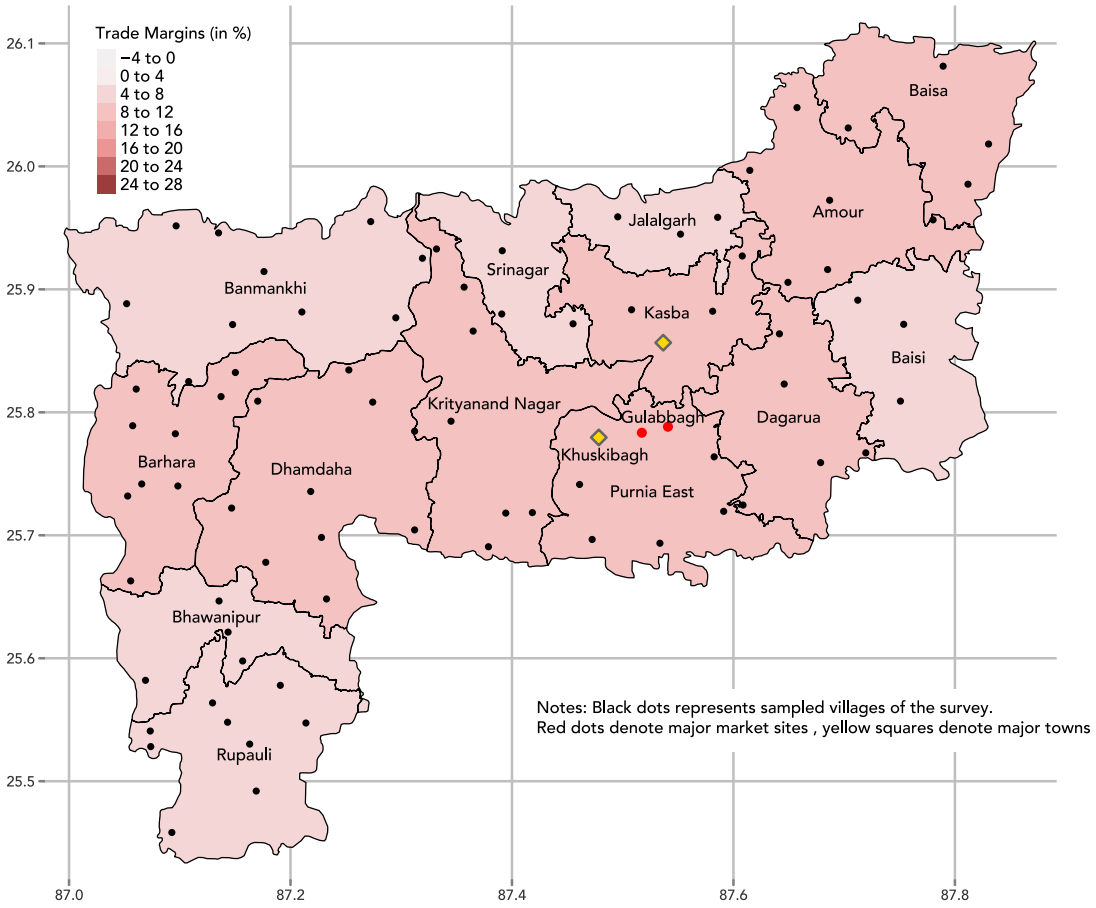


Figure 7.15

Purnea: Trade Margins in Maize

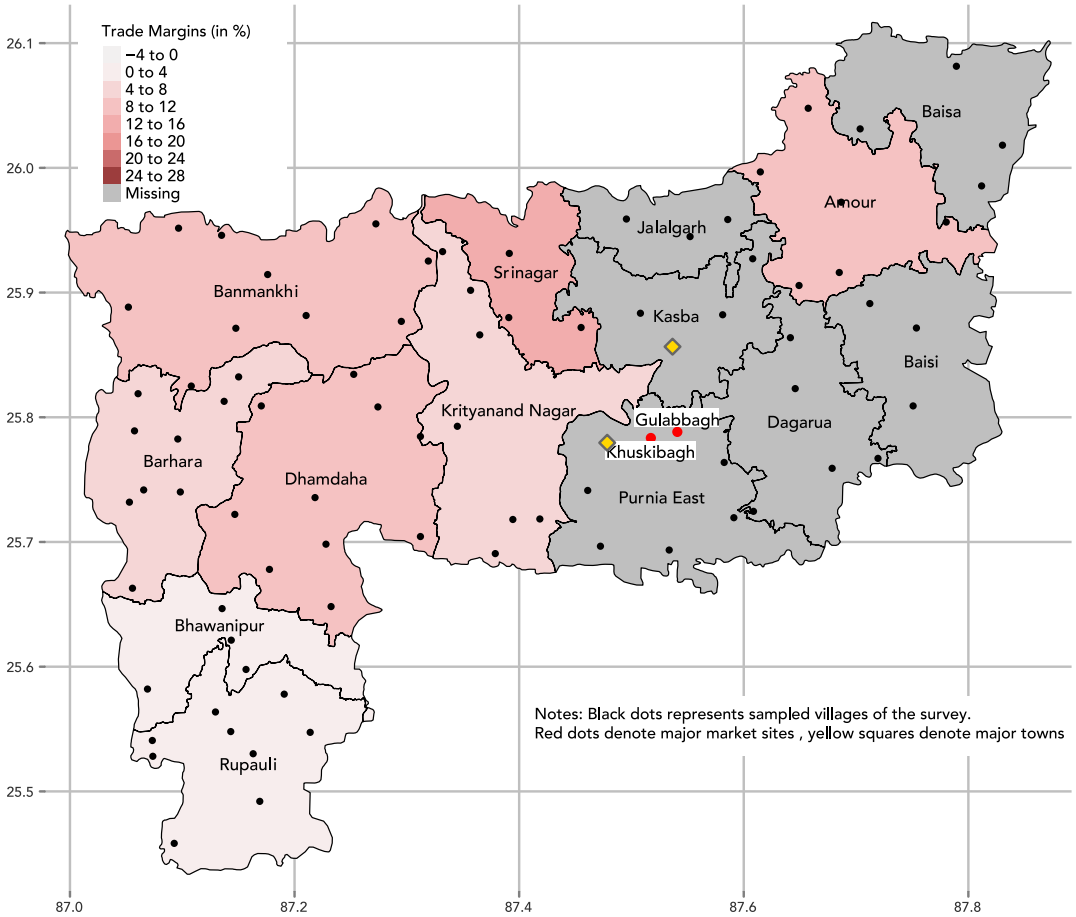


Figure 7.16

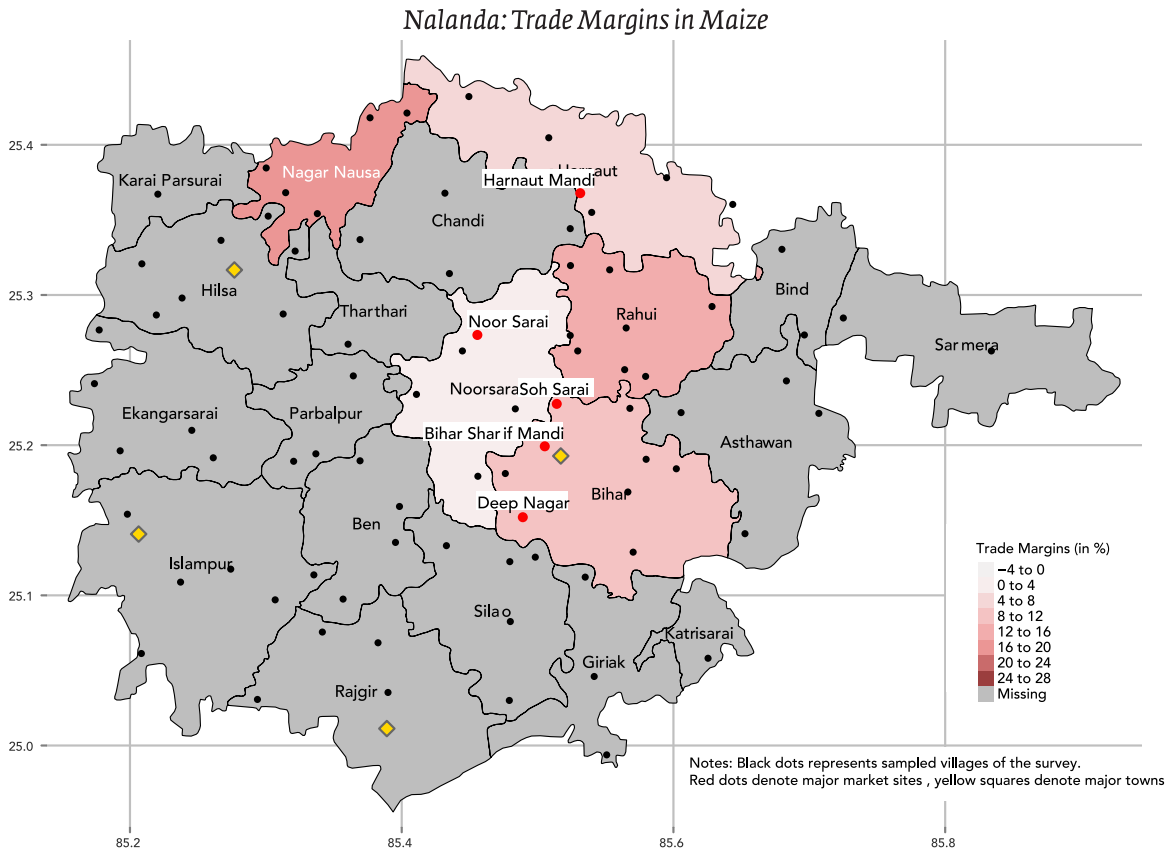


Figure 7.17

Overall, our survey data suggests that given their small size, competitive environment, and modest earnings, village-level intermediaries play a useful role as first stage aggregators of product, and their earnings are commensurate with the risks they take and the role they play.

7.3 Middlemen and maize markets: Proliferation of brokerage in Purnea

Unlike village-level traders and mandi-level commission agents, brokers do not feature as important intermediaries across most commodity networks. Brokers do seem to play an increasingly important role in the maize market in Purnea, while they are notably absent in the Samastipur maize marketing network. Samastipur maize is considered to be of lower quality than the maize grown in Purnea and is largely consumed by the poultry feed mills within the district. Purnea, home to the 56-acre Gulabbagh mandi complex, is, in contrast, at the centre of Bihar's maize revolution. Figures 7.18 and 7.19 present the commodity network for maize in Samastipur and Purnea respectively, illustrating the difference in market complexity and dynamism.

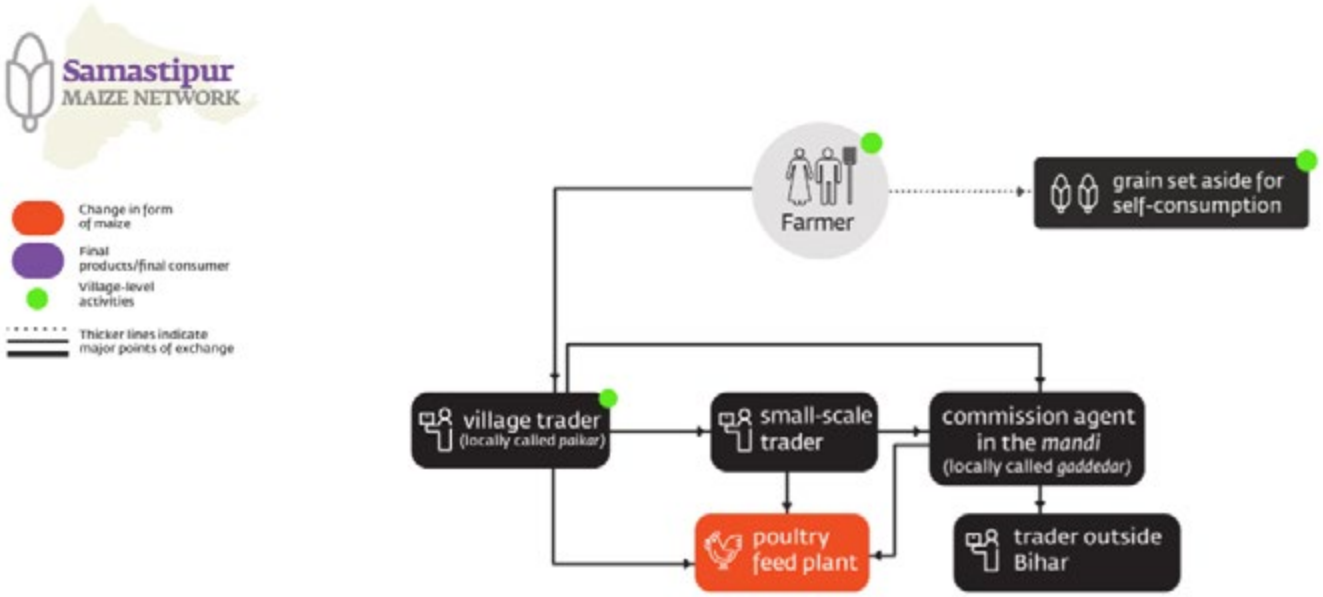


Figure 7.18 Maize Network in Samastipur

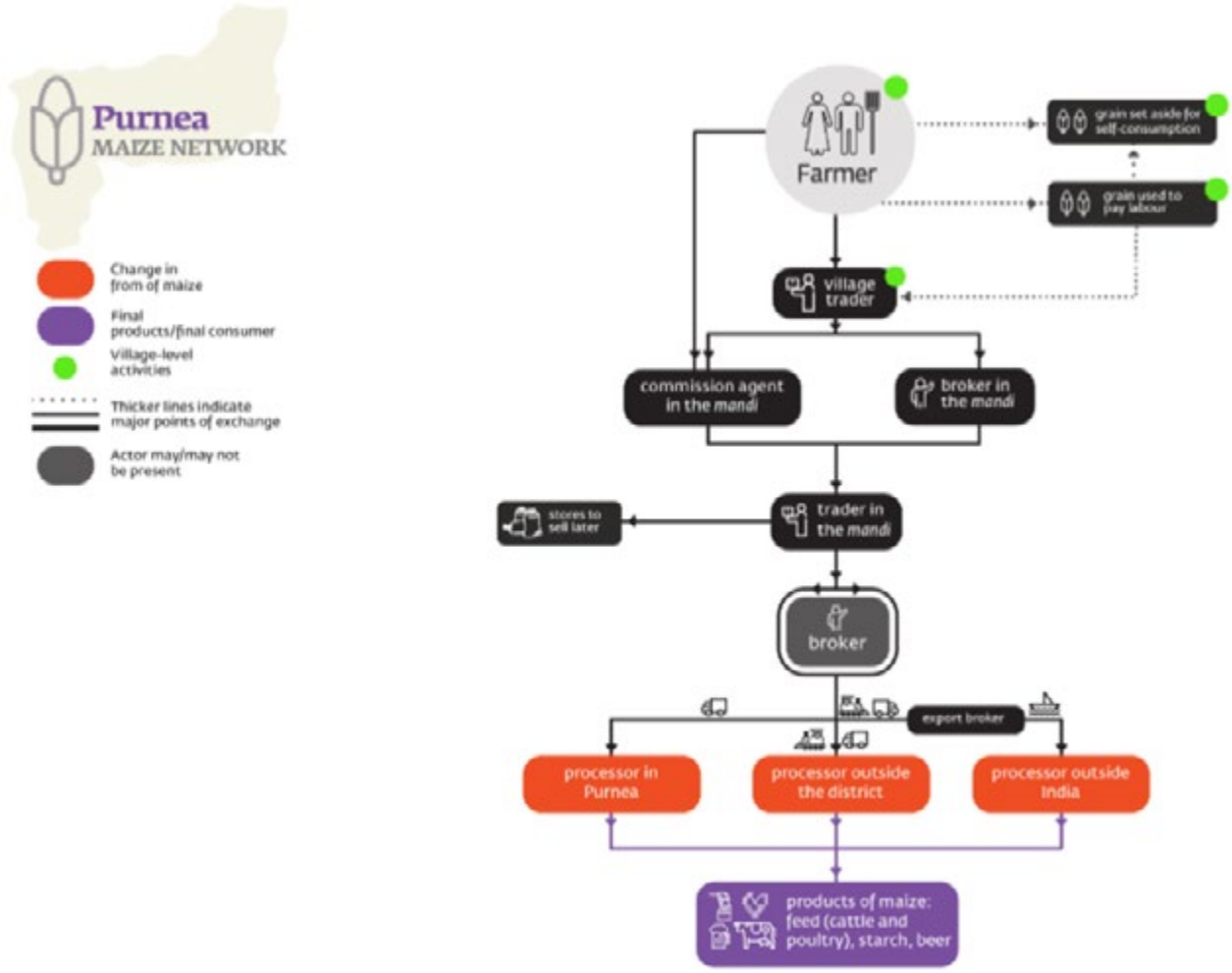


Figure 7.19 Maize Network in Purnea

Our ethnographic research indicates that a major change in maize production began in the early 2000s with the introduction of hybrid maize in the district. Earlier, only white maize was consumed, but with the introduction of hybrid maize, farmers began to consume the yellow variant also. Initially, it was a few progressive farmers who responded to the know-how they had access to and connected with private seed companies. In an interview, a farmer suggested that the sandy loam that washed over the Purnea district during the 2008 floods gave an impetus to maize production.

Over the last several years, especially since the listing of the Gulabbagh maize contract on NCDEX, there has been increasing density and dynamism in the maize trade in the district. The Gulabbagh mandi attracts a number of large multinational corporations (MNCs) every season. During our time in the field, Skylark, Cargill, Roquette, and Louis Dreyfus were some of the major multinationals actively buying maize from the Gulabbagh mandi. These MNCs manage their own supply chains and have invested in warehousing, research and development, and input markets, contributing to Purnea's development as a maize hub.

The lack of processing units within the district leaves a huge gap in the maize value chain in Bihar, in spite of Gulabbagh being possibly one of Asia's largest maize trading centers. A large amount of paddy from Purnea goes to processing units in West Bengal, Uttar Pradesh, Gujarat, and Tamil Nadu. Some of the produce is also exported to Bangladesh. In Purnea, as in other districts in Bihar, the structure and regulation of land was cited as the primary reason for the lack of processing units in the state.

We now find that a growing number of smaller traders from across India visit Gulabbagh during the peak maize harvesting and marketing season and set up offices in the nearby hotels, owing to the lack of physical space in the mandi. The entry of new players every season seems to have led to a significant increase in the number of intermediaries and brokers in the market, who have stepped in to facilitate exchange between village-level traders and local and non-local traders. The problem of counter-party risk was identified as the key reason for the proliferation of brokers in Purnea, from estimates of about 30 in the early 2000s to 500 young men at present trying to make it big in the trading season during the peak marketing season.

The brokers in Purnea typically have a training period where they join a trader to get some hands-on experience to learn about the trade, quality assessment, price discovery, and negotiation tactics. These are usually men with no family background of working in agricultural produce markets. When attached to a gaddidar, they have a fixed income. They get paid additionally by the mandi trader for every village trader they close a deal with. The price they get paid for every closed

transaction ranged from Rs 200–300, depending on the volume the village trader was able to put up for sale.

There is an informal geographic distribution of areas within the district from where a broker may receive produce. The village-level traders from those areas only seem to be connecting with one or two brokers, who typically procure produce from their locations. We understood from village traders that connecting with brokers in advance before coming to the Gulabbagh mandi was more likely to fetch the village trader a higher price. They reported that if a village trader enters the mandi without any negotiation, the colluding brokers, by crowding around the trader's produce, are likely to depress his offer price rather than offer greater competition on the spot. This is at any rate a prevailing perception and encourages village traders to route sales in Gulabbagh through brokers.

In terms of the risk mitigation that the brokers actually provide, their role is largely limited to ensuring payments are made in time. They rarely have to make the payment out of their own pockets in case of a payment failure by the buying party. The job of a broker is primarily to exert pressure on the buyer to make the payments on behalf of the farmers and village traders. Village- level vyaaparis themselves do not expect the broker to make the payment, as brokers typically operate on a small scale, earning just enough to sustain their families. However, when it comes to larger brokers transacting on account of larger buying parties in Gulabbagh and beyond, there have been instances when the brokers have been made to pay in lakhs to the farmers and vyaaparis, when the onward buyers defaulted.

For brokers unattached to a mandi trader or commission agent, transactions appear to be based on trust. Small-scale brokers are now threatened by the increasing number of new entrants in the mandi. While Gulabbagh's maize revolution first brought traders from other states, it has now started bringing in brokers, which they fear could create cut-throat competition, forcing brokers to reduce their margins. These brokers often manage transaction between large mandi traders and companies and many of these transactions are inter-state.

Another market where our field teams observed an increasing role for brokers or dalals between mandi-level traders and out-of-state buyers is the onion market in Nalanda. In recent seasons, traders in Nalanda have found that buyers in other states have reneged on the originally negotiated price. This is usually on account of quality considerations, but it was felt that the primary factor was a change in the level of supply in the receiver's market, driving the price lower than the one previously decided. Buyers have then often refused to take the delivery of the produce at the originally agreed price. In such cases, the gaddidar in Nalanda has found himself at the buyer's mercy and has had to accept his conditions. To deal with such situations, the trend of appointing brokers to manage the counter-party risk involved has now been picking up. Connecting with dalals in other states also appears to help the trader keep up with the demand in other states and make the highest profits.

7.4 Gaddidars: Bihar's established intermediaries

In contrast to village-level traders and even the young crop of brokers operating in Purnea between village traders and mandi-level buyers, the gaddidars in Bihar's agricultural markets are the most established, influential, and well-connected market intermediaries. They function both as commission agents on behalf of larger buyers and as traders on their own accounts, and play an important role as the major market aggregators who sell to bigger companies, processors, millers, and traders in other states. The gaddidars are therefore, unsurprisingly, the most likely among all levels of traders to have family roots in agricultural-produce trading. We spoke to traders with businesses as old as 70 years in the Soh Sarai mandi of Nalanda. The larger traders seem to have a geographic spread of about 80–100 villages. Purnea has attracted traders from Uttar Pradesh and West Bengal who have now settled in the district and deal in large quantities of maize that are transported through rakes.

Depending on the scale of their operation, gaddidars might be involved in trade with other districts within Bihar or states outside Bihar including Uttar Pradesh, West Bengal, Jharkhand, Odisha, Chhattisgarh, Andhra Pradesh, Karnataka, and Assam. Some of the gaddidars in these districts export to Bangladesh and Nepal directly or trade through third-party brokers. The number of traders who physically come into the mandis from other states has gone down due to a mix of factors. The emergence of new production clusters elsewhere has diverted their attention. Improvements in roads and communication has reduced to some extent the need for physical presence for purchased produce. But, also more negatively, the fear of ***rangdari*** (extortionary "taxation"), has also reportedly driven many out-station traders away.

The major risks the mandi-based commission agents and traders face today is delayed payments. If the payment does not come from the buyer in time, the farmer's or village trader's dues get delayed, which reflects badly on every transacting party and reduces the degree of trust for future engagement. However, making do with delayed payments is a part of the business and a risk that all gaddidars have to deal with. To maintain their base of farmers and village traders, commission agents often take loans. Those who do not have the required capital may fail and shut shop. Credit for the gaddidars comes from a mix of sources—other gaddidars, mahajans, and rarely banks.

Many first-generation gaddidars have also entered the trade, especially in horticultural markets. In Samastipur, some of them come from the Kushwaha caste, which has traditionally engaged in farming. They believe that entering into trading has helped them make smarter production decisions. While farmers from the villages of these Kushwaha traders do sell to them as a result of the caste association, their long-term relationship depends on fair trading practices by the parties involved.

In Nalanda, we met a miller who had entered the Bazar Samiti in 2007–08 and now functions as one of the more influential gaddidars in the mandi. There have also been instances of traders moving up the ladder from ***paikari*** (village-level buying

and aggregation) to becoming a broker and finally a mandi gaddidar. Some have moved in the opposite direction from being a trader to now functioning as a broker due to lack of the financial capacity to deal in large sums and increased risk of rejection of produce in quality assessments by onward buyers. Some intermediaries play the dual role of a ***paikar*** and a gaddidar. Those who have been in the trade for longer periods see themselves as the last of their family to work in this line of business, as their children move on to other professions in urban centers. This opens up space for brokers and village traders to move up a rank in the chain of intermediaries. A Marwari trader (gaddidar) we met in Samastipur worked as a paikar for around eight years, when the work of a paikar was more broad-based and commonly involved delivering farmer's grain to the miller. As one of the biggest grain traders in the district now, he makes use of the contacts he made during his paikari days with large landholders and procures their grain directly. As he moved up the ladder as a trader, the role of a paikar evolved to simply supplying grain to the trader. Today, he deals with 150 paikars and 50 smaller gaddidars. His staff includes 14 labourers. His brothers are involved in business within the food supply network as gaddidars, millers, and provision storeowners.

7.5 "Organic" disintermediation: Farmer-led initiatives towards direct sales

There have also been some notable moves towards disintermediation in our study districts. In Nalanda, the Deep Nagar mandi was established by a group of farmers about 20 years ago. The farmers who come to this mandi transact directly with traders who come from other districts in Bihar or with one of the seven gaddidars in the mandi.

The setting up of the mandi did face significant resistance, particularly from the gaddidars of Bihar Sharif Bazar Samiti, located at a distance of about 8 km from this new farmer-formed mandi. A significant portion of the Bazar Samiti's business was diverted to the Deep Nagar mandi, which agitated the gaddidars of the Samiti. Ten years ago, the gaddidars gave the farmers who ran the Deep Nagar mandi two options: either the farmers move their transactions to the Bihar Sharif Bazar Samiti or the Samiti would appoint two of its gaddidars to take commissions from the traders operating in Deep Nagar. The farmers protested against these demands and the Bihar Sharif gaddidars had to withdraw.

The Deep Nagar mandi offers benefits to both the farmers and the traders. It is close to many villages, due to which farmers do not incur heavy transportation costs. Farmers can make the sale early in the day and quickly return to their fields to start the day's work. No commissions are charged either from the farmer or the trader, and neither has to negotiate with a gaddidar, which is a tough task for both the parties. The labor costs of loading and unloading are one-fourth of those charged at the Bazar Samiti. However, where the mandi seems to falter is in its trading volume and capacity. The traders who come to the Deep Nagar mandi are small and cannot absorb large quantities of produce, owing to which farmers who have greater quantities of produce prefer to sell in one go at the Bihar Sharif Bazar Samiti.

There is another grain mandi in the Silao block, 17 km from Bihar Sharif where farmers directly carry their paddy to sell to the gaddidars in the mandi. In Samastipur, the haats also offer an alternative to the mandi for farmers. Although not in large numbers, farmers are slowly and increasingly directly engaging with small traders and local wholesalers and retailers at the haats, taking their produce either directly or in aggregation with a few other farmers.

The farmer-led initiatives to set up new market sites and institute fairer, direct trading practices, reducing commissions and fees, do indicate that it is indeed possible to introduce competition and alternatives to the major existing market sites. However, as we see in the case of the Deep Nagar mandi, the volumes passing through these new market sites is still relatively low. Perhaps a better approach would have been to introduce practices that increase competition and market oversight in the Bihar Sharif mandi itself, which is a much larger market site. In the absence of any formal regulatory authority there, this is of course very difficult for farmers to currently push for. At the same time, in the long run, setting up a small competing market may not work for farmers either if it is not able to grow to scale.

7.6 Promoting aggregation: The FPC experience in Purnea

How about initiatives that have promoted aggregation and enterprise by farmers? A much smaller but still significant outlet for sale was observed on the field in Purnea. This was the TechnoServe- supported Farmer Producer Company (FPC), Aranyak Agri Producer Company Ltd. (AAPCL). This all-women FPC is promoted by JEEViKA to conduct operations in Purnea and Katihar districts. By 2018, the company was selling 23,599 metric tons of maize procured from 5,824 female farmers. [16] The aim of the organization was to provide an alternative point of sale to small farmers who, it was felt, suffered as a result of unfair intermediary practices leading to low prices. AAPCL intended to break this cycle through village-level producer groups acting as aggregators and quality-control hubs for harvested maize. [17]

Aranyak linked its maize procurement and trading business with NCDEX for spot and future trading. It is believed that the organization not only gave higher prices to farmers but also made profits of Rs 6.3 million in its first two years of operation, leading it to leverage institutional credit worth USD 780,000 from State Bank of India and Friends of Women's World Banking. However, in 2017, due to a glut in maize supply, the company did not receive the prices it was expecting in the futures market, putting a high risk burden on its shareholders.

[16] https://www.technoserve.org/blog/female-maize-farmers-lift-themselves-out-of-poverty/
[17] https://tinyurl.com/jeevika-maize
[18] https://tinyurl.com/appcl-loss

The downturn in maize prices, possibly combined with high stockpiles and low demand from the feed industry, caused AAPCL to run losses for a couple of years. [18] In addition, the CEO of the company was trying to recover dues from the small and medium-sized traders to whom the FPC had sold maize. The FPC had conducted these transactions without the help of a broker, which seemed to have proved unwise given the ecosystem in which the maize market of Purnea operates. In the absence of regular cash flow, the FPC was meeting its expenses through bank loans. Initiatives like setting up the company's procurement centers at every 10 km have also been found to be not working well, as farmers are reluctant to travel at their own cost to sell to the company, even though it promises fair weighment and quality standards.

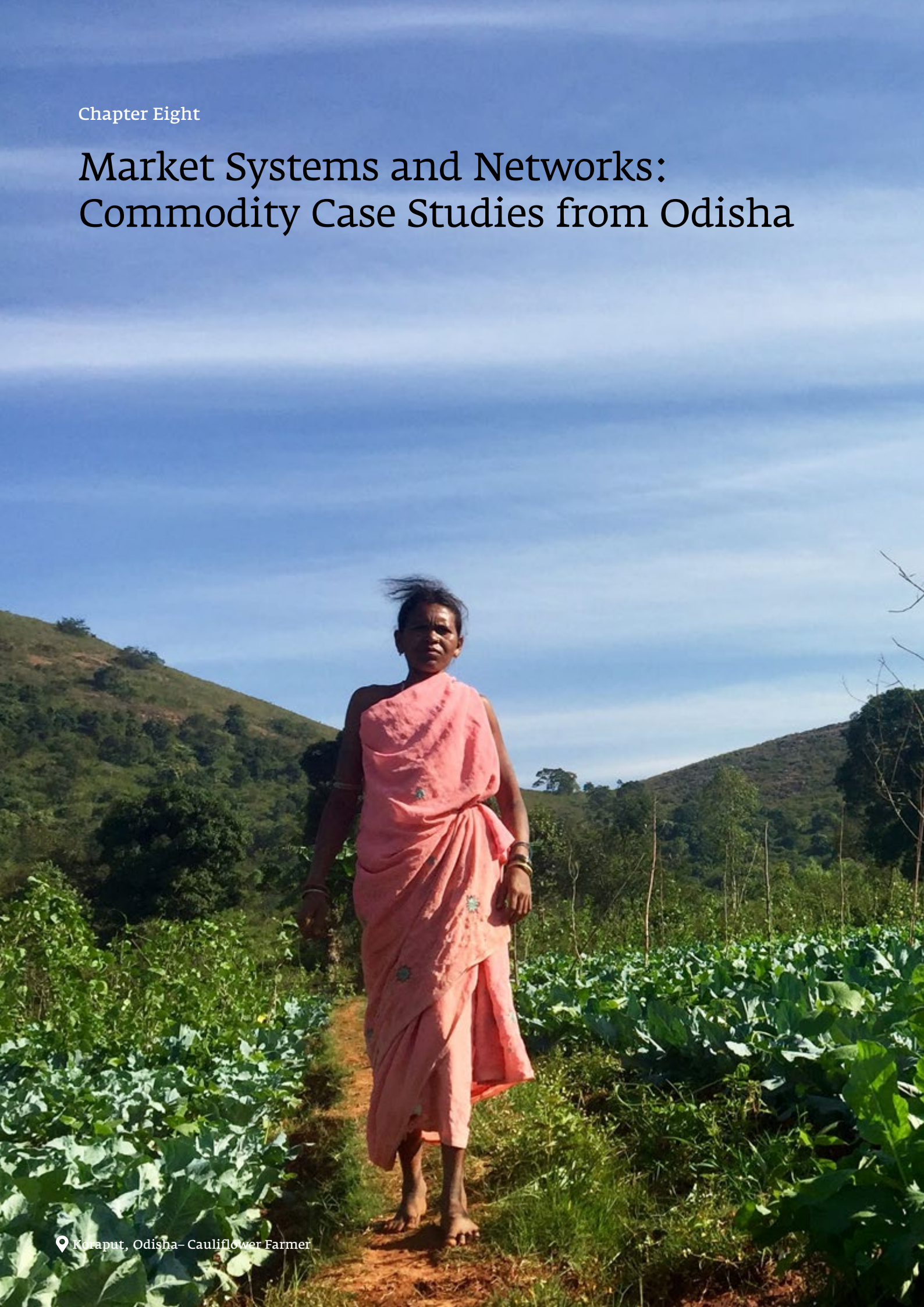
The FPC was estimated to be running a Rs 3 crore loss, out of which Rs 50 lakh was blamed on the lack of capacity of the village resource persons (VRP) of JEEViKA, who help the FPC conduct its maize procurement according to the quality requirements. The VRPs who procure produce from known farmers are unable to deny the purchase of low-quality produce as a result of which the FPC suffers losses. From our research, it appears that the company was having to compromise on quality standards while supplying to large buyers like Roquette in order to hold on to support from the community. Stricter quality controls and rejections may lead to several shareholders (farmers)

backing out. Due to the low quality of maize procured, the MNCs refused to take delivery and the FPC had to get into trading with small local traders who then delayed their payments. Nevertheless, there is also some evidence that in its limited area of operation, the presence of the FPC has forced local traders to compete both with higher prices and better practices of weighing and payment.

While this is a positive effect as far as farmers are concerned, the overall experience is a cautionary one and reveals the many challenges that need to be addressed and overcome if FPCs like Aranyak are to be able to sustain their operations in the future. They also reconfirm our overall findings about the general competitiveness and low margins of intermediaries and the critical roles they play in keeping commodity trade flowing and managing diverse roles and risks. We will return to the question of market-based interventions to strengthen the terms of participation and engagement of farmers in agricultural markets in Chapter 10.

Chapter Eight

Market Systems and Networks: Commodity Case Studies from Odisha



Koraput, Odisha– Cauliflower Farmer

Chapter Eight

Market Systems and Networks: Commodity Case Studies from Odisha

In Chapter 5, we have reported on the paddy trade in Odisha and the role of different formal and informal market actors and intermediaries across the three districts in the state. Beyond the common crop of paddy, which, as we have seen, itself varies in its marketing dynamics in Balasore, Koraput, and Sambalpur, agricultural production and marketing is commodity-specific and, within a district, is often concentrated in specific clusters at the block level. In Chapter 6, we also described the regulatory pluralism observed across agricultural markets in Odisha. Here, we will focus on four major non-paddy commodity markets: green and red chili in Balasore and Sambalpur respectively and ginger and *ragi* markets in Koraput to illuminate the commodity-specific dynamics of market exchange, intermediation, and trade in Odisha.

8.1 Sambalpur and Balasore: A tale of two chilies

Two types of chili, red and green, are grown by farmers in parts of Sambalpur and Balasore and play an important part in their ***rabi*** agricultural production and marketing systems. Both commodities are also part of long-distance networks of trade and are known in commodity trading circles for their chili cartels, schemes, and scams, being the subject of a great deal of local market intrigue. For farmers in both districts, chili has proven to be remunerative, but it is increasingly associated with a high degree of volatility and risk. A close study of these commodity networks provides important insights into the ways in which these markets operate and the challenges of introducing formal regulation and e-trading to support the producers of chilies. In doing so, we also understand why the cultivation of chilies, while remunerative in the past, is now experiencing a steep decline.

Let us begin with Sambalpur.

8.1.1 Red chili in Sambalpur

Kuchinda block in Sambalpur is known as the "chili bowl of Odisha." Grown in Kuchinda and Bamra blocks, with small quantities also cultivated in Jamankira block, the chili grown here is famed for its spiciness and is locally known as "Bamanda," a reference to the Bamanda kingdom that once ruled over the region. Indeed, high chili cultivation in this region is often attributed to the efforts undertaken by the King of the Bamra kingdom to develop irrigation systems in the region to promote horticulture. In reality, however, it is the lack of water in the rabi months that encourages chili cultivation here, as these are single-cropping blocks for paddy. The Bamra railway station, one of the oldest railway stations in the district, allowed easy movement of the produce. In 2017, farmers demanded that Kuchinda chili be assigned a Geographical Indication (GI) tag for its distinctiveness.

Farmers in Kuchinda have seen good success with chili cultivation and marketing in the past. In a good year, farmers reported profits ranging from Rs 70,000–80,000, going up to Rs 2,00,000 over a single season. However, over the last five years, chili production is estimated to have declined by 20–30%, and chili cultivation is widely considered to be in its final phase in the historical northern cultivation belt of Sambalpur. During our fieldwork, farmers cited a number of reasons for this decline:

- A response to falling market rates.
- The lack of crop insurance in light of scanty and unseasonal rainfall and high chances of crop diseases. The contrast cited here was paddy, which is consistent with our findings reported in Chapter 5 on rice and risk.
- The lack of chili processing units/cold stores at the block level, encouraging distress sales at low rates by farmers. Processing units were reported to exist in Chhattisgarh. The cold storage unit operational in Bamra is utilized by the local intermediaries.
- Lack of access to transportation. While Bamra block benefits from the railway station to transport the produce to Chhattisgarh, for Kuchinda, the nearest railway station is 50 km away in the neighboring district of Jharsuguda.
- Lack of labor
- Chilies from Guntur (Andhra Pradesh), Rajasthan, and Nagpur (Maharashtra) have come up as competitors to Kuchinda's chili. These are cheaper alternatives, which are high in spice and yield. The cost of production of chili is quite high in the Sambalpur blocks, something that could be harming the farmers. The quality, desi nature, and spiciness are what make the local chili distinctive.
- Influence of village-level intermediaries called chittiyas who have dominated the agricultural markets of the block over the years. Farmers are harassed if they make a sale to an outside party, even if offered a higher price than the local chittiya. The result of disobeying a chittiya is harassment.
- Chili at lower prices is available from the neighboring Bargarh district in local markets.
- Declining yields of chili from 12–14 quintals to 2–3 quintals per acre.
- The after-effects of demonetization.
- Improper utilization of government subsidies to install bore wells in areas that are not easily accessible to chili farmers. The Kuchinda agriculture department had received Rs 11 crore to install these bore wells.

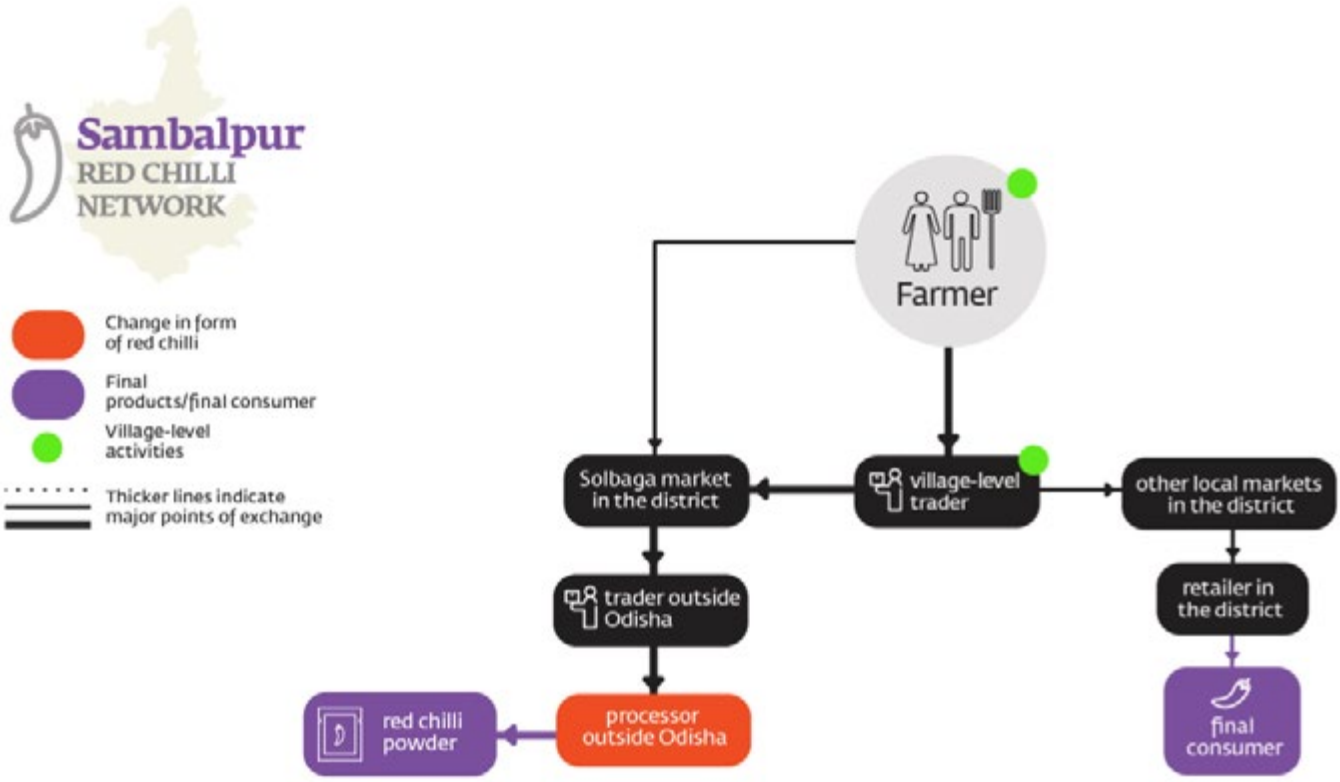


Figure 8.1 Sambalpur Red Chili Network

8.1.2 A short-lived challenge to the status quo

After facing years of exploitation and low prices at the hands of the intermediaries in Kuchinda and Bamra blocks, farmers recalled that there was a major change in market dynamics in 2006 with the arrival of the Seashore Group of Companies. The company started purchasing farmers' red chili at what was then an improved price of Rs 70 per kg. The farmers recall that they had to face significant resistance from the local intermediary network before they could start transacting with the company, and it is likely that only the larger upper-caste farmers were able to defy the rules of the local intermediary. The company continued its procurement operations until 2011 and bought land to construct a processing unit in Kuchinda, for which it had deposited Rs 5,00,000 with the government. But then, the company was embroiled in a high-profile investor scam and was shut down by the state authorities. The company's presence, however, ensured some benefits for the farmers as they continued to enjoy higher prices even a few years after its closure.

It later emerged that the fixing of price at Rs 70 per kg led to a loss of Rs 50 lakh to the company in its initial years of operation, due to the high moisture content in the chili produce. There were no fair average quality (FAQ) standards set for chili anybody involved was aware of. A board member of the Seashore Group of Companies, who was also a member of the Western Odisha Farmers' Union decided to make farmers aware of the FAQ standards in the next purchase year across the three chili cultivating blocks to avoid losses. In 2009 and 2010, the company set the rate for chili purchase at Rs 90 and Rs 100 per kg, respectively. The company used to sell this dry chili to buyers in Jharkhand, Chhattisgarh, and West Bengal.

The company was operating out of Kuchinda Regulated Marketing Committee's (RMC) premises to run its chili marketing operations. When the company realized that the intermediaries were selling chili to them on behalf of the farmers, they decided to make farmer registration compulsory to weed the intermediaries out. A database was created using farmers' voter IDs and land registration details. Then ID cards were issued to farmers to participate in the company's purchase operations.

At the time of its closure in 2011, the company was in a poor financial condition, owing lakhs of rupees to farmers. The farmers' union member involved in the organization's operations managed to get the company to disburse funds to clear the farmers' dues, yet at least a few farmers remained unpaid for their produce.

Even after the Seashore Company was completely discredited, it stood out for having taken on, with some success, an economically and socially powerful network of village intermediaries, commonly known as chittiyas, which dominates farmer-level exchange in the red chili market in Sambalpur Indeed, farmers in Sambalpur have tried repeatedly to get the district administration to intervene in the market by opening up contract farming channels and setting up a block-level farmers' mandi to bypass the chittiyas but with very little impact. This seems to be an important area for regulatory intervention, and, as we will see, it would be anything but straightforward.

8.1.3 Intermediation and the failure of formal regulation

Over the last few years, there have been ongoing efforts to bring the chili trade under the regulatory oversight of the

Kuchinda RMC. However, chili sales by farmers in Sambalpur remain predominantly between farmers and chittiyas or traders at the village level and do not take place in the market yard. In Kuchinda and Bamra, downstream from the village-level traders, there is a small group of three–four major intermediaries based in town. One particular family is known as the "kingpin" of the chili market. This family organizes and controls local trade and sets the price for chili in the market. These block/town-based intermediaries have a small network (made up of several village traders) that they engage with and bring in chili from the farmers. Each intermediary has a particular number of farmers and villages under him. The number of intermediaries varies depending upon the distance of the village from the town. If a village is remote, there can be multiple intermediaries in the chain, before the produce reaches the Kuchinda intermediary and, finally, the RMC. A commission of 2% per quintal of the produce traded is paid to the RMC. The chili is then loaded onto trucks and transported to other blocks, districts, and states.

Ever since trade has come under the RMC, we were told that the 2% market fee rate has been a deterrent for traders from other blocks and districts to come in and trade in Kuchinda chili. The farmers view this taxation to have been imposed on them rather than the trader, leading to lower prices of chili. Farmers are unable to move the chili outside the block without attracting the tax. In fact, farmers were happier with intermediary involvement without the RMC intervention, stating that the private market rates were in fact better. The RMC officials told our teams that they were sealing the trucks of traders who came in from outside the block and tried to escape without clearing the RMC's tax dues.

We should also note that even though the town and village intermediaries' network is dominant, farmers also reported that when prices surge, they do their best to reach one of the larger market sites—either a local ***haat*** or the nearest major market, e.g., the Kuchinda or Solbaga chili market—for direct sale to traders. While some large farmers are able to reach these markets directly, village-level intermediaries also sell here.

In previous years, during the peak season for chili marketing, traders recount that there were nearly 200 traders who used to flock to the Solbaga market. At the village level, traders make a rough estimation of the quality and quantity of the produce to pay the farmer. No weighing machines are used in the process, but a bag is used to weigh the produce, assuming a certain quantity (in kilograms) would fit into it. Farmgate transactions are immediately paid off in cash.

Once the produce reaches the Solbaga market, the seller has the option to choose from four–five intermediaries present in the market, occupying different physical spaces in the market. Some village intermediaries have been dealing with a single market intermediary for years, so they continue their dealings with him. Farmers tend to bargain around a bit more, getting a sense of the prices for the day, showing their samples to the market intermediary. The village intermediaries tend to show the better lot out of the sample. After the agreement on the price, the bags are unloaded, emptied by the labor, weighed, and the chili is laid out on tarpaulin sheets to dry.

Payments are usually cleared after 10 am, once the day's arrivals have slacked. Labor then begins packing up the chili into the Bamra traders' bags. The farmers and village intermediaries, waiting with the market intermediary clear out the cash payments. The village intermediary helps the market intermediary with payment calculation and log maintenance, while the latter handles the cash.

The Bamra market intermediaries have a limited amount of cash in order to make the day's payments. They look at the quantity of stock written against each farmer/intermediary and multiply it by the agreed upon price. Whatever balance payments are left to be made are carried forward to the next visit by the farmer/village intermediary. The "carry forward" practice restricts the options of the seller such that he may have to end up selling to the same intermediary who owes him money the next time, so as to keep the relationship going and his chance of extracting his full payment alive.

The commodity is then transferred to the godowns of Bamra's intermediaries, who store the produce and sell it in retail in small amounts. Some quantities are sent via train to other states. Most of the produce from the Bamra intermediaries is procured by traders from Rourkela. The chili then goes on to areas within Sambalpur, Jharsuguda, West Bengal, Bihar, Chhattisgarh, and Jharkhand. The majority of this inter-state trading is carried out by the Rourkela traders, rather than the local Bamra traders.

8.1.4 Resistance to eNAM and its design and implementation failures

As we have seen, village intermediaries have played a critical role in obstructing the administration's recent and ongoing attempts to bring the chili trade under the Kuchinda RMC. This has also impeded any progress in implementing the eNAM scheme introduced in 2016, although there are also other reasons for its failure.

According to RMC functionaries, the eNAM lab was installed in Kuchinda at the worst possible time for trade, when the market was frozen due to demonetization. Further, although traders from Bilaspur (Chhattisgarh), Ranchi (Jharkhand), and Nagpur (Maharashtra) have registered on the eNAM platform, the hold of local traders on farmers has meant that farmers have been forcefully prevented from participating in any direct trade. Local intermediaries are also well known for intimidating outside traders from entering the market and buying directly in Sambalpur. An RMC official went as far as saying to us that local traders threaten outsiders with a "pistol to the head." When the RMC started its chili marketing operations in 2016, the intermediaries stood on the highway along the way to the RMC to buy the farmers' produce at higher rates before the latter got a chance to reach the RMC. RMC officials were also open about the bribes commonly received from intermediaries to allow trucks to pass without paying taxes.

During our fieldwork, the RMC was trying to conduct a survey among farmers to ascertain their price expectations and create awareness about trading on eNAM. The survey was also being conducted with processors to make an estimate of the demand and supply of chili for the marketing season. In 2017–18, a few companies had agreed to purchase chili from the Kuchinda RMC, but the cheaper Rajasthan chili ensured that these

commitments fell through. In March 2019, a meeting was organized at the beginning of the chili marketing season with farmers from every chili-cultivating village in the block to try to encourage sales at the RMC. However, keeping the previous season's rates in mind, when intermediaries offered prices of around Rs 120 per kg compared with the low prices of Rs 30 per kg offered by bidders on eNAM in the 2017 marketing season, there was little appetite for trading on eNAM. RMC officials struggled to convince farmers to transact on the eNAM interface. Additionally, farmers complained that the RMC was only able to make payments within 15 days, whereas intermediaries in the villages and in the Solebaga chili market made instant clearances. Moreover, the eNAM payments were via electronic bank transfers, while farmers preferred immediate cash payments.

During the trading season, RMC officials were present in the Solbaga market, keeping a note of the quantities and prices. Later, the study teams discovered that the officials were there to convince the traders to share their account details, so that some of these transactions happening in Solbaga could be put up online as reflective of the trade taking place via the eNAM platform. However, the traders stayed away. Their businesses were already performing poorly with low quantities and prices, and they did not have the bandwidth to get stuck in a bureaucratic mess. The officials were also speaking to the farmers, convincing them of the benefits of using eNAM. However, it became increasingly apparent that the RMC staff was quite desperate to show some chili transactions on the online platform. Storage facilities were also offered to farmers in Kuchinda with the advent of eNAM to incentivize trading of chili within the Kuchinda RMC.
Even after the elections, when our teams made a visit in May, the eNAM operations were yet to begin. RMC functionaries were still trying to convince the market intermediaries to come on board, carrying around check books, and convincing them to make some check payments which could be added to the platform, but to no avail.

And yet, for all the apparent social and economic power, the red chili intermediaries and traders in Sambalpur occupy a nebulous and risky regulatory status. Now under the RMC, their business is not quite legal, and they operate under the fear that they may be shut down. They are also used to routine harassment and extraction of bribes at the hands of government officials. Overall, the regulatory experiment with chilies in Kuchinda seems to bring forth the worst features and failures of state regulation in agricultural commodity markets, while doing nothing to introduce serious alternative marketing channels that can compete with powerful local networks of intermediation and trade.

8.1.5 green chili in Balasore

Green chili production and marketing in Balasore shares some important features with red chilies in Sambalpur. Here too, production is concentrated in a small number of blocks. In this case, it is the two blocks of Sadar and Remuna. Markets, however, are inter-state and at a long distance. Balasore's green chilies are sent to the major vegetable markets of Mumbai and Delhi. The hybrid variety is commonly cultivated, and most farmers in this region have not grown the desi variety in over a decade. Farmers sell their chili to the village intermediaries and the commodity moves in a fairly linear fashion as represented in the network below. A small quantity is sold at the local Motiganj and Nayabazar markets for domestic consumption in Balasore, and the rest is "exported" to other Indian states and markets.

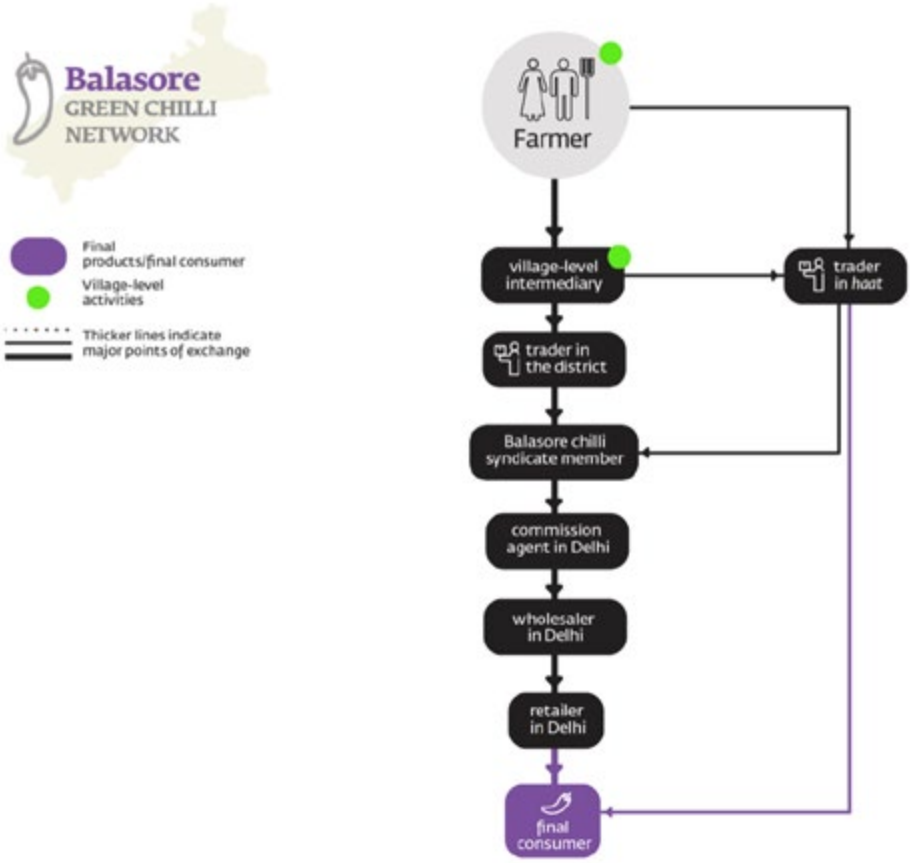


Figure 8.2 Balasore green chili network

8.1.6 Market volatility

As in Sambalpur, chili farmers in Balasore have also been exposed to high production and price volatility in recent years. Farmers experienced a major market crash in the 2017–18 period due to which many did not even harvest their fields. The market crash has led to a significant reduction in green chili production in the following year (2018–19) when we were in the field. Many farmers had decided to halve the area under cultivation, while others had stopped cultivation for that season altogether. The unseasonal rainfall in December further discouraged the farmers who planned on cultivating the crop during the next season. Instead, cauliflowers and other vegetables were taking over that land. We also found that farmers are well aware of how the Azadpur mandi (Delhi) rates shape the local rates for green chili in Balasore.

During the 2018–19 chili season, we noted that green chili prices had been somewhat remunerative for farmers till the end of February, while falling in the first week of March. The desi chili had an edge over the hybrid chili, trading at Rs 10 per kg higher. Balasore farmers reported that they are able to earn profits as long as chili rates hover around Rs 15 per kg. Anything lower than that leads to losses. In spite of this, farmers continue to grow green chili as it has a designated marketing channel in the form of the village intermediary, and rates are usually manageable till Holi in March because of constant demand through the traders. Post-Holi, the traders in the two main local markets stop buying chili and so the farmers let the existing stock dry, selling the dry chili in retail locally. The hybrid chili does not have much of a local demand because it is not considered spicy enough in the region. However, farmers cultivate the hybrid variety because of higher yields, almost 1.5 times that of desi. The cost of harvesting the desi variety of chilies is also higher because of their small and slim size, making them harder to pick than the long, fat hybrid variety. The labor rate for harvesting hybrid chili was Rs 3 per kg, while the rate for desi chili was double that at Rs 5–7 per kg.

One of the farmer's we followed had harvested four times until mid-March and decided not to sell green chili post-Holi (20 March that year) but let it dry and sell it in retail as red chili at Rs 40 per kg as against the current green chili price of Rs 8 per kg. The drying process reduces the weight to one- fourth, so in the end, the farmer estimated she would earn Rs 2 per kg more.

Another farmer who had sold desi green chili eight times in the season reported fluctuations in the range of Rs 50 to Rs 25 per kg for different sales. He sold chilies to a village trader who would take it to one of the two local markets, from where it would be further transported by the trader to Ranchi.
Most farmers in Balasore sold to a village-level trader and complained of the complete lack of infrastructure at the Nayabazar and Motiganj markets in the block headquarters. They pointed to the lack of a proper organized and regulated market leading to low rates of green chili. Both the local markets have no shed or shelter, no drinking water, and no space for farmers to sit. Nayabazar is operated by the municipality but there has still been no development. During our interactions, farmers also highlighted that the prohibition of green chili export to Pakistan has impacted prices.

The traders in the Nayabazar and Motiganj markets had their own litany of woes to share. One trader who spoke to our team had exported 20 trucks of 16 metric tons each to Azadpur in 2017–18. However, the trader reported that he incurred a loss due to over production that year and a glut in the mandi. His purchase price was Rs 5 per kg, and the price in Azadpur was only Rs 2.5 per kg by the time of sale. He expected 2018 to have a lower production of chili due to the losses incurred by farmers and traders the previous year, which he hoped would drive up the prices and therefore earn him a profit. The trader also sends chili to Ranchi (Jharkhand) and Aurangabad (Maharashtra).

8.1.7 The Syndicate

Like the "kingpins" in Sambalpur, the most important market player in the Balasore green chili trade is a group of traders known as the "Syndicate." The origins of this group dates back to 1995, which was the first year that traders in Balasore exported green chilies to the Azadpur mandi in New Delhi. On discovering that green chilies enjoyed great demand and good margins in the Delhi mandi, over the years, traders in Balasore slowly came together to form what is known as the Syndicate to market chili in 2008. All traders in this group have a designated share in the Syndicate based on the size of their Azadpur contacts and their monetary resources to purchase chili. Their share, however, does not take into account the amount of chili they actually purchase from farmers. For every percentage of share they have, the traders contribute Rs 20,000 towards the working capital of the Syndicate to meet the expenses of procurement from farmers. In our research year, there were 22 traders who were a part of the Syndicate.

The Syndicate collectively decides the rate at which the chili is procured on a particular day on the basis of the prevailing price in Azadpur, Delhi. The chili is collected at one location in Balasore and sent collectively to Azadpur through trucks. At the end of the season, traders get a share in profits based on their share in the Syndicate. These traders are in contact with the village intermediaries (estimated to be around 115 in strength) who purchase chili from the farmers. These village intermediaries exercise significant influence on farmers as they provide them with credit and inputs in the form of seed and an assured sales outlet. The credit is the amount offered by the Syndicate to the intermediaries as an advance.

The farmers in Balasore feel that this cartelization by the Syndicate is bad for them and keeps farmgate prices low even when the market price for green chili in destination markets is high. However, given the recent history of price crashes on account of gluts in the market, farmers reported that they only cultivate chili when they get the go-ahead from traders. Only when farmers are sure that there is demand, do they cultivate the chili.

Our research on the green chili market in Balasore also took us to Azadpur, where we spoke to the President of the Chilli Traders' Association. He informed us that the national market for chili has been low for the last four years. The President, a large trader who receives chili from all over the country, spoke specifically about the Balasore Syndicate being responsible for greater chili arrivals in Azadpur over the past two years. He suggested

that the Syndicate enhanced commissions and margins for the traders involved but kept farmgate prices low and exploited farmers. He also told us that in Haryana, Behrampur's chili trade had also been managed by a similar syndicate, which was shut down two years ago. He also remarked on the arrivals from Balasore being lower than usual in 2018–19 due to Cyclone Titli. He reported that arrivals from Balasore fell from 10–11 trucks in the previous year to only three trucks in 2018–19.

Unlike in Sambalpur, there has been no effort by the RMC to try to regulate market exchange and trade of chilies in Balasore. But given the poor infrastructure and presence of the Syndicate, it would seem that some sort of regulatory intervention to provide oversight and improve market competition would be in favor of producers. However, the RMC in Balasore was especially lackluster and has never really seen investment either in infrastructure or human resources. In the meanwhile, the chili commodity network depends on complex webs of intermediation to absorb risk and shock, reveals a significant degree of trader cartelization, and leaves farmers vulnerable to both production and price volatility.

8.2 Ginger and vegetable markets in Koraput

Like chili in Sambalpur and Balasore, ginger cultivation, exchange, and trade in Koraput district provides us with another close study of a market system in practice and the specific dynamics of intermediation and regulation. Along with red chili in Kuchinda, ginger in Kunduli block has also been officially brought onto the eNAM platform, providing insight into the process of eNAM implementation on the ground. Koraput subdivision is also interesting as it has an active system of weekly haats for the wholesale and retail sale of fresh produce and an ***expanded regulatory role for the RMC.***

There are two RMCs in Koraput district, one in each subdivision: Jeypore and Koraput. Koraput subdivision is known for its trade in horticultural produce, including ginger. In 1994, Koraput was made into a ***market area*** district from a ***market yard*** district, turning all the markets in the entire district into RMC markets. There are eight principal market yards: Dumriput, Similiguda, Subei, Padwa, Nandapur, Kunduli, Ralegada, and Podagada. Most markets in the district are handled by the RMC. Unlike other districts (see Chapter 6 on Sambalpur), our team in Koraput only noted three markets that were managed by the gram panchayat, and these were under the Jeypore RMC. There may be a few smaller markets in the interior Adivasi belt, for which the RMC may have given the management responsibility to the local community.

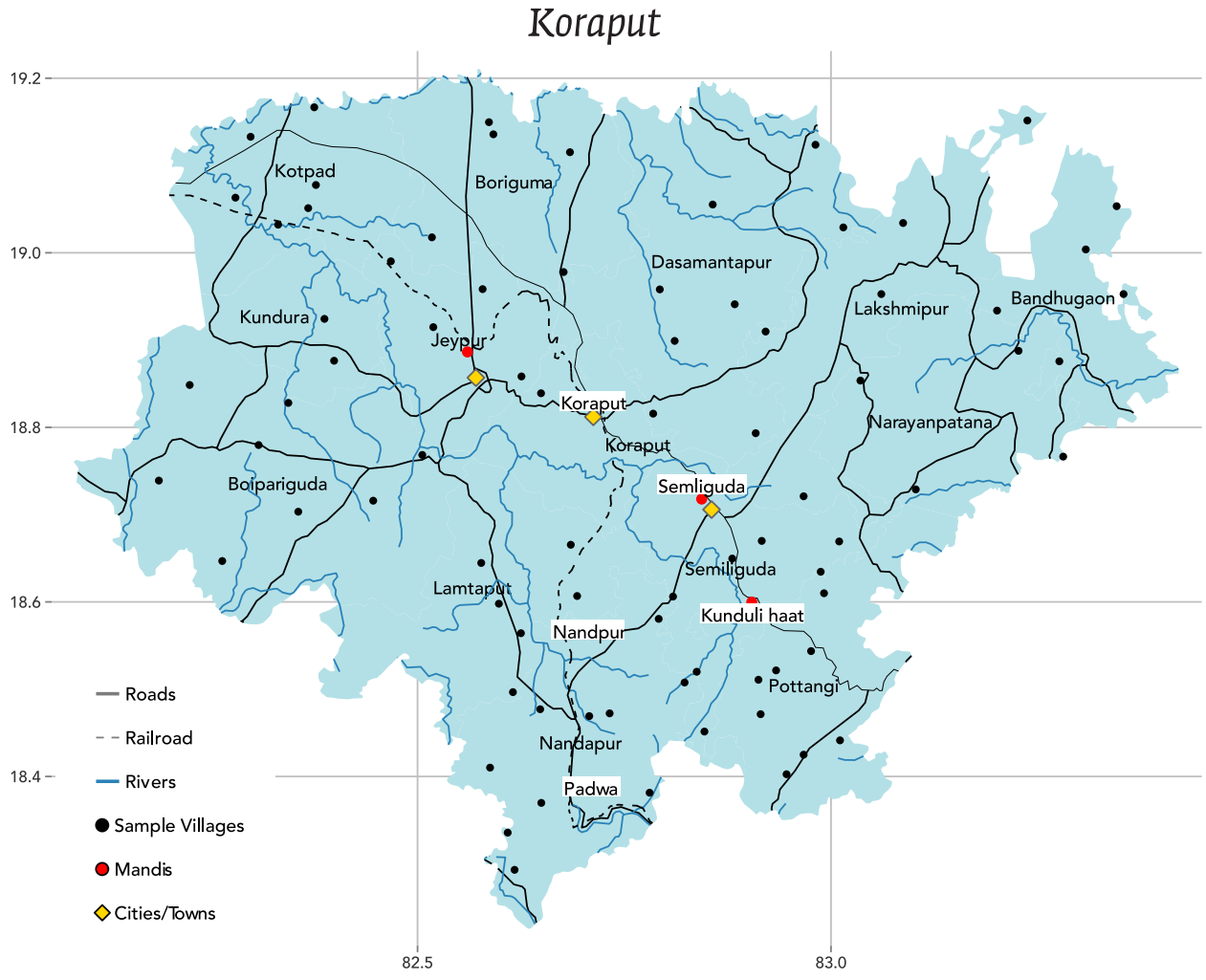


Figure 8.3 Market sites in Koraput

The Koraput RMC has 68 licensed traders, and membership is renewed at Rs 1,100 annually. Once the market yard at Kunduli was constructed, the weekly haat also moved closer to it. The RMC took over the Kunduli market from the panchayat in 1976. The market is set up on panchayat land. Other than Kunduli, 22 weekly haats have also been taken over by the Koraput RMC since 1977. The typical structure of administration in these haats is one supervisor and one–three market guards. One supervisor handles seven–eight yards. There are 15 market guards in Kunduli to collect market fees. There is no tax on vegetables, and farmers sell the fresh produce themselves with no intermediary involvement. There is a 2% market fee on paddy and 1% on ginger, ragi, little millet, niger, and non-timber forest produce (NTFP).

Since 2018, the RMC check gates have been removed in the district. However, there is a truck union that collects Rs 500 for every six-tire truck that is loaded in the market. During our fieldwork, an RMC official shared the view that he preferred the checkpoint collection days because now he has to collect market fees from shop to shop and there is no room for him to rest.

The peak season for the Kunduli market is October to February, during which time the night market for horticultural produce is also functional. Mid-March to May is the lean period in this market. Kunduli is the largest market for ginger and all vegetables in Koraput and is at the district center of the inter-state vegetable trade with Chhattisgarh, Delhi, Andhra Pradesh (AP), Jharkhand, and Uttar Pradesh (UP). Major commodities include jackfruit (summer), ginger (monsoon), onion (winter), and potato (winter).

The wholesale days in Kunduli are Sunday and Wednesday. The retail market is set up on Fridays. The RMC charges Rs 10 from the retailers in the retail haat on Fridays. Farmers do not have to pay this charge. Regular traders have their own unofficially designated space. Most farmers are from the Mali community, laborers are Adivasi, and aggregators from the Raeli community (a Scheduled Caste). Large traders in the haats buy from the aggregators. During our fieldwork, we were often told that the Raeli community had donated the land on which the Kunduli haat has been constructed to the government and therefore feels that it is the rightful intermediary between farmers and traders, taking a "cut" for every kilogram transacted. We found women present in this market as both buyers and sellers but not as brokers, aggregators, or laborers. A few Mali and Adivasi women work in the early morning market by purchasing from farmers and selling onward to other traders or directly in retail. But they deal in small quantities of produce.

The RMC has constructed storage and living space here. On the nights of wholesale markets, man farmers and traders stay back at the haat. Dormitories are available but hardly used because they are deemed by most to be expensive at Rs 100 per night. The traders who come in from outside rent a cabin, the size of a security guard's room, at Rs 500 per month to store their produce. A weighbridge is available at the yard.

The RMC for the Kunduli market yard is responsible for budgeting and expenditure, particularly on infrastructure. It has 12–15 members, including farmers and traders. The Sub-Collector acts as the Chairman and elections are held annually. The President is from the Regional Co-operative Marketing Society. There are eight farmers and four millers or traders on the committee. Traders are charged Rs 50 for tempos, Rs 100 for pick-up vans, and Rs 150–250 for big trucks by the committee. It was noted by the RMC officials that it is difficult for them to keep account of every transaction and many, thus, remain untaxed. The earnings from the market fees are equally divided between the RMC and the panchayat, after keeping aside 40% for infrastructure and administration. However, on the ground, we did not find the committee to be particularly active during the year.

In the haats, retailers pay Rs 20 to the supplier of bamboo-made tents and Rs 5–10 to the sweeper. These payments are made privately in the Similiguda, Lakshmipur, Boriguma, and Podagada haats but not in Nandapur and Kunduli. Although no market fee is supposed to be charged on vegetables, those selling in wholesale do end up paying Rs 5 per ***kaudi*** (60–70 kg of ginger). Buyers, on the other hand, pay between Rs 50–100 per transaction, depending on volume. All haats lie on a straight main road leading up to Vishakhapatnam, which helps the traders to bring in large vehicles for loading. This also helps traders to log the movement of their trucks and keep an eye on other traders' truck movement. Koraput is well connected by road and rail to big mandis in AP, facilitating easy movement of produce. Boriguma haat under the RMC charges a fee of Rs 10 from everyone who sets up a stall.

As mentioned, the brokers in Kunduli market are from the Raeli community. They deal in all sorts of produce. They buy from farmers, aggregate produce, and sell to traders in the haat. When a buyer enters the haat with his empty vehicle, the attached broker approaches him, having kept the produce required by the trader ready before his arrival. The aggregator immediately starts the loading process. Brokers book the produce with their farmer contacts with the payment of Rs 50–100. The labor charge for loading and unloading is Rs 5, and packing charge is Rs 10 per bag. It is estimated that brokers usually make a margin of Rs 2–5 per kg. The trader then assumes the risk for the produce as he is the transporter and is responsible for the produce until delivery at the destination.

Let us now take a closer look at production, exchange, and intermediation in the ginger commodity network in Koraput.

8.2.1 Production, exchange, and intermediation

In Koraput, farmers generally thought of ginger as a remunerative crop, and it is widely cultivated by the Mali community in this district. Ginger cultivation has expanded over the last three decades and has replaced traditional oilseed cultivation in Koraput. Ginger is an input and labor-intensive crop. The same field is usually used for ginger cultivation with a gap of two–three years because the intensive use of inputs means that the soil must be given time to recover. The crop is laborious, and harvesting of an acre can take two days. New ginger is retained and is later used as seed.

Nandapur, Lamtaput, Pottangi (the most important producer), Similiguda, and Lakshmipur are the major production blocks. Ginger has a crop duration of six–eight months. It is planted in

March–April and harvested twice, first in August and later in December.

Mother rhizome or "MAA" ginger comes into the market from June–October. During the monsoon months, the moisture content is high and determines who buys ginger, because high moisture can ruin the produce when destined for long distance travel. Having a godown to dry this ginger can have a huge impact on the price/profitability in such a situation. The rate falls in Koraput in September once the Karnataka ginger enters the market. Bangalore ginger is almost half the price of Koraput ginger and has half the shelf life. New ginger then enters the market from October–February. During our fieldwork year, the new ginger harvest was low, leading to high prices in the local market.

Both hybrid and desi ginger are grown in Koraput. Hybrid ginger has high moisture content and therefore needs to be sold off quickly. The desi variety, in contrast, does not rot for a month. However, between these two kinds of ginger, the ***mota*** (or plump hybrid MAA ginger common in Koraput) and the ***patla*** (desi ***supraba*** ginger), the former fetches a higher price. Traders said that although there is little difference in taste, "Humans first eat with their eyes, and then with their tongue."

Farmers assemble their ginger in 42-kg bags but typically get the price of 40–41 kg as deductions for soil weight, rotten ginger, and moisture are common.

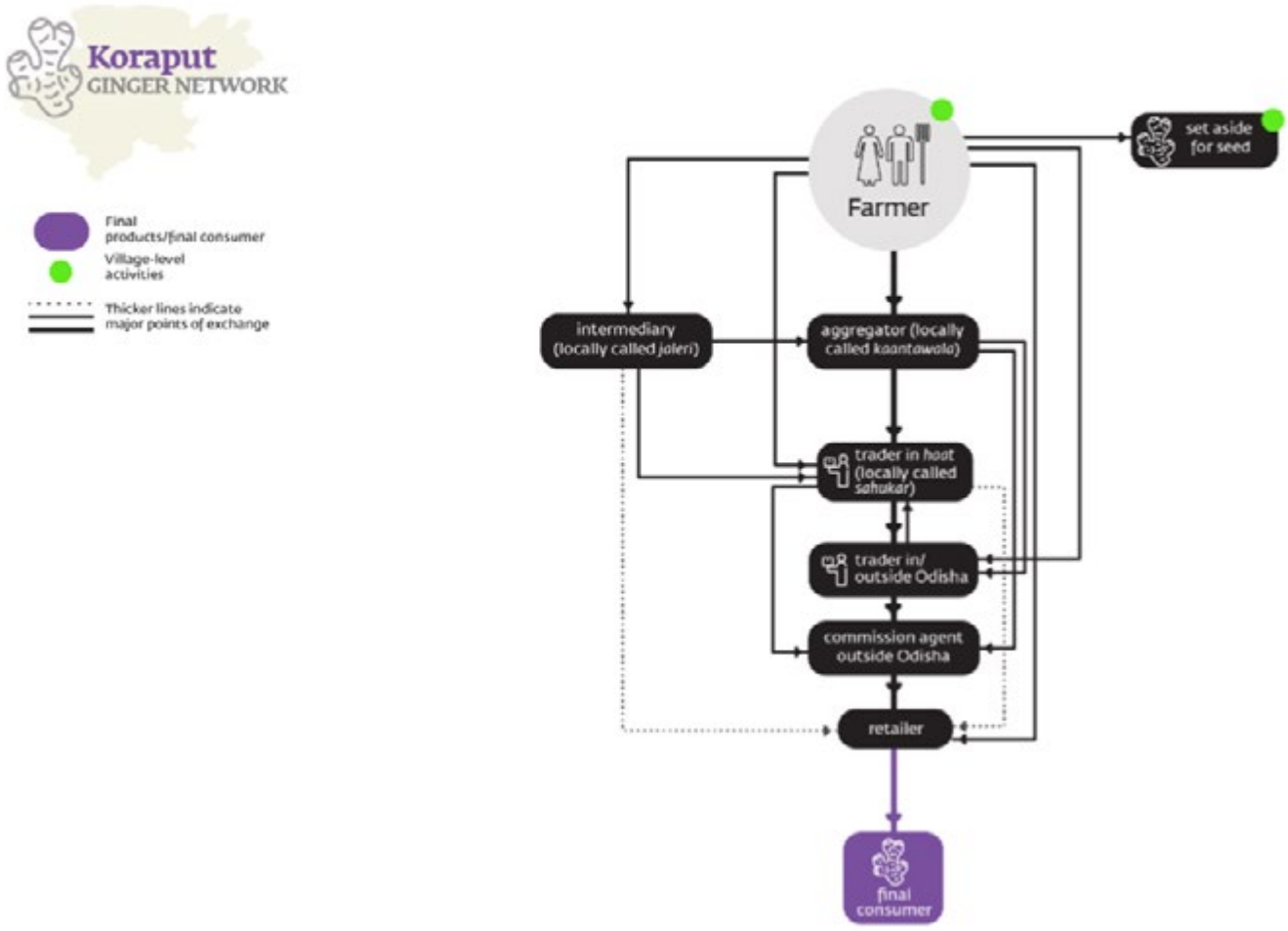


Figure 8.4 Ginger network in Koraput

During the peak season, if the prices for ginger drop, farmers stop harvesting ginger and leave it in the field until the second harvest season, using pesticides to keep the crop from getting infected. When farmers need instant cash payments, they take their ginger for sale at the nearest haat. However, farmgate sales are far more common, and those who can afford to wait sell to village traders and aggregators. Farmers rarely make losses in ginger as there are two harvests to work with In case of losses in MAA ginger marketing, the new ginger marketing makes up for it.

Farmers often choose to sell their ginger to the *kirana* (retail) store owner in the village, usually in return for groceries or other items bought in advance. Farmers who did this told us that while the price is higher in Kunduli market, it works out to a difference of approximately Rs 2 per kg in their calculation, which is not worth their time. But when the kirana store owner has too much produce, he refuses to buy, and that is when the farmer makes the trip to Kunduli haat.

Small village traders ***(jaleris)*** and larger intermediaries ***(kaantawalas, dalals, sahukars)*** also operate at the village level. On the field, we generally found that there was a division of villages between *kaantawalas*, but new intermediaries were still free to enter

a village. Farmers, however, said that they preferred selling to an intermediary with whom they have had a transactional history and that familiarity breeds trust.

Jaleris or small traders carry their own jute bags and go around the village approaching farmers to see if they wish to sell their ginger. A farmer shared a commonly held view that the village trader's machine always shows the weight to be 5 kg lower than what they expect, but then, farmers also sometimes believe their own assessment to have been faulty. Farmers said that going to the market is cumbersome because they have to hire a tempo, pay for the jute bags, and bargain with a trader. Selling to the village trader, all things considered, they felt, is a better deal.

A farmer from Nandapur block commented on how there is competition between the village traders and that farmers are able to sell to the one offering the highest price. If the village trader does not come, farmers themselves go to the weekly haat and make the sale. In Nandapur, in particular, many farmers are able to sell at the haat. One farmer said that 80% people sell at the haat and the rest in the village. Farmers also have contacts of traders to compare prices and then decide upon whom to sell to if they want to make the deal at the farmgate.

In the haat, farmers prefer to go to the big kaantawalas, as they are able to purchase greater quantities. In the haat, they are able to get their jute bags back from the trader, who uses his own to transport the produce further. However, even with these advantages and a sense of a relatively competitive market, farmers did point out that the kaantawalas often function with manual weighing scales and hinted that there was collusion between the kaantawalas, who decide among themselves the rate at which they will purchase from the farmers. Many village traders or jaleris work under the kaantawalas.

The intermediaries live close to the Kunduli haat, and we were told of instances where traders from the Kunduli market landed up at the farmer's doorstep and the kaantawalas created an uproar saying that the traders are not letting them earn money. These intermediaries also prove to be helpful to have in the system when the Kunduli traders are low on cash, as they can make spot payments to the farmers.

In some cases, however, haat rates were found to be lower than the village rates because farmers would sell the better-quality produce at the farmgate. This was observed in the case of a village trader, called a ***sahukar*** for his larger scale of operation, who was in direct touch with the AP trader. Once he has bought enough produce from farmers to be able to fill up a truck, he arranges for it be loaded and sends it straight to Araku in AP. This enables him to offer better prices to farmers than the chain that involves kaantawalas in haats and traders in Kunduli. On an average, it was estimated that he offers Rs 1 per kg more than the other traders that farmers may be dealing with. The village trader makes the payment to the farmers in a week's time.

The kaantawalas themselves decide the rate they offer in the haat based on the rates being offered by the bigger traders or the sahukars for the day. They find it better to pick up the produce from the villages, where the competition is not as intense as it is in the haat. They do not need any license and pay Rs 20 to the RMC every day.

For the village-level trader, it is important to be on good terms with not only the traders but also the farmers to keep the commodity coming. These aggregators are usually loyal to a trader to whom they sell their produce, but during peak season, when prices are high, there is stiff competition and the broker/aggregator may decide to sell to a different trader in spite of the credit lines extended to him. However, the bigger traders are able to make up for this loss when there is a considerable supply available in the market by colluding with each other and ensuring that the aggregator gets the same price from all the traders, resulting in traders recovering what they may have lost earlier.

For vegetables, including ginger, the trade for which typically takes place during the rabi months, traders contact farmers over the phone and mobilize one of them to facilitate the trade with multiple farmers in their village. This enables them to buy in adequate quantity to load their vehicles. The facilitating farmer earns Rs 200–300 for managing the process. This is the process followed by traders from the neighboring districts of Kotpad and Malkangiri. Quality is not as important a factor in other vegetables as it is in ginger. If a trader incurs a loss on sale, he deducts the amount from the farmers' payment, typically made in three–four days from the purchase. The sacks are supplied by the trader.

It was not uncommon for a village trader (kaantawalas/sahukars/dalals) to enter into an arrangement with the farmer where the trader is responsible for the harvesting and marketing of the crop. This is rarely in the case of vegetables in Koraput.

Most ginger traders speak Odia and Telugu, reflecting the importance of the markets of AP in Koraput. Odia traders also buy horticultural produce from AP to sell in the Kunduli haat.

The two cases that follow provide a better sense of the operating margins and risks that aggregators and traders face in Koraput's ginger market.

8.2.1.1 Brokerage margins

A kaantawala we followed closely had been dealing in ginger for the past six years. If he buys from the farmer directly at Rs 60, he sells forward at Rs 62. If he procures a bag, he takes Re 1 as commission and Re 1 as expense. If the farmers sell directly to the wholesaler, they earn a rupee more by selling at Rs 61. The kaantawala's purchase quantities are much smaller than the wholesalers. His main risks include getting repayments from buyers and the possibility of losses due to lower prices in the destination markets. He has to make immediate payments to farmers, and he reported that since there is significant competition amongst ginger traders within Odisha, traders are constantly undercutting each other by offering lower prices to the onward buyer. The bigger traders make up for loss in price through volumes.

This kaantawala sells in the Kunduli haat and works on commission with buyers in other parts of Odisha, AP, and UP. The trader has four–five people who work for him and go to the villages to negotiate prices with farmers, taking along a

tempo and an electronic weighing scale. These smaller traders come and then pick up the bags from him. The kaantawala then takes his Rs 2 over the price paid to the farmer and transfers all the expenses on to his onward buyers. The profit or loss in the destination market is the buyer's risk, and the kaantawala can remain insulated from the price risks. He takes half the payment before releasing the produce to reduce the risk of delays in full payment or non-payment.

8.2.1.2 Business practices of a big trader

We were also able to gain detailed insights into the operations and business practices of a big trader in the Kunduli haat. We will refer to him as R. This trader was from an upper-caste community, a member of the RMC, and well known for having the capacity to buy up almost the entire produce of the market on a given day. His father was a vegetable retailer. In 1993–94, when R used to sit at his father's shop, one day a trader from AP came to purchase a large quantity of vegetables from Kunduli but could not figure his way around because of the language barrier. R facilitated the trade for him, and by 1999, he had become the only big ginger trader in the haat. People learnt from him and branched out. Now there are 15–20 traders working at a good scale in the market. R estimates that his trading operations cover approximately 20% of the total ginger in Koraput's markets. He also runs a transport business and is an example of upward–downward extension into businesses facilitating agricultural produce trade. His operations span Odisha, Chhattisgarh, AP, UP, Maharashtra, West Bengal, Nepal, Karnataka, Punjab, and Assam.

R covers the risk of transportation for traders from outside the district. In July, he had pending payments for ginger of up to Rs 1 crore. He loads four to six trucks of ginger every day and has a godown right at the entrance of the Kunduli market yard. Like many other big traders, you will always find him on the phone, receiving calls about the location of trucks, demands for more produce, and dealing with disputes over the quality of produce. He does not grade the produce due to the large quantities he deals in. R considers labor to be the most important element in his business. He uses an electronic weighing scale and has agents aggregating for him in villages and other haats.

R explained at length that maintaining clients is at times more important than earning profits, especially given the growth in competition within the Kunduli haat over the years. Many traders who learnt from R have gone on to open their own businesses, taking away some of his business. He has also reduced his disbursement of "advance" payments to farmers as farmers would often sell elsewhere. The aggregators also came up to traders like R to request that he factor in a rupee in the transaction for them, so he switched up his trade to purchase from aggregators instead of farmers, even though the aggregators are no more trustworthy than the farmers. These aggregators may in turn have village-level intermediaries under them. Buying from aggregators is easier than buying from farmers because he then has to deal with fewer people. With R's experience, just by looking at the produce, he can identify the village it has come from.

- ***Credit:*** R gives credit to aggregators, who pass it off as an "advance" to farmers. The advance given to farmers can be as high as Rs 1,00,000 because ginger cultivation is considerably expensive.
- ***Recovery:*** R has a lot of pending payments but does not worry about these because most get settled in the course of exchange with the traders he deals with. He also asks for the pending payments whenever his buyers seem to be desperate for a large quantity of produce.
- ***Profits & Losses:*** R suffered a major loss of Rs 8 lakh due to the loss of a truck sent to Satara (Maharashtra). He was not able to locate the truck and had to reimburse the Satara commission agent he was dealing with. He had to sell off some of his property to pay off his dues. *These risks and the limited profits make the entry of new players tough as not everyone has the capacity to bear losses.* As he put it, "We gamble without seeing any of the cards."

Recently, a trader from UP had come to R's shop in the haat to purchase ginger. Previously, the UP trader used to purchase produce from Nepal but a change in government policy two years ago made the international trade unprofitable. He came to know of R through his contacts in the mandi. The UP trader is reliant on R because of the language barrier. He is not able to directly transact with the farmers and also has limited access to credit. R covers the transactions for him and he is able to repay him later. The UP trader takes big 20-tire trucks to do long-distance trade, which he deems profitable in comparison to short-distance trade. When dealing with him, R has to buy produce from all the other shops operating in the haat to fulfil the order. He does not buy ginger when the moisture is high as it is not suitable for long-distance trade. The expenses incurred by the UP trader include the sale price of ginger, transportation, and the commission for the agent in UP. Expenses for ginger being sent to UP for R include labour, the cost of empty bags, part-transportation, and Rs 10 to the RMC mandi.

The RMC charges 1% on the price of the quantity purchased, but R and the UP trader sometimes show a lower quantity to the RMC than the actual transaction. However, this can backfire. A truck driver once took the UP trader's produce to Agra instead of Delhi. The produce did not sell in Agra, and the trader was able to locate the truck to recover his money. However, the driver only returned the amount mentioned on the RMC receipt, while the produce was worth much more. The UP trader thinks that digital payments have spoilt business in the mandi. Earlier, only a few were brave enough to show up at the mandi with cash. Now, with mobile phones, payments are quick, so is information transmission on prices.

R once told us, ***"hamara paisa sadak par chalta hai"*** (our money runs on the roads). He therefore not only makes sure he tracks his own trucks like a hawk but also keeps track of where other traders' trucks are going because it affects prices.

8.2. eNAM in Kunduli's ginger market

Ginger and potato are the two commodities available for eNAM trading in Koraput. However, potato marketing is only important for 10–15 days during Durga Puja, when the supplies from West Bengal slow down. Koraput is largely an importer of potato.

Eight markets have been linked to the platform: Subei,

Nandapur, Kunduli, Podagada, Similiguda, Lamptaput, and Badasarupalli. The inauguration of the platform was held in July 2018. This inaugural meeting was held in the newly constructed market yard at the cost of Rs 7 crore. Farmers were taught how to register on the eNAM portal with the required documentation. Four traders had been "invited" from AP to do the inaugural bidding. The auction price was Rs 65.75 which made the farmers upset, since they were getting Rs 66 in the market. This made the District Collector ask the event organizers to make more traders available on the platform to bring up the price of the produce.

Almost 70% of the entire trade of Kunduli is directed towards AP. The alternating timing of vegetable production between AP and Koraput keeps the trade going between the two locations. A lot of the vegetable trade takes place outside the market yard, as pick-up vans and small vehicles are not able to go up the steep road. Larger traders of ginger and other vegetables also continue to trade from outside the market yard and the new market infrastructure lies unutilized. This is in keeping with an older history of infrastructural disrepair. A cold store unit was set up in the Kunduli marke yard in 2004, which was much needed due to the heavy trade of semi-perishables and perishables. In all these years, the unit has not received any electricity. In the Nandapur haat, a godown was built with no road leading up to it.

A trader who won the bid on the eNAM platform did not come to pick up the produce. It has simply been lying in the market yard godown. The farmer also had not been paid. Five transactions had been conducted on the platform within two weeks of its opening, and overall there has been negligible uptake on the platform.

8.3 Ragi in Koraput: Promoting millet procurement

Ragi (finger millet), locally known as ***mandia***, is an important crop widely cultivated in Koraput district. However, it has traditionally been grown by households for self-consumption and therefore sees limited market exchange and trade. Small amounts of marketable surplus may be sold to small-scale aggregators operating at the village or haat level. Over the last few years, through the work of the Millet Mission, the Government of Odisha has increased its policy focus and investment in promoting millet production and consumption. In 2018–19, a new initiative was introduced to undertake public procurement of ragi and to include the procured millets in the Public Distribution System (PDS), Integrated Child Development Services (ICDS), and Mid-day Meal (MDM) programs. Ragi procurement was officially started in Kharif Marketing Season (KMS) 2018–19 with the support of Tribal Development Co-operative Corporation of Odisha Limited (TDCCOL) with the MSP for ragi set at Rs 2,897 per quintal.

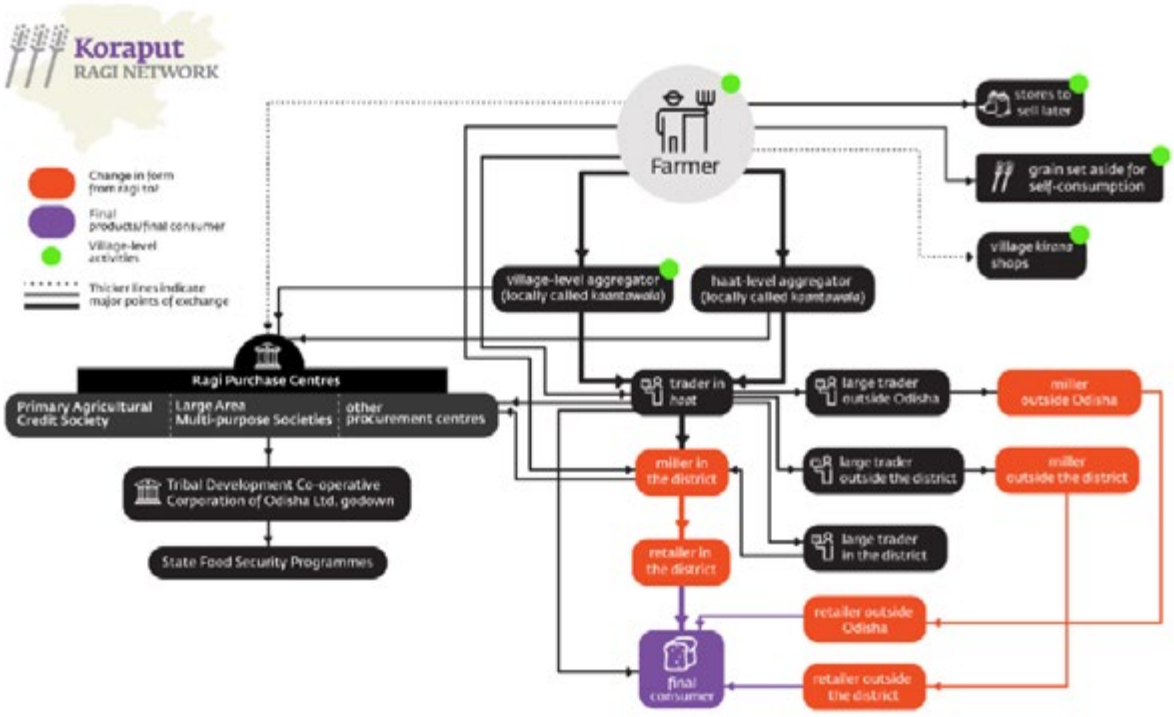


Figure 8.5 Ragi network in Koraput

Our field team in Koraput was able to observe the first season of ragi procurement under the new program. Its reports confirm the findings of the larger study of eight procurement districts by the Nabakrusha Choudhury Centre for Development Studies (NCDS).[19]

Although the state tried to put in place a procurement system and process for ragi, the scale of procurement remained extremely limited and the coverage of farmers was very weak. The critical issues highlighted by the NCDS review and confirmed for Koraput by our field observations include the following critical gaps:

[19] Srijit Mishra and Biswabas Patra (2018), "Procurement of Ragi in Odisha: Farmer Registration and Other Concerns," Policy Brief 3, NCDS, Bhubaneswar. Available at http://ncds.nic.in/sites/default/files/PolicyBriefs/PB3NCDS.pdf

- **Low farmer registration:** Only 11% of the total ragi farmers in the eight targeted districts were registered, with the lowest percentage of registration in Koraput, where only 1.1% of all ragi farmers were registered on the procurement system. Of this tiny figure, only 17% of the registered farmers in Koraput sold their ragi in the procurement centers, contributing a total of 8,904.7 quintals. This still amounted to approximately 50% of the total collection of the state pool.
- **Difficult registration process:** The registration process created problems for farmers who did not have proper land records or were cultivating the land given to them under the Forest Rights Act (FRA). [20] An NCDS policy brief points to low farmer registration, slow record digitization, and slow verification of bank and land details. 80% of the bank details and 35% of land cases were reported to be pending a week before beginning of the 2018–19 KMS in Koraput.[21] About 3,000 farmers were unable to register in Koraput due to their land being under the FRA.
- **Problems with the marketable surplus calculation:** The procurement limits were set by working with the calculation that approximately 10 quintals of ragi are produced per hectare, out of which 7 quintals (70%) is retained for self-consumption and 3 quintals will be available for sale in the mandi at MSP under the procurement program. However, it was found that this standard limit did not apply across the different geographies under millet cultivation, preventing some farmers with greater volumes for market sale from selling at the MSP to the state agencies. In Koraput, we also found that changes in the calculation also proved confusing. The state originally set the limit as 1.2 quintals ***per farmer*** and then changed this to 1.2 quintals ***per acre***. As a result, many farmers did not provide the full details of the land under ragi cultivation and could not make use of the higher procurement limit. The procurement target was also revised downwards. The initial procurement target for the district was set at 57,000 quintals and was later reduced to 30,000 quintals due to negative impact of the weather on the crop. Eventually, as noted, only 8,904.7 quintals of ragi was procured in Koraput over the season.
- **Inappropriate timing of procurement:** as ragi threshing only begins around 15 January, because of which December (the first month of procurement during our time in the field) was very slow. The mandi in Koraput shut on 7 March 2019 during KMS 2018–19, but farmer registrations were done till mid-February and many farmers only made the sale to the procurement centers after noticing that other farmers were receiving timely payments, an issue they all face during paddy procurement.
- **Distance, poor infrastructure, and untimely closure of procurement centers:** In many cases, the procurement centers were inaccessible, being located at over 20 km from production sites in their catchment area. There were also several infrastructural bottlenecks related to limited labor and paucity of gunny bags, leading to long queues and waiting time for farmers. Lack of sieves, moisture meters, and drying space in the procurement centers were also observed, which led to difficulties in quality assessment.
- **Lack of capacity in TDCCOL:** TDCCOL lacked familiarity with ragi, its quality, and handling during procurement. For instance, it was under the impression that the outer layer of the millet should be removed. However, the removal of the outer layer reduces the storage life from five years to only one year. The procurement center also faced a shortage of manpower due to limited RMC personnel. On the other hand, the NGOs implementing the Odisha Millet Mission in the district were of considerable assistance during the procurement process.

8.4 Conclusion

First, our field research finds that the two new flagship initiatives of the state in non-paddy agriculture markets—eNAM and millet procurement—are facing extensive challenges getting off the ground and will require considerable reassessment and redesign if they are to improve marketing conditions and outcomes for farmers. However, given that districts such as Koraput have suffered from systemic regulatory neglect and underinvestment, the focus on improving market infrastructure and competition and on expanding procurement for ragi, a non-paddy nutritious crop, merits greater time and effort. The two initiatives should be thoroughly reviewed based on the current experience and then a more realistic, responsive, and phased initiative can be developed for the district.

Second, as we can see in the case of both the red and green chili market systems in Sambalpur and Balasore, intermediaries do possess significant social and economic power in these commodity markets. Attempts to bring these markets under formal regulation have, however, failed and indeed proved regressive, where new fees and taxes have disincentivized buyers and sellers. Moreover, the RMCs in the state are neither designed nor have the capacity to function as well-regulated primary wholesale markets where auctions are conducted, and other market processes are followed in ways that facilitate both farmer-sellers and buyers to participate in market exchange. Unless serious investments, both infrastructural and personnel-related, are made to strengthen wholesale markets, regulation will continue to be ineffective. As it stands, bringing trade into the market yard therefore simply does not provide any tangible benefits to the trading parties and incentivizes them to resist and circumvent regulation.

This is precisely what the local chili intermediaries have done while continuing to collude on price setting and harass farmers if they sell to other buyers. Such harassment and violence must be addressed, but it is an issue of law and order rather than a problem of agricultural market regulation. The example of Seashore also shows that while a new buyer was able to provide competition, the prices offered were unsustainable and landed the company in major losses. As in all the other markets that we have studied, intermediaries, even when collusive, are also highly locally responsive and risk-taking, especially in volatile, long-distance commodity exchange and trade.

[20] An attempt to rectify this has been made by inclusion of FRA land in 2019–20 guidelines.
[21] Mishra and Patra, "Procurement of Ragi in Odisha."

As we see from these case studies, non-paddy commodity trade in Odisha is part of a much larger network of market exchange that spreads across districts and states. Inter-state trade in agricultural imports and exports into and out of Odisha is characteristic of this state's markets. This is true of not only chili and ginger markets but also commodity trade in betel leaf (see Part 2, Chapter 14). This is also the case for the export-centric prawn market in Balasore, which we studied closely but have not reported on extensively here in this core report on food grain and horticultural markets. Given the structure and functioning of current market systems in Odisha, it would be more productive for the state to invest in regional agro-industry, based on agroecological and geographic advantages, and to develop larger domestic and global markets for agricultural commodities cultivated and processed in Odisha. This will require considerable technical and market research, planning, public investment, and partnerships but is far more likely to prove transformative than even the modest gains to be made by improving market regulation.

Nalanda, Bihar- Cauliflower harvesting

Chapter Nine

Summary of Findings

Most Indian farmers have tiny farms that yield meagre incomes. They face a multiplicity of risks, which jeopardizes even these low incomes. These twin pressures, stemming from low incomes and high risks, are particularly acute in eastern India, manifest in the two states that were the focus of our study, Bihar and Odisha. With nearly 80% of the population in Bihar and 70% in Odisha still engaged in agriculture, increasing farmers' incomes in these two states is critical.

Agriculture policies in India have largely focused on three policy tools to increase (and stabilize) farmers' incomes: decreasing input costs through input subsidies, improving crop yields through better seeds and farming practices, and increasing output prices while stabilizing incomes through the Minimum Support Price (MSP) and procurement. More recently, policy has begun to pay attention to getting farmers a greater share of the marketed surplus, which has led to renewed concerns about the state of agriculture markets, the focus of our study.

Our findings relate to three broad areas:

- markets and prices that farmers realize at the point of sale,
- market sites—the physical sites of sales, and
- structure and functioning of market systems—the networks and relations of markets and market sites that are context specific to particular commodities and regions and further shaped by different state regulations and policy interventions.

9.1 Markets

The prices farmers receive for their produce vary considerably across farmers and commodities. There is a range of factors (timing of sale, site, volume) and transaction processes (grading, quality assessment, price determination, weighing method, and timing and mode of payment) that impacts the final price that farmers realize in any given sale.

The site of first sale also varies substantially. While the village (and to some extent local periodic markets or haats and small unregulated wholesale markets) remains the predominant site for farmers' sales in Bihar and Odisha, the regulated ***mandi*** is the near-universal site of sale for farmers in Punjab. Thus, a singular focus on mandis as market sites for farmers will miss out the actual physical sites of sales for most farmers in eastern India.

Misconceptions about the primary site of sale also extend to the manner in which sales occur. Notwithstanding the large expansion of banking services and farmers' access to bank accounts, the reality is that cash remains the predominant medium of exchange. Both electronic sales and auctions are small and, in many places, negligible.

In principle, farmers could engage in post-harvest processing, with the value addition giving them a price mark-up. However, post-harvesting processing is quite limited, reflecting market structure and price signals. The primary post-harvest process that farmers invest their time in is drying paddy, which fetches them higher prices. On the other hand, grading at the farm level does not seem to translate into higher prices, and few farmers invest in it. Expecting greater post-harvesting processing by farmers in such commodity markets is unlikely unless there is much greater demand, reflected in higher prices that farmers can expect for the additional effort and time delay involved in post-harvest processing activities.

Farmers also scarcely invest in storage since delaying the sale of their harvested crops rarely results in higher prices. In Odisha, larger farmers do delay sales, because they are able to wait for the limited paddy procurement operations by the state to open so that they can benefit from the MSP. Smaller farmers, however, lack such access and sell earlier, in cash, to village traders at lower rates. In Punjab, where public procurement opens on schedule and all farmers sell at MSP via *arhatiyas* in the mandi, farmers again have little incentive to invest in storage since delayed sales do not bring higher prices.

Larger volumes sold by farmers do translate into higher prices but for the most part these gains are modest. Although this should create incentives for farm-level aggregation to increase lot sizes, the aggregation required is deemed to compromise quality (due to mixing) and can actually drive down prices for the farmers involved. The resulting trade-off means that there is little farm-level aggregation.

Thus, whether it is the site of sale, the manner of sale, post-harvest processing, storage, and aggregation, all point to the need for public investments and interventions to be much more sensitive to specific contexts.

Finally, our findings challenge a longstanding assumption about Indian agriculture markets: the supposed ubiquity of interlinked transactions, especially for poor farmers. The majority of transactions between farmers and their first buyers in Bihar and Odisha do not show evidence of interlinked transactions. Interlinked markets do occur but for richer farmers in Punjab, where such exchanges between farmers and a stable network of commission agents continue to be important. Importantly, however, these interlinked markets in Punjab—between credit and product markets—only affect who the farmer sells through but not the price (which is determined by the MSP).

9.2 Market sites

A farm's location is a crucial determinant of the prices a farmer gets for his produce. Farmers in villages that are remotely located are doubly handicapped. First, the farmer gets lower prices because it is costlier to transport the farm produce to where there is demand. Second, there are fewer buyers which limits competition and gives them greater monopsony power,

further driving down the price the farmer gets in more remote locations.

But no matter what the location, if there is government procurement in a market site, farmers unequivocally benefit both due to higher prices (albeit modestly higher) as well as less uncertainty in their income stream. Even when there is partial procurement, there are some spillover benefits to farmers in the same market area who do not get to sell to the government. Nonetheless, when there is limited procurement, it is often regressive. The benefits accrue disproportionately to well-off farmers as they have both more financial and political power to take advantage of the de facto rationing. However, since procurement is confined to a handful of crops, especially paddy in eastern India, it reduces the relative risk of growing paddy versus other commodities. By providing a price floor in one crop, the government very actively influences farmers' crop choices rather than responding to market signals. And by growing greater quantities of a crop whose domestic demand is slowing and which guzzles a critical life resource—water—the opportunity cost of its overuse is high and rising rapidly.

In principle, India's farmers could shift to growing crops that bring higher average incomes but are riskier, if they could hedge against those risks. However, we find that insurance markets are largely missing, preventing farmers from hedging risk. Awareness of the Indian government's flagship crop insurance program (Pradhan Mantri Fasal Bima Yojna) is limited, and the actual take-up is only amongst a small minority of farmers. As long as agriculture markets remain incomplete temporally, and without long-term support towards the production of other crops along with market development for those commodities, *paddy* will continue to be a very attractive crop for farmers to grow.

The lack of clarity on the economic problem that MSP and procurement are trying to solve—increasing production, keeping consumer prices low, or increasing farmers' incomes—has meant that a single policy instrument is being used to target multiple policy goals. Since the vast majority of farmers in India are small, they are understandably very risk averse, which manifests itself in a strong preference for growing *paddy*. Any policy change must take a long-term view, with gradual phase-in, and provide farmers viable options before reducing government support for policies such as MSP and procurement.

9.3 Market Systems

Agriculture market systems encompass both markets and market sites, and they are commodity specific. The marketing system has attuned itself to the prevailing farming system—one with many small farmers who have modest marketable surplus. This excludes the roughly one-third of farmers who sell very little in the market anyway (but for whom production is tied to household food security). This report solely focuses on farmers who produce enough to sell.

Larger entities—e.g., the government and agro-processing companies—always have difficulties in transacting with many farmers. When a principal has to deal with many agents, as the number of agents grows, the principal faces a span of control problem. The result is multiple layers in the marketing system. Each layer has principals dealing with as many agents as can be managed with a limited span of control.

In Bihar and Odisha, this is manifest in the many small intermediaries buying from farmers in a few villages in close proximity. Each of them serves as a small aggregator who then passes on the agriculture commodity to larger intermediaries who in turn pass it on to processors. In Punjab, where farms are larger, there is usually one layer, with arhatiyas buying on behalf of the Food Corporation of India (FCI) in the case of paddy and wheat. Since intermediaries aggregate from many small farms, the mixing of produce from many farms undermines price premiums for higher quality produce. This reduces incentives for farmers to invest in post-harvest processing.

The market system with many intermediaries at multiple levels is less a sign of market inefficiency and more a rational response to the dominant structure and condition of Indian farming (especially in eastern India), which is characterized by tiny farm sizes. There is little evidence of intermediaries charging big mark-ups or delays in the movement of goods. Indeed, liquidity constraints drive smaller intermediaries to transport what they buy within a day. Vegetables harvested in Nalanda reach Patna (several hundred kilometers away) in a matter of hours. Furthermore, farmers are also paid quickly—in most cases, within a few days of sale. Other than remote locations, there is little evidence of the market power of the much-vilified middleman. In some cases, for example, the commodity networks for chili in Odisha, we did observe evidence of collusion, cartelization, and even physical intimidation by intermediaries and traders. State regulation has so far been unsuccessful in introducing competition and oversight in these niche markets.

Overall, without major changes either in the conditions of production or in the expansion in demand for the commodities produced in these regions, there is limited potential for dramatically increasing farmers' incomes through market interventions.

A ubiquitous attribute underlying all aspects of farming in India is risk. Risk determines what farmers grow as well as the prices they get for their produce. The strong preference for growing paddy is largely because it is the least risky crop for farmers to grow. Intermediaries help reduce risks faced by farmers, often paying them for the produce before they themselves get paid and absorbing the risk of the crop failing or prices falling (this is especially true in vegetables). The weakness of insurance markets, or the failure to integrate markets temporally, is an important factor why farmers have been averse to moving to higher-value but riskier crops. Addressing this serious market failure is key to changing the trajectory of Indian farming.

Brokers also seem to proliferate in dynamic markets where both local and non-local buyers are present, where they play an important role in providing some assurance against counter-party risk in the context of weak relationships between parties. This is especially the case when there is no formal regulation to provide such assurance.

In contrast to the dominant narrative of restrictive state regulation in agricultural markets in India through the

Agricultural Produce Marketing Committee (APMC) Act, the eastern Indian states of Bihar and Odisha are characterized instead by market deregulation (Bihar) and limited and weak formal regulation by the state (Odisha). The vast majority of first sales takes place at the village level itself and remains out of the purview of any formal regulation. Even market exchange and trade in notified market sites, whether mandis or haats (under local government authority), cannot really be considered as formally regulated, at least by usual norms.

State-appointed market functionaries do not oversee the conduct of auctions (virtually all sales are bilaterally negotiated), engage in wide dissemination of price information, ensure standardization and fairness in weighment and timeliness of payment, or facilitate dispute resolution. Commission agents and traders largely manage these functions. The only role of state regulation seems to be in market fee collection and, unfortunately, there is little evidence of these fees being ploughed back into upgrading infrastructure and market site development. Moreover, in recent years, new market infrastructure under eNAM appears to have been misdirected and inappropriately constructed and is therefore lying unutilized. Across the three eNAM sites in this study, we found significant resistance and virtually no substantial participation by farmers or traders in Hoshiarpur, Sambalpur, and Koraput. There was also widespread confusion regarding eNAM being only an electronic bidding and payments platform versus a platform to integrate long-distance trade.

In physical commodity markets, the lack of market infrastructure is not a cosmetic matter but undermines value through damage to the produce as a result of exposure to the elements (both weather-related and damage due to fires, which have been common across multiple sites).

The framework of equating mandis with APMCs needs to be expanded to consider the multiplicity of physical sites, from periodic haats to large, permanent wholesale markets. It is imperative that the state invest substantially in improving the physical infrastructure of market sites. This should prioritize building physical wholesale markets—both permanent and periodic—within the proximate distance of farmers.

Furthermore, since most wholesale markets are set up for bilateral trade between village aggregators, commission agents, and traders, many farmers are dissuaded from venturing into the wholesale market even when it is within easy physical reach, and they are not bound by interlinked exchange to sell to a particular local intermediary. This was the original purpose of Indian agricultural marketing law as it was envisaged in the 1950s and 1960s, and it remains almost unrealized by farmers in these two states.

Change in laws will matter little if the problem is structural. If farm sizes remain small, even if big firms enter, they will either buy from the same intermediaries or employ them and control greater market power, in which case farmers' gains will be minimal. So, addressing the structural constraints that small and marginal farmers and landless cultivators face must be a priority if we are to strengthen their terms of engagement in agricultural markets.

The need for open, competitive, and well-regulated markets, market integration, electronic trading, and free movement of goods is now well recognized. However, implementing the reform vision will require several coordinated investments on the ground, taking into account local realities with routine feedback from local stakeholders such that all ***pre-requisite conditions*** are met for the reforms to take off.

Overall, our research finds that when it comes to this vital sector of Indian economic activity and development, the idea that there are discrete low-hanging fruits that can be easily plucked through simple interventions and that these will result in significant gains in price realization for farmers is as seductive as it is mistaken.

Part 2 →

Part 2

Sambalpur, Odisha– Municipal Haat

Chapter Ten

Land

In this chapter, we discuss the distribution of land across our study regions. The contrast between the distribution of landownership and land cultivated throws light on the identity of who actually does the tilling. The landless and the small farmers are either leasing in land or sharecropping on farms owned by larger farmers. We show that land fragmentation is pervasive, specially hurting those who are small. We discuss the interaction between caste and land, and how it becomes a source of power. Finally, we end with a brief examination of rural land markets—sharecropping, tenancy, and sales.

10.1 Farm size distribution

Most Indian farms are small and fragmented. This has been a result of massive population growth and slow structural transformation of the economy that has failed to draw large numbers of the population out of agriculture.

10.1.1 Landownership

According to provisional numbers from the 10th Agriculture Census (2015–16), 86.2% of farmers in India are small and marginal, operating on holdings smaller than 2 ha, covering 47.3% of the cropped area. Between 2010–11 and 2015–16, the size of the average holding declined from 1.15 ha in 2010–11 to 1.08 ha in 2015–16. Concurrently, fragmentation of holdings has also been increasing, especially among small and marginal farmers.

Our survey data shows a preponderance of small and marginal farmers in all surveyed districts in Bihar and Odisha and somewhat less so in Punjab. Out of the 8,167 farming households surveyed, 71% own less than 1 ha of land and 89% own less than 2 ha of land. These numbers are comparable with state-level estimates from the Agriculture Census of India 2015–16.

Figure 10.1 shows the land-size distribution as per our data and data from the Agriculture Census of 2015–16. Close to 90% of farmers in Bihar and nearly three-fourths in Odisha are marginal (less than 1 ha). By contrast, about 14% of the holdings in Hoshiarpur, Punjab, are marginal. To show the consistency of our data with the census, we illustrate the same comparison at the district level in Figure 10.2. Since data from the latest Agriculture Census is not available at the district level, we use numbers from the 2010–11 census. In the surveyed districts, note that the minor difference from the census data is on two counts: (i) our data is more recent and (ii) our data is based on surveys as opposed to land records and hence is likely to capture smaller and landless farmers with greater certainty.

Figure 10.3, shows the prevalence of landless farming amongst farmers cultivating at least 0.5 acre of land. This does not show or proxy for the prevalence of landless farmers in general since we did not survey farmers who cultivates less than 0.5 acre. In Nalanda, almost a quarter of the farmers who cultivate more than 0.5 acre are landless, implying a significant proportion of tenancy and sharecropping. The rate is lower yet notable in Purnea, Balasore, and Sambalpur.

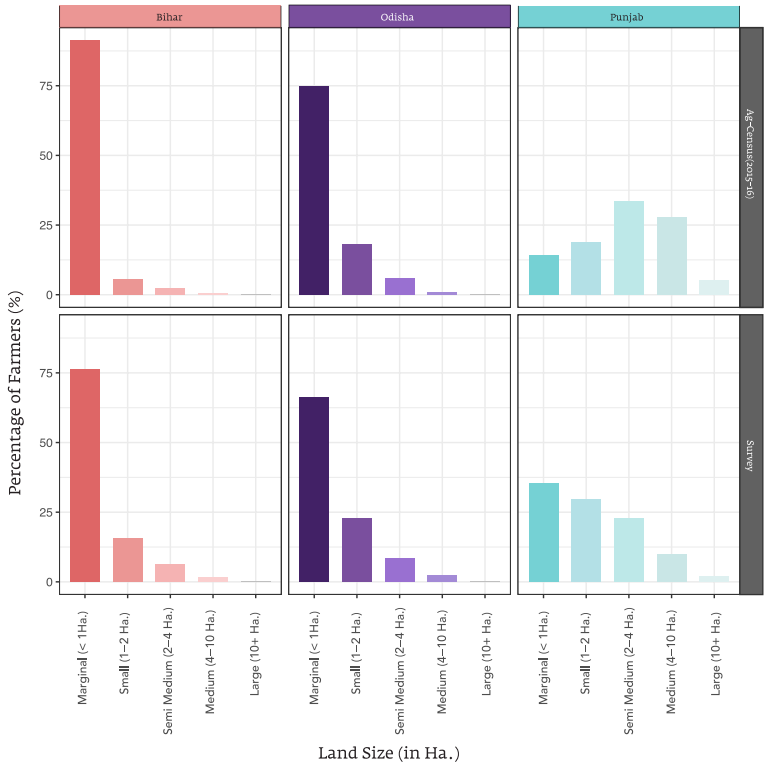


Table 10.1 Landownership distribution Note: Since in Punjab we only surveyed Hoshiarpur, results are not representative of the state as a whole, which has more smaller farmers in other districts.

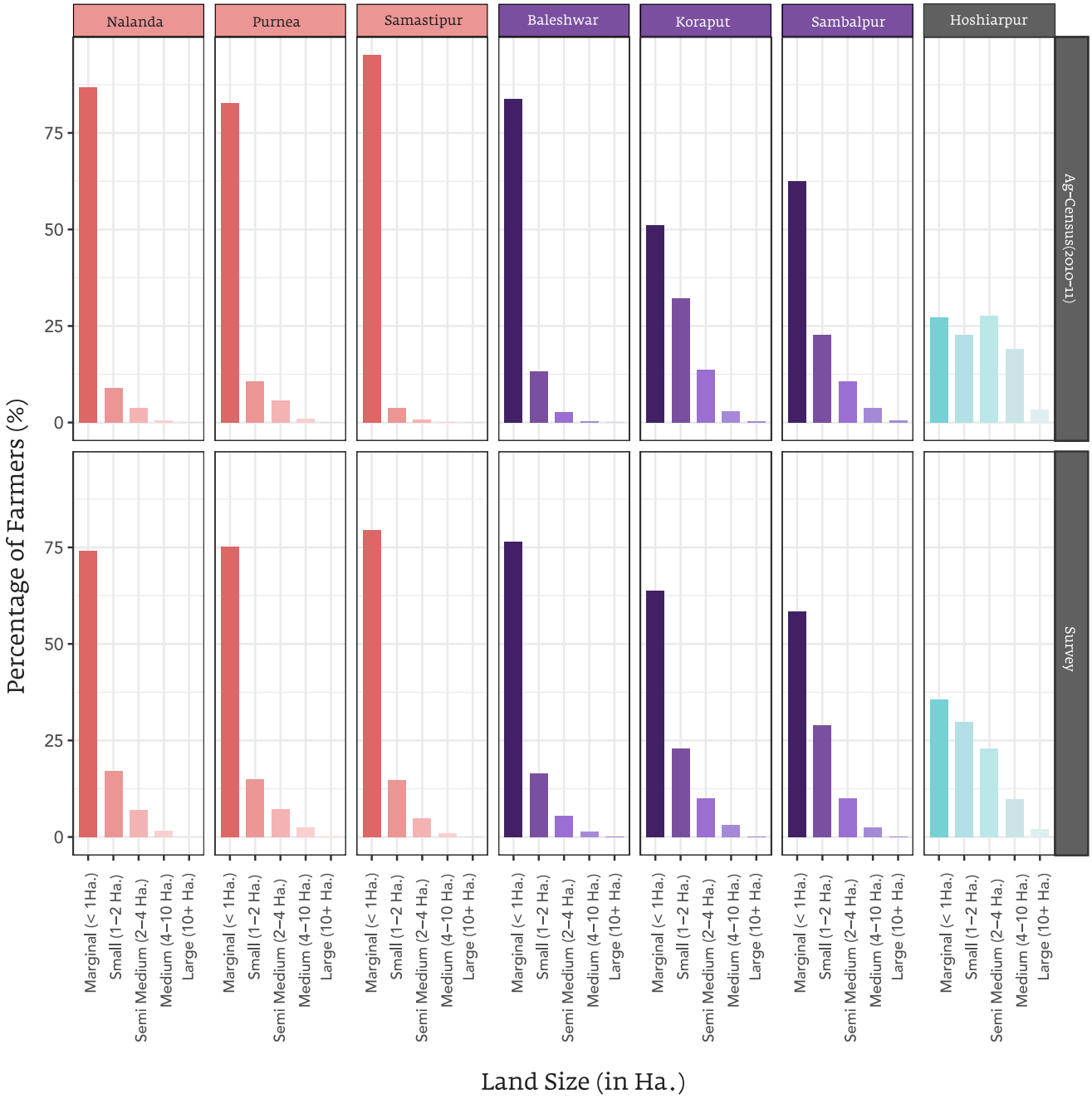


Figure 10.2 Landownership distribution at district level

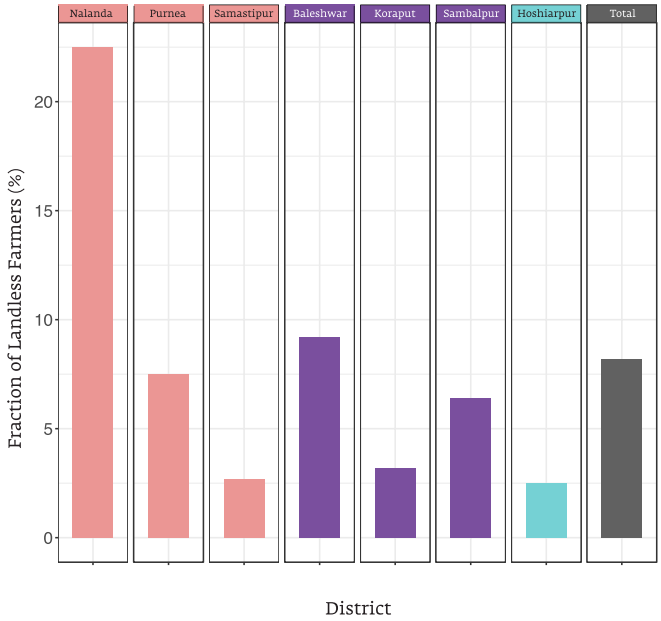


Figure 10.3 Distribution of landlessness amongst farmers cultivating at least 0.5 acre

10.1.2 Operational holdings

If we shift the unit of analysis from farm holdings by landownership to operational farm holdings, i.e., the land area cultivated rather than the land area owned, we see a fall in the proportion of smaller cultivators. For instance, in Nalanda, 53% of the farmers own land less than 0.5 ha. However, when it comes to land cultivated, this number falls to 31.4% in ***kharif*** and 33.6% in ***rabi***. Similarly, in Sambalpur, 30% of the farmers reported owning less than 0.5 ha of land. However, only 20% of the farmers reported cultivating land less than 0.5 ha in the kharif season.

The other fact to note is that the fraction of marginal cultivators increases substantially during the rabi season in Odisha. This is because most farms are left fallow during the rabi season owing to lack of irrigation. Only 20–30% of the area cultivated in kharif is cultivated during the rabi season in Odisha.

The observations from the ethnographic research as well as from

the survey data indicate that a significant number of farmers in each of the districts is part of a variety of tenancy arrangements (most common being leasing and sharecropping), enabling them to cultivate more land than they own. In Hoshiarpur, while 16.4% of the farmers reported owning more than 3 ha of land, 33.5% reported cultivating more than 3 ha in kharif and 22.5% in rabi. We discuss tenancy arrangements in detail in a later section. Lack of irrigation in rabi poses a limitation on area under cultivation in Odisha, which is reported in Chapter 12 that looks at production costs.

In addition to inter-district variation, geographical factors can result in considerable intra-district/block-level variation in the distribution of operational holdings. As figure 10.5 illustrates, in Koraput district, farm plot sizes are smaller in Koraput subdivision compared to Jeypore subdivision. Jeypore is located on flat land, making it suitable for cultivation of paddy. Historically, large farmers and landlords are known to have settled in this subdivision. Koraput subdivision is hilly and forested, a terrain that makes large-scale cultivation challenging. Thus, plots are smaller and more fragmented.

Similarly, in Hoshiarpur, the sub-mountainous and rainfed Kandi area in the central and eastern belt has smaller plots, with a higher concentration of marginal farmers. Compared to this, blocks in southern Hoshiarpur, closer to plains of the fertile Doaba belt, have larger plots of land (see figure 10.6).

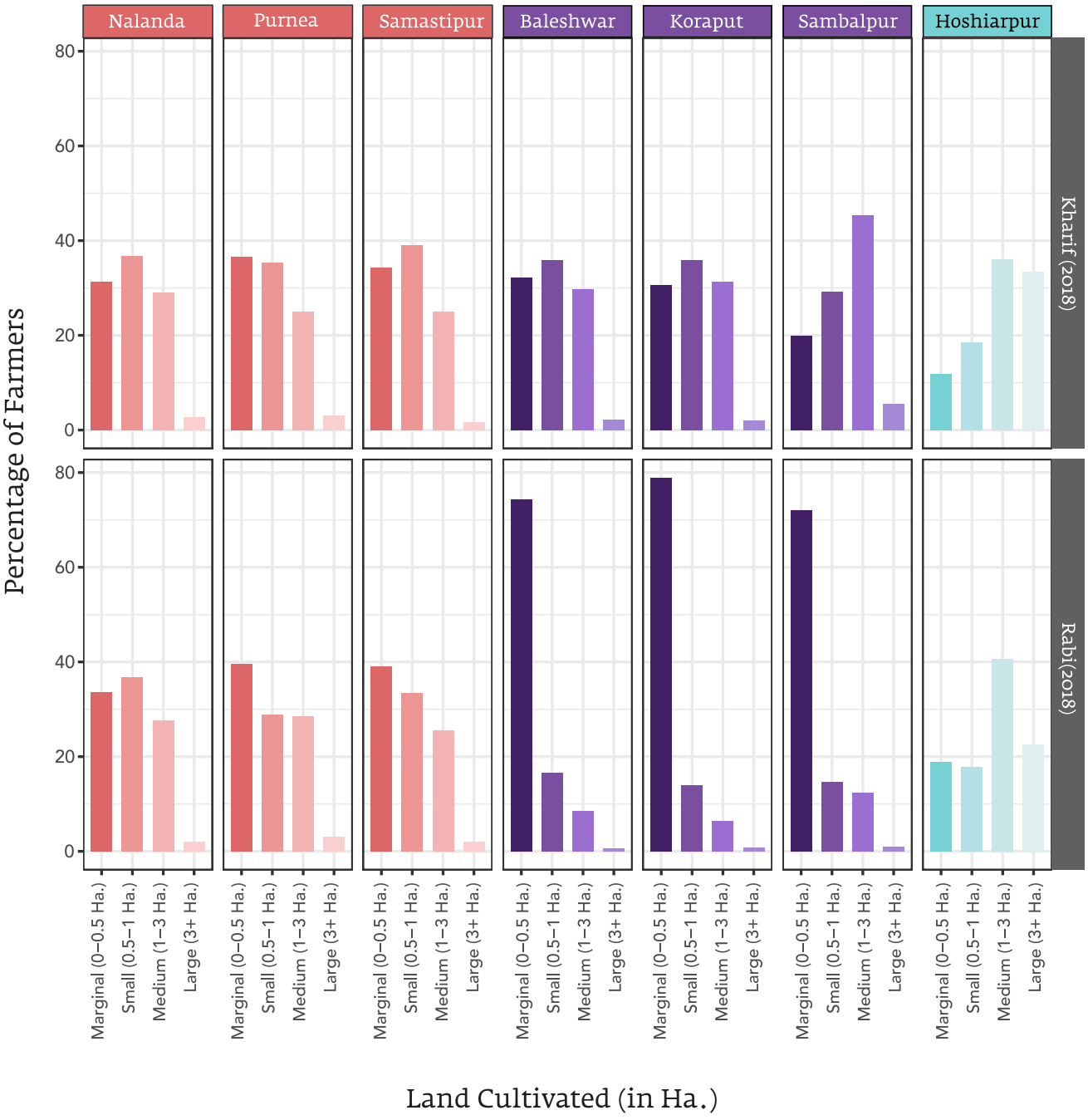


Figure 10.4 Size distribution of cultivated land

Hoshiarpur: Median Land Cropped in Kharif

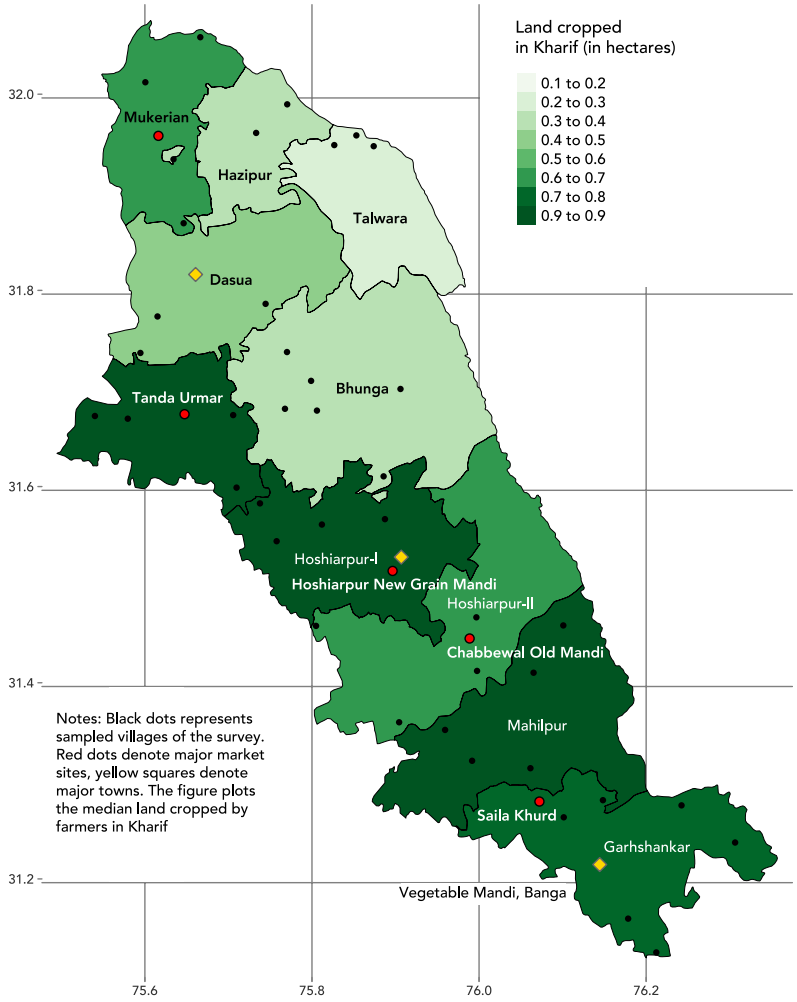


Figure 10.5

Koraput: Median Land Cropped in Kharif

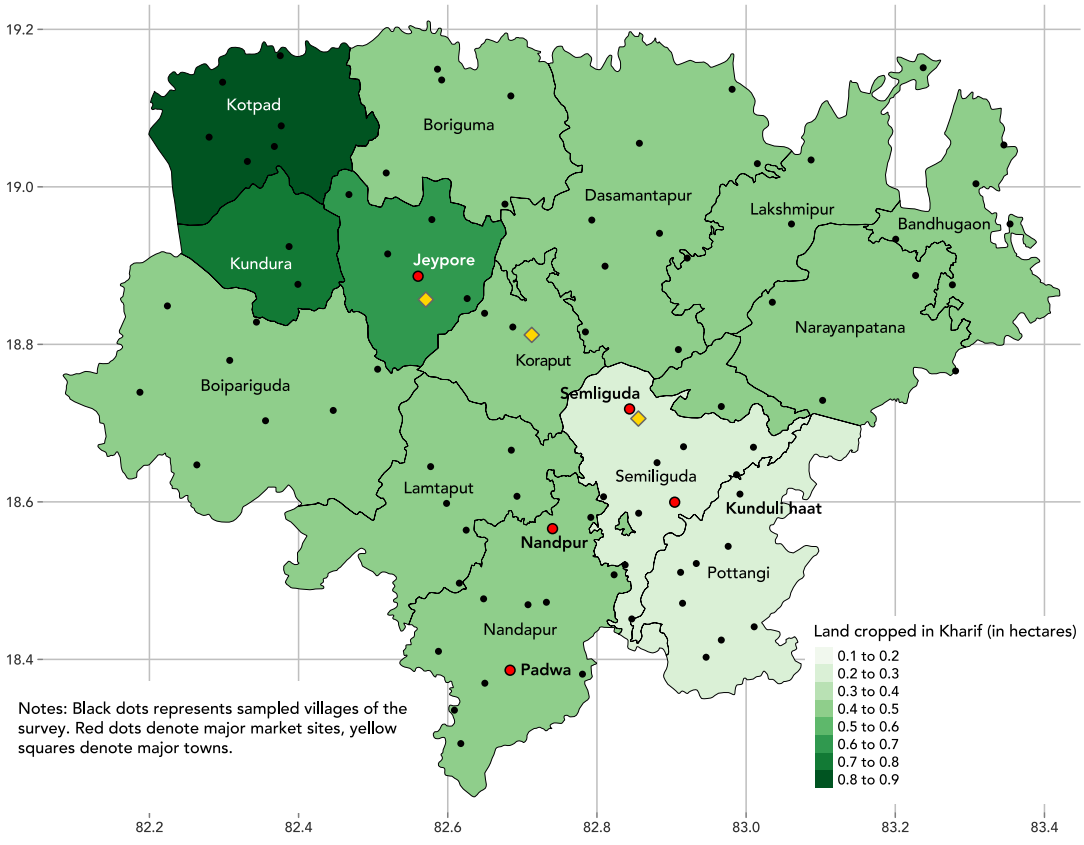


Figure 10.6

10.1.3 Land Fragmentation

While the challenge of small farms facing farmers in India is a critical one, it is compounded by land fragmentation. One consequence is that the distinction between landlord, laborer, and farming one's own land, often breaks down. The same individual may well be concurrently farming his own plot, leasing out a plot that is spatially distant, and working as a wage laborer in a proximate plot.

Figure 10.7 shows that the median plot size across districts is abysmally small. Land fragmentation is particularly severe in Bihar and many parts of Odisha. According to our survey data, farmers in Nalanda and Samastipur were cultivating more than 10 plots per hectare. *Chakbandi* (land consolidation) reforms have largely failed in Bihar as farmers have not been willing to give up fertile plots of land which may be further away in exchange for more proximate plots. Over the years, population pressure has only exacerbated the extent of fragmentation. In Samastipur, some farmers reported cultivating plots that were 5 km apart.

Moreover, land fragmentation is regressive. We find that the smaller farmers are more fragmented as shown in figure 10.8. For example, a farmer with 0.5 ha and one with 3 ha in Nalanda both have similar number of plots (~14-17), but the larger farmer has larger pieces of contiguous land.

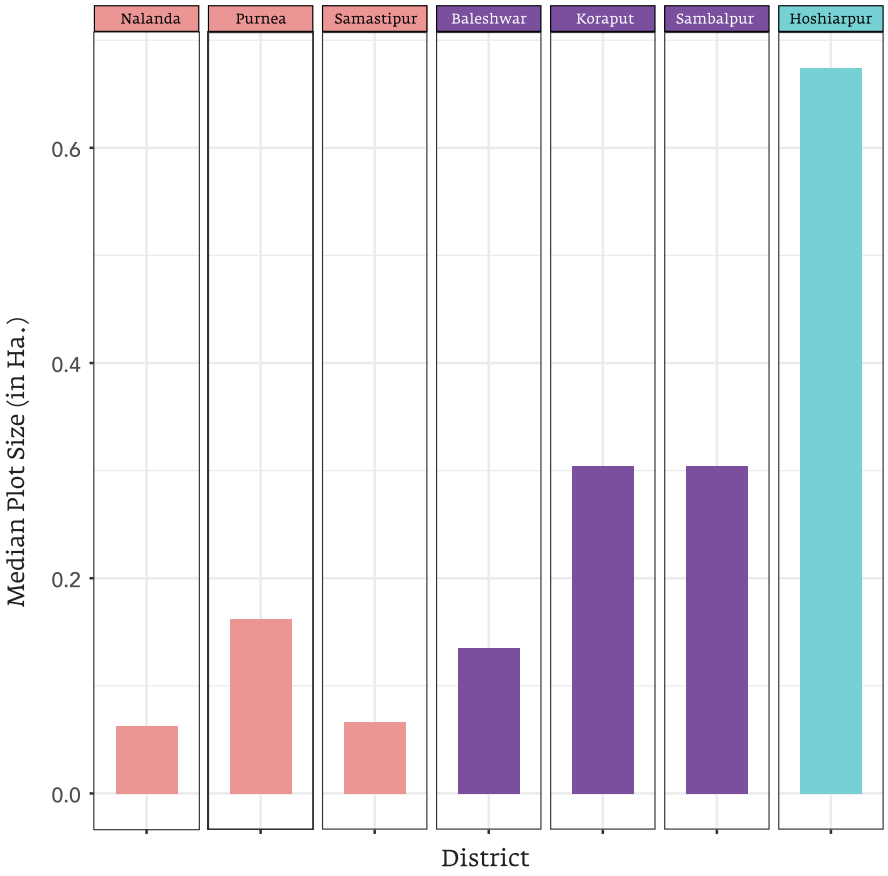


Figure 10.7 Plot size distribution

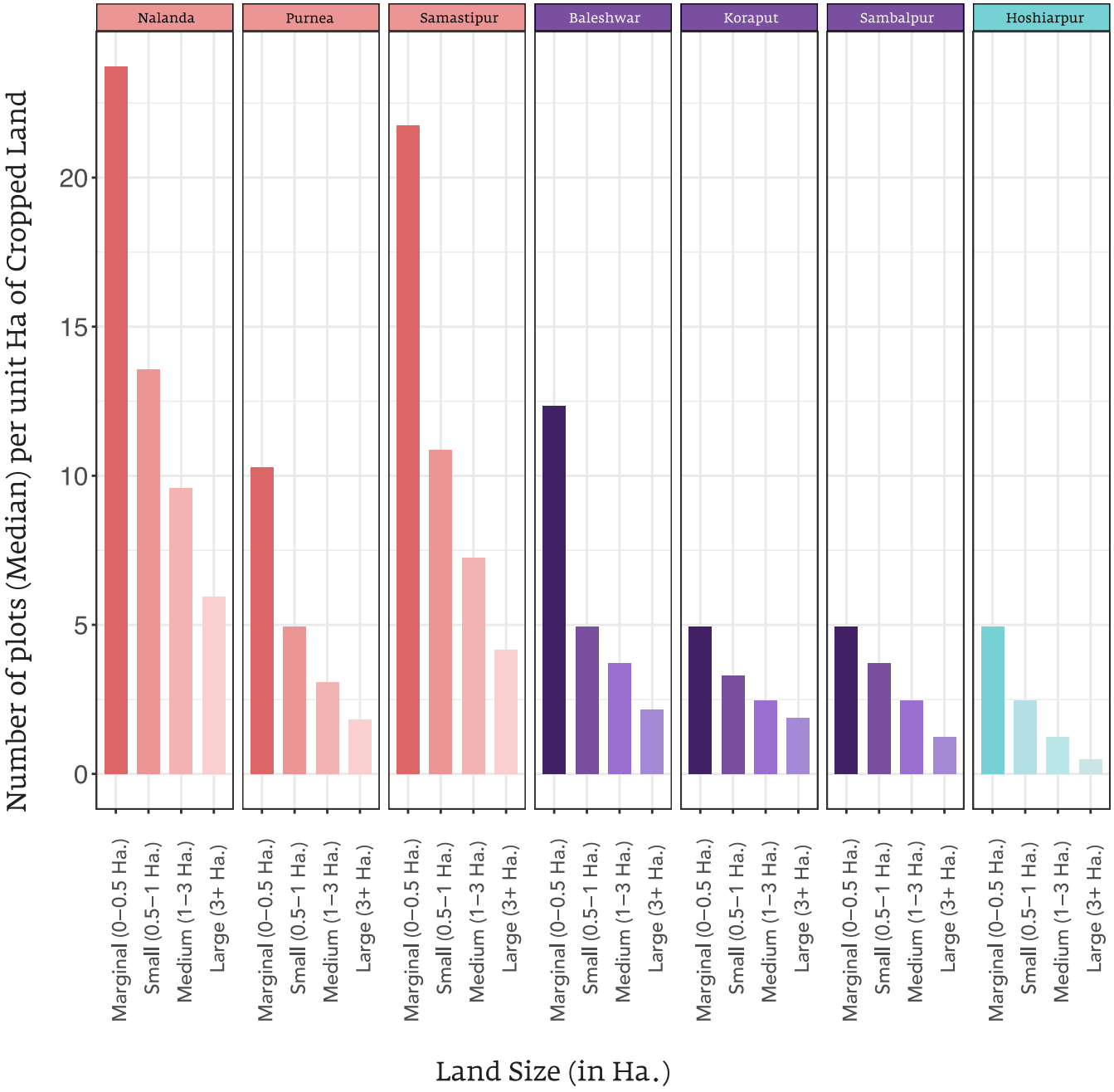


Figure 10.8 Plot size by farm size distribution

10.1.4 Historical Context

Land distribution patterns across India are deeply imbedded in historical disjunctures, especially the policies of the British colonial state. And eastern India, especially what was then the Bengal Presidency (Bengal, Bihar, and parts of Odisha in particular), bore the brunt of the policies of the British East India Company.

Bihar was part of the region which came under the Permanent Settlement Act of 1793. The act established the ***zamindari*** system whereby ***zamindars*** or landlords were responsible for the collection of revenue on behalf of the colonial state and had the right to ownership of land vested in them. Ownership was also linked to caste. Most zamindars belonged to upper-caste communities like Bhumihar, Kayastha, and Rajput. This system offered no protection to tenants who were the actual cultivators of the land and often belonged to backward castes like Kurmi, Kushwaha, and Yadav. This inherently exploitative and extractive system of land tenure severely undermined agricultural development and even today continues to shape agrarian relations in rural Bihar.

After independence, Bihar was among the first states to abolish the zamindari system in 1947, following which it enacted the Bihar Land Reforms Act of 1950. However, resistance from powerful landlords ensured that its implementation was sabotaged, with zamindars retaining large tracts of private and homestead land. Despite the enactment of further reforms aimed at redistribution, implementation of land reforms in the state has historically been poor.[23] While the political and economic power of large landowners undoubtedly ensured that these reforms were stillborn, the reality is that over time their holdings declined and today there is just not that much

[23] *D. Bandyopadhyay (2009), "Lost Opportunity in Bihar," Economic and Political Weekly, 44 (47): 12-14.*

land with large landholders to redistribute. Large farmers (those with more than 10 ha of land) account for just 0.02% of all holdings and 0.69% of all agricultural land.[24] Our survey data indicates that just 2.8% of the farmers in Nalanda own more than 3 ha of land. The proportion of large farmers in Purnea and Samastipur (owning >3 ha) is 4.2% and 1.9% respectively. "Large" here is simply a relative concept—in many parts of the world, these so-called large farmers would be considered small if not marginal.

Compounding the problem of small farm sizes is fragmentation, a topic we discuss in detail later, of already tiny plots. According to the 2015–16 Agriculture Census, 97% of Bihar's farmers are small and marginal (landholding size between 0–2 ha), and they own about 76% of the state's land. This indicates that a very large part of the state is divided into very small landholdings. With a population density three times the national average, Bihar (along with West Bengal) is an extreme example of a national trend where growth in the rural population has led to further divisions of landholdings, with increased fragmentation and smaller landholdings.[25]

Odisha's case is different since historically, it has been at the periphery of the power struggles that beset the Gangetic plains of northern India. Different regions of Odisha were under Maratha and Mughal rule in the sixteenth and seventeenth centuries. Under colonial rule from the seventeenth to the twentieth century, the region was split across different administrative boundaries. Until 1936, some southern portions of Odisha (Ganjam, Koraput, and Phulbani) were under the Madras Presidency; Cuttack, Balasore, and Puri were part of the Bengal Presidency; and Sambalpur was part of the Central Provinces. Taking the Odia-speaking tracts from these different provinces, a separate province of Odisha was formed in 1936. With this territorial amalgamation however, the tenancy system in Odisha became more diverse and complicated. For example, while the ***raiyatwari*** system prevailed in the southern part, the zamindari and ***khas mahal*** systems were extant in the north-western parts of the state. While feudal lords were hegemonic in Garjat, some areas were rent-free as well. These historical legacies continue to have an impact on present-day patterns of landownership in different parts of the state.

But the historical legacies were not immutable. The construction of the Hirakud Dam (completed in 1957) had a significant impact on the social composition and land relations in Sambalpur district. Our ethnographic research revealed that in the early 1960s, groups of currently medium and large farmers migrated from Punjab and Andhra Pradesh and settled in the command area. They began leasing in land from several small farmers or entered sharecropping arrangements. This practice continues even today, where some of the largest cultivators in the Hirakud command area are often Telugu farmers operating as tenants on 40–50 acres of land.

Population growth over the years has led to increasing subdivision of land and rising fragmentation of landholdings in the state. Data from the 2015–16 Agriculture Census indicates that 93% of the landholdings in Odisha are small and marginal, covering 75% of agricultural land. The state also has a large number of landless farmers and sharecroppers, although there is no reliable data on their numbers. Since sharecropping is illegal ***de jure*** even as it is practiced widely *de facto*, this posed challenges to collecting data on sharecropping, which we discuss later. Tenant cultivators, who are mostly small and marginal farmers, have no clear property rights, and the contracts with landlords are of short duration and oral in nature.

10.2 Land and social groups

Landownership varies substantially across social groups (caste, tribe, religion, gender) and historically has been a clear marker of rural power in agrarian societies.

10.2.1 Caste

In Bihar, our ethnographic research revealed, land is predominantly owned by Brahmins, Bhumihars, Kayasthas, and Rajputs—all upper-caste communities. Other Backward Class (OBC) communities like Yadavs, Koeris, Kurmis, and Kushwahas also own smaller plots of land. These intermediate castes benefited the most from land redistribution in the 1960s, significantly strengthening their position in rural society.[26] Nalanda was often locally referred to as Kurmistan, due to the large number of Kurmis residing in the district. The fact that the current Chief Minister of Bihar also belongs to the Kurmi caste was often brought up as a reason behind their clout. Across all three districts in Bihar, a large majority of the Scheduled Caste (Dalit) farmers are either landless or marginal and operate tiny holdings with very little to sell in markets after consumption or work as agricultural labor.

During our research in Bihar, we often came across villages which had more than 10 castes residing in them, with the caste ***tolas*** (hamlets) marked distinctly. In Samastipur, we found that in villages with a diverse group of castes, small farmers were often able to negotiate more favorable tenancy arrangements as local caste- based power was diffused. In areas where there was a larger concentration of upper-caste landlords, this was more difficult.

In Odisha, local histories of migration vary in each of the three districts, shaping patterns of land ownership across social groups. Brahmins and Pradhans were found to be the major landowning castes in all districts. The major landowning Adivasi communities—Porjha, Kondh, and Dom—usually own land close to forests and rely on forest produce to some extent for their livelihood. Gorunds, an Odia-speaking non-Adivasi community, are also prominent landowners. In Koraput, some land is also owned by the Kumti community, originally inhabitants of neighboring Andhra Pradesh who migrated to Koraput in search of livelihood. The Malis, who are prominent vegetable cultivators and known for their indigenous skill and expertise,

[24] Agriculture Census 2015–16

[25] Ramesh Chand, P.A. Lakshmi Prasanna, and Aruna Singh (2011), "Farm Size and Productivity: Understanding the Strength of Smallholders and Improving Their Livelihoods," *Economic and Political Weekly*, 46 (26): 7

[26] Alakh Sharma (2005), "Agrarian Relations and Socio Economic Change in Bihar", Economic and Political Weekly, 40 (10): 960–72.

have a unique history in Koraput. Their villages and settlements are around perennial sources of water, a key resource for vegetable cultivation. Local accounts seem to indicate that the erstwhile king of the Jeypore kingdom invited the Mali community to Koraput and offered plots of land in areas where they could cultivate vegetables for his kingdom. Members of the Scheduled Caste (SC) community do not own much land and usually lease in land for cultivation.

Across Bihar and Odisha, while OBCs are not the major landowners, they are the major cultivators, as measured by their share in the cropped area. Kushwahas in Bihar and Malis in Koraput (both OBCs) were often solely dependent on agriculture (especially horticulture) for their livelihood. In Koraput, Adivasi communities are the major cultivators.

In Hoshiarpur, land is largely owned and cultivated by the majority Sikh population. Jat Sikhs constitute the dominant landowning caste in Hoshiarpur, similar to the rest of the state. Hoshiarpur along with the rest of the Doaba region has a large SC population. It is a stronghold for the SC community whose population size gives them considerable influence in local politics.

We noted earlier the prevalence of land fragmentation. Land fragmentation is a further concern for SCs and STs in Bihar as their land plots are particularly likely to be small (see figure 10.9).

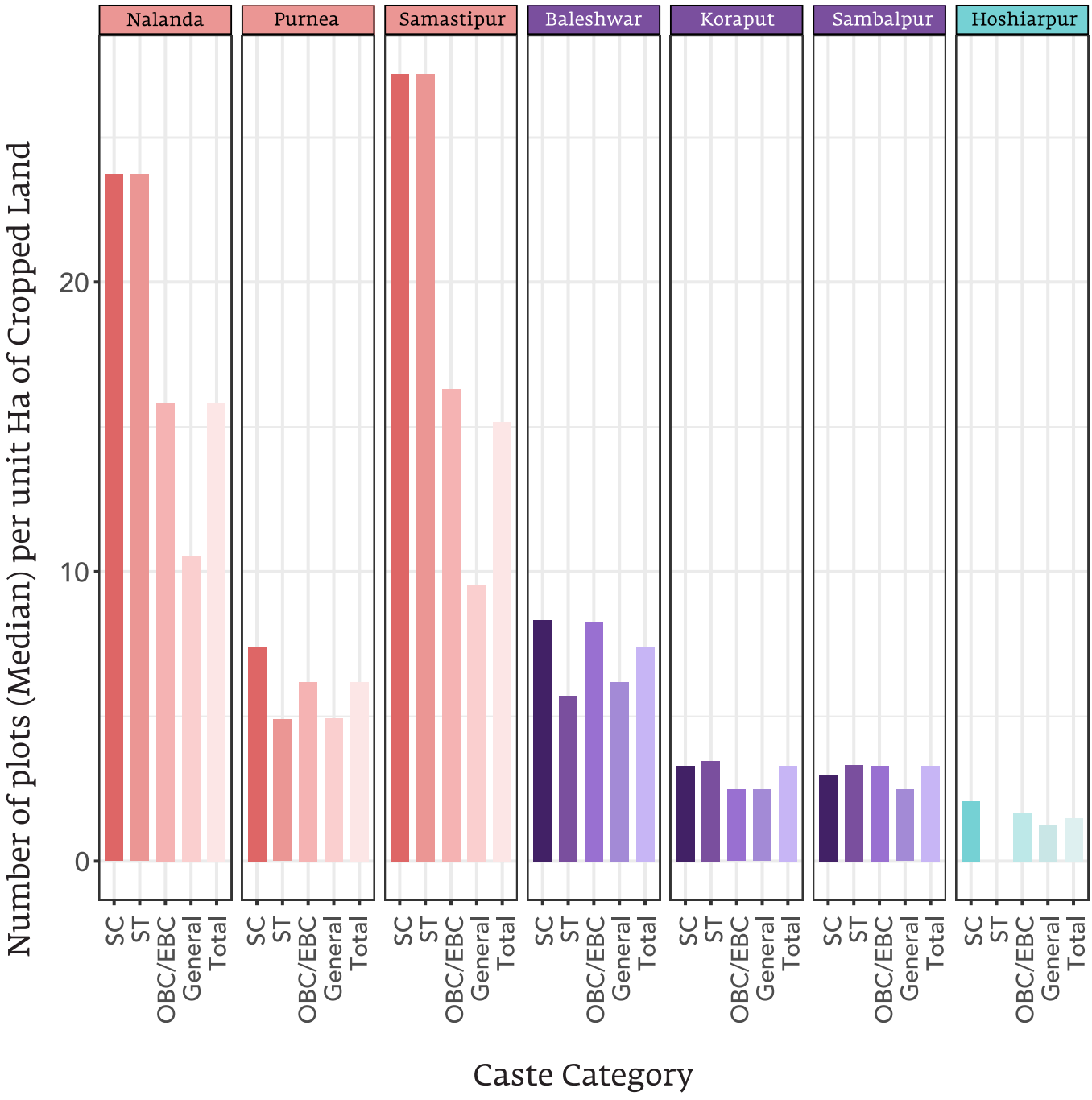


Figure 10.8 Plot size by farm size distribution

Table 10.1a Distribution of caste

Districts	# of surveyed households	SC	ST	OBC	General	Don't Know	Total
Nalanda	1,274	23.9	0.6	64.8	10.5	0.1	100.0
Purnea	1,252	13.7	1.8	65.6	17.7	1.4	100.0
Samastipur	1,233	14.9	1.5	61.2	22.4	0.0	100.0
Balasore	1,295	19.7	5.4	50.7	23.9	0.3	100.0
Koraput	1,288	9.5	69.6	18.7	1.9	0.3	100.0
Sambalpur	1,229	16.1	40.7	37.9	4.4	0.9	100.0
Hoshiarpur	596	10.6	0.0	17.8	71.6	0.0	100.0
Total	8,167	15.9	18.6	47.4	17.7	0.5	100.0

Table 10.1b District-wise median landholding size by caste group (in ha)

Districts	SC	ST	OBC	General	Don't Know
Nalanda	0.01	0.38	0.32	0.85	0.38
Purnea	0.23	0.49	0.49	0.81	0.32
Samastipur	0.09	0.07	0.37	0.92	
Balasore	0.24	0.40	0.40	0.61	0.10
Koraput	0.81	0.81	0.81	0.81	0.81
Sambalpur	0.54	0.81	0.81	1.21	0.61
Hoshiarpur	0.81		1.21	1.42	

Table 10.1c Distribution of Landownership by caste (in%)

District	Caste Category	Landless (0 ha)	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium (1-3 ha)	Large (3+ ha)	Total
Nalanda	SC	42.6	47.2	8.2	1.6	0.3	100
	ST	0.0	50.0	25.0	25.0	0.0	100
	OBC	18.3	41.3	18.4	19.6	2.4	100
	General	3.7	25.4	22.4	38.1	10.5	100
	Don't know	0.0	100.0	0.0	0.0	0.0	100
Purnea	SC	20.5	55.6	19.9	4.1	0.0	100
	ST	9.1	45.5	31.8	13.6	0.0	100
	OBC	6.6	47.9	21.7	19.0	4.9	100
	General	0.0	32.6	31.2	31.2	5.0	100
	Don't know	17.7	52.9	17.7	5.9	5.9	100
Samastipur	SC	8.2	81.5	7.1	3.3	0.0	100
	ST	5.3	89.5	5.3	0.0	0.0	100
	OBC	2.1	64.1	18.2	14.6	1.1	100
	General	0.4	20.3	34.8	39.1	5.4	100
Balasore	SC	12.9	100.0	0.0	0.0	0.0	100
	ST	25.7	55.6	19.9	4.1	0.0	100
	OBC	7.8	45.5	31.8	13.6	0.0	100
	General	4.9	47.9	21.7	19.0	4.9	100

	Don't know	50.0	32.6	31.2	31.2	5.0	100
Koraput	SC	2.5	34.4	36.1	24.6	2.5	100
	ST	3.1	30.3	31.6	31.1	3.9	100
	OBC	2.9	23.7	33.2	34.4	5.8	100
	General	12.5	29.2	25.0	25.0	8.3	100
	Don't know	0.0	0.0	100.0	0.0	0.0	100
Sambalpur	SC	13.1	35.9	25.8	24.6	2.5	100
	ST	7.4	29.0	27.2	31.1	3.9	100
	OBC	3.2	24.7	27.9	34.4	5.8	100
	General	0.0	14.8	16.7	25.0	8.3	100
	Don't know	0.0	45.5	18.2	0.0	0.0	100
Hoshiarpur	SC	7.9	30.2	20.6	36.5	4.8	100
	ST	3.8	17.0	21.7	47.2	10.4	100
	OBC	1.4	11.0	20.1	47.8	19.7	100

Table 10.1d Distribution of cultivated area by caste (%) – kharif

Districts	SC	ST	OBC	General	Don't Know
Nalanda	16.8	0.8	68.4	14.0	0.1
Purnea	9.1	1.2	67.3	20.9	1.5
Samastipur	11.2	1.3	58.3	29.2	
Balasore	17.0	5.7	51.0	26.2	0.1
Koraput	8.1	69.8	20.0	1.8	0.3
Sambalpur	12.7	35.5	43.3	7.8	0.6
Hoshiarpur	7.2		13.1	79.8	

Table 10.1e Distribution of cultivated area by caste (%) – rabi

Districts	SC	ST	OBC	General	Don't Know
Nalanda	16.3	0.7	68.2	14.7	0.1
Purnea	7.5	1.3	68.4	21.2	1.5
Samastipur	12.5	0.9	56.2	30.4	
Balasore	14.4	3.7	51.6	30.0	0.3
Koraput	9.4	59.7	28.2	2.7	0.1
Sambalpur	14.7	28.0	46.7	10.4	0.3
Hoshiarpur	6.6		14.1	79.3	

10.2.2 Gender

Women in India have traditionally lacked property rights in land, and this has been an important reason underlying their marginal status.[27] However, with men migrating, there is an increasing (albeit modest) "feminization" of agriculture in India. According to the 2015–16 Agriculture Census, the proportion of farms operated by women rose from 12.8% in 2010–11 to 13.9% in 2015–16.

While our surveys did not ask questions related to the gender of the landowner, we did ask about the gender of the household head (Table 10.2). Koraput has the highest fraction of households with female heads. A high population of Adivasi communities, some of whom have matriarchal family arrangements could be the reason behind this. In the other districts, migration was another reason why women became default heads of the household, managing farm operations in the event that the male members migrated to work in urban areas.

[27] Bina Agarwal (1994), *A Field of One's Own: Gender and Land Rights in South Asia.* Cambridge, England & New York: Cambridge University Press.

Table 10.2 Female headed household in each district (%of total)

District[6]	Nalanda	Purnea	Samastipur	Balasore	Koraput	Hoshiarpur
%	5.2	9.2	7.7	6.6	10.6	7.8

In the course of our ethnographic work also, we came across very few cases of women owning land. In Sambalpur, we found a few instances where women had land titles in their name if the husband had migrated from a neighbouring state and belonged to a different regional community and was thus unable to purchase land in his name. But even in these cases, the women didn't seem to have much control over decision-making or resource allocation related to agriculture.

10.3 Tenurial arrangements and land markets

10.3.1 Sharecropping

Figure 10.10 shows that sharecropping is quite prevalent in Nalanda and Purnea, where 35–40% of farmers are sharecroppers. These rates are much lower in Samastipur. The estimates for sharecropping in Odisha appear low but are a lower bound. This is because sharecropping in Odisha is officially illegal. Therefore, it may have dissuaded respondents from replying truthfully.

When the Odisha government initiated its Krushak Assistance for Livelihood and Income Augmentation (KALIA) scheme of cash transfers to farmers, as part of the registration process, special provisions were made for the registration and verification of sharecroppers. This data was then supposed to be cross-checked with the existing database of farmers registered for paddy procurement, cooperative loans, the Public Distribution System (PDS), etc. Ethnographic research in Balasore revealed that sharecroppers continued to face the same paperwork-related hurdles in order to prove their status as cultivators while registering for KALIA. Indeed, in the first phase of KALIA, sharecroppers constituted just 57,000 of the total 4 million farmers identified as beneficiaries.

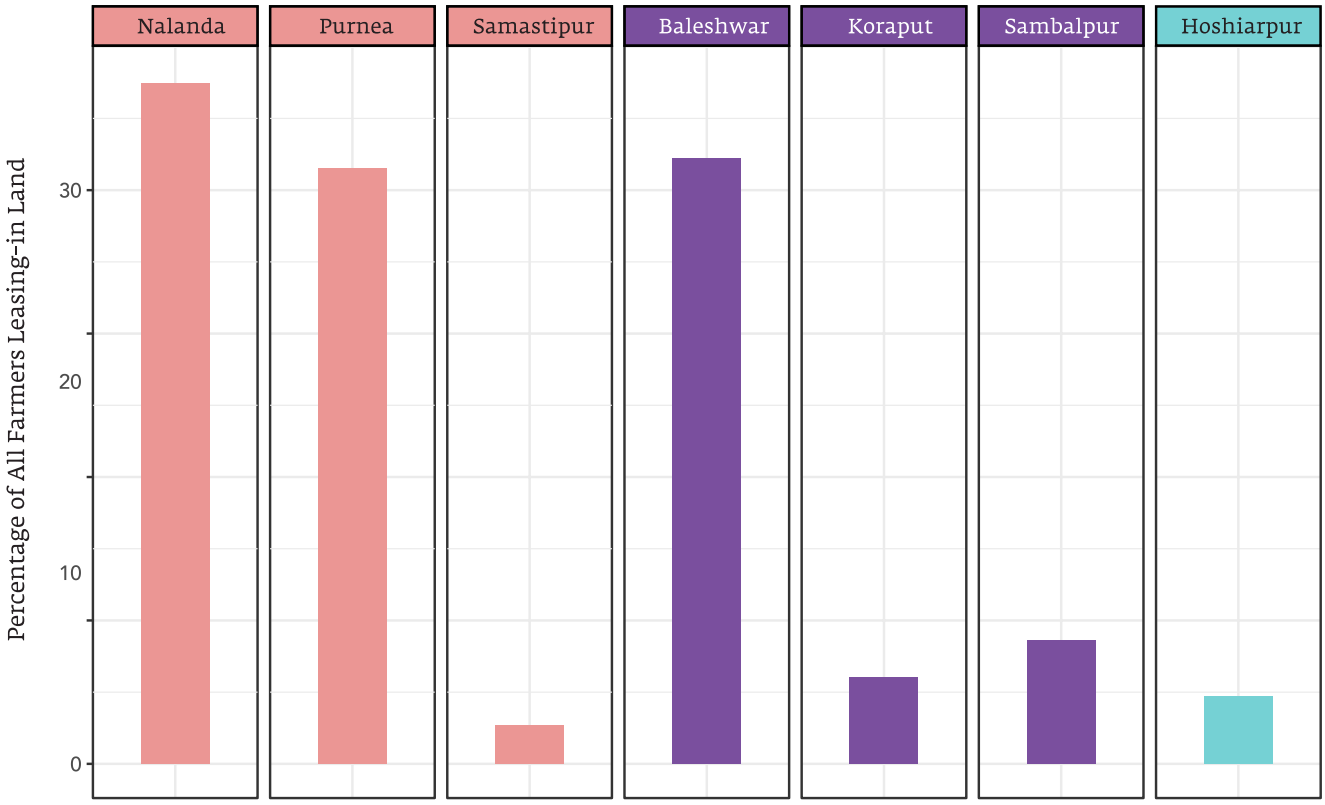


Table 10.10 Prevalence of sharecropping

The data also reveals that marginal farmers are most likely to take up sharecropping in Bihar and Odisha on land owned by the larger farmers. However, in Hoshiarpur, even medium-sized farmers engage in sharecropping. This is a result of farmers cultivating the land of their neighbors and relatives who have migrated out of the state.

Among social groups, OBC farmers are most likely to take up land on sharecropping (figure 10.12) followed by SCs. The exceptions are Koraput district in Odisha where tribals dominate and to a lesser extent Sambalpur district.

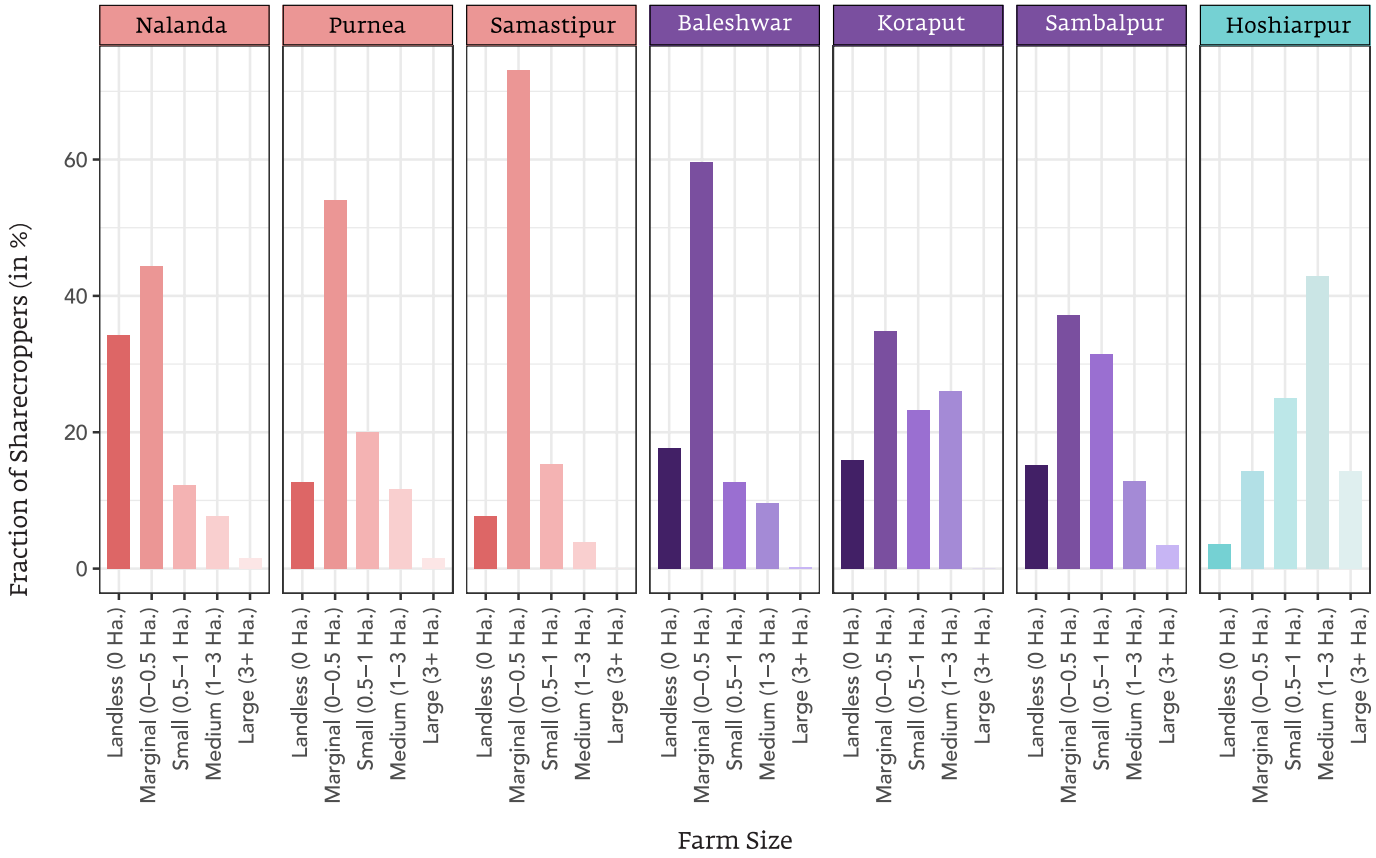


Table 10.11 Distribution of sharecroppers across landowndership categories

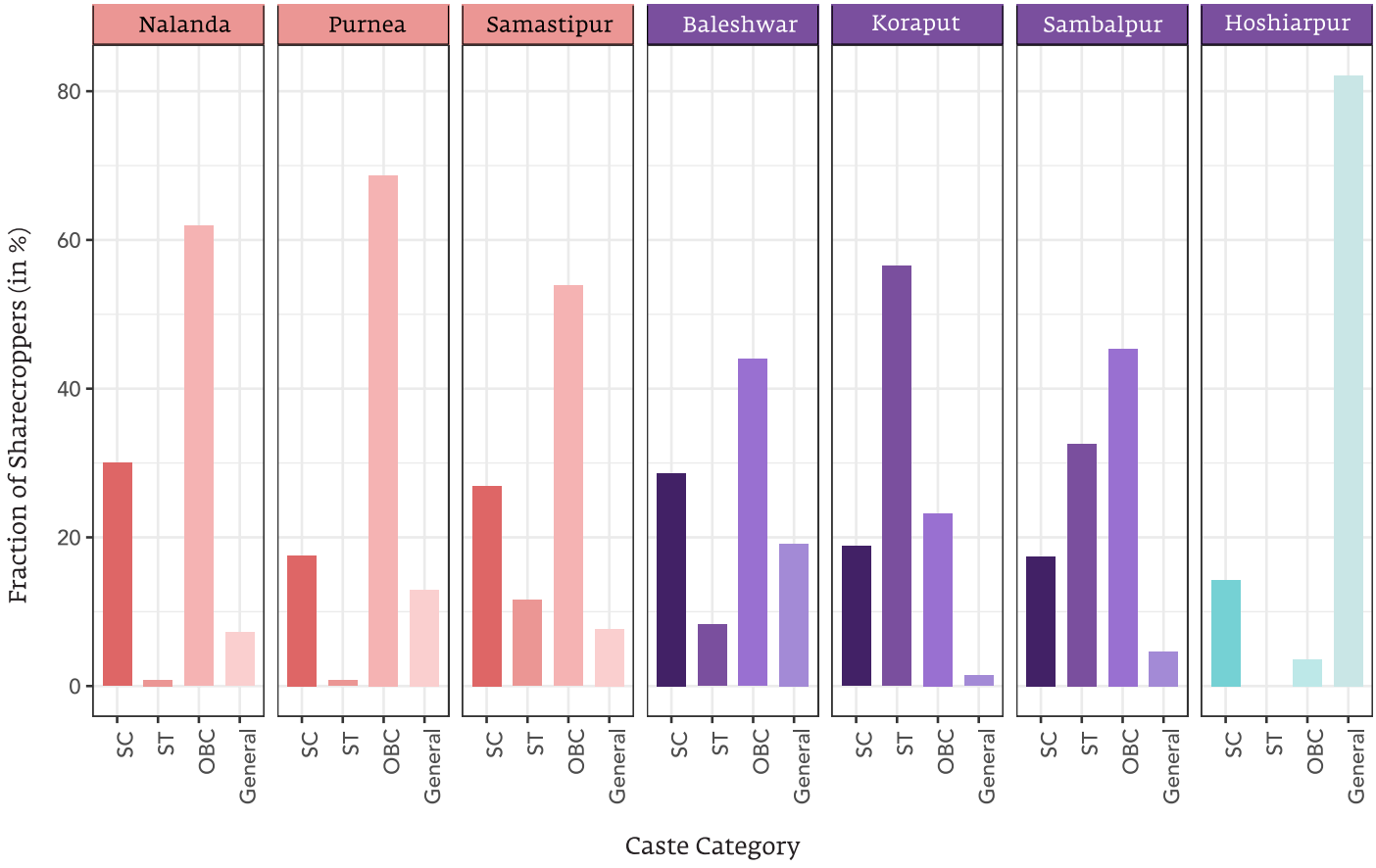


Table 10.12 Distribution of sharecroppers across caste groups

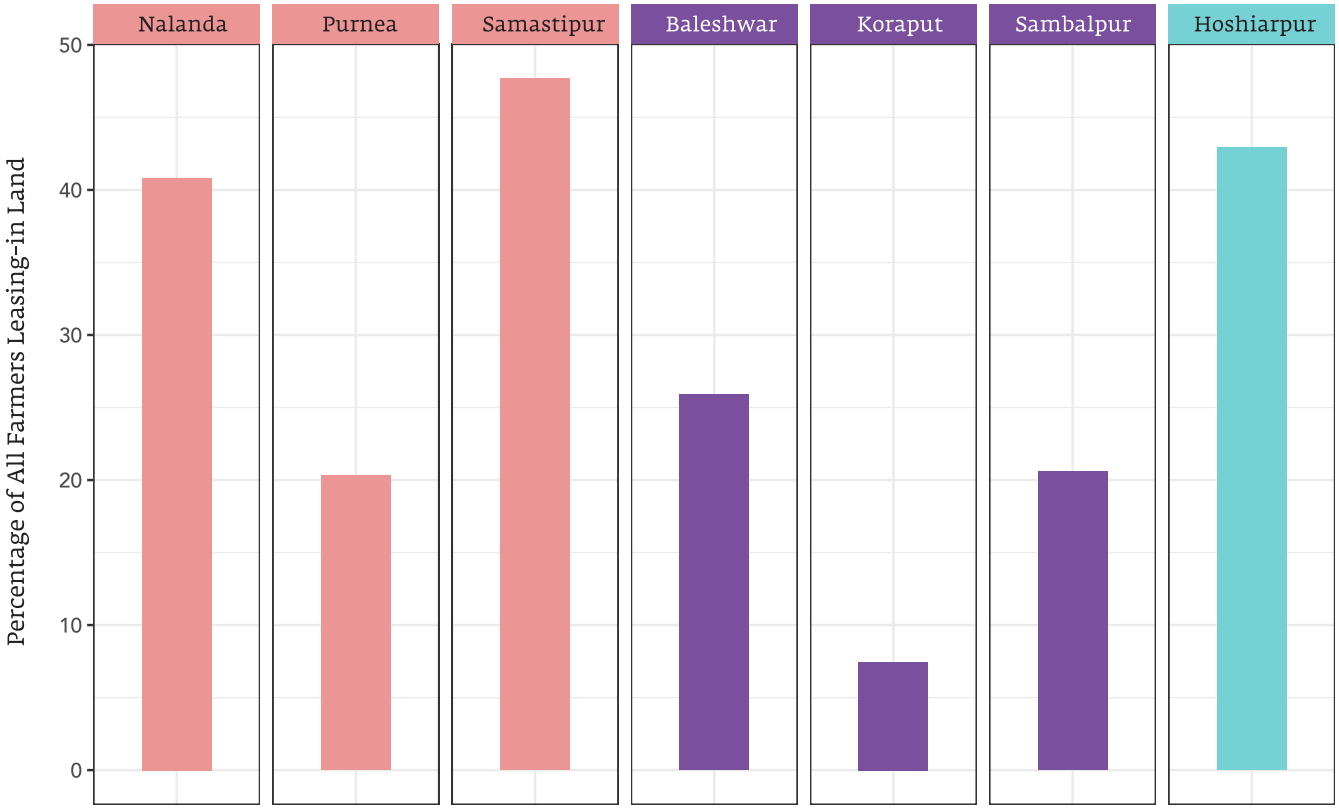


Figure 10.13 Prevalence of tenancy

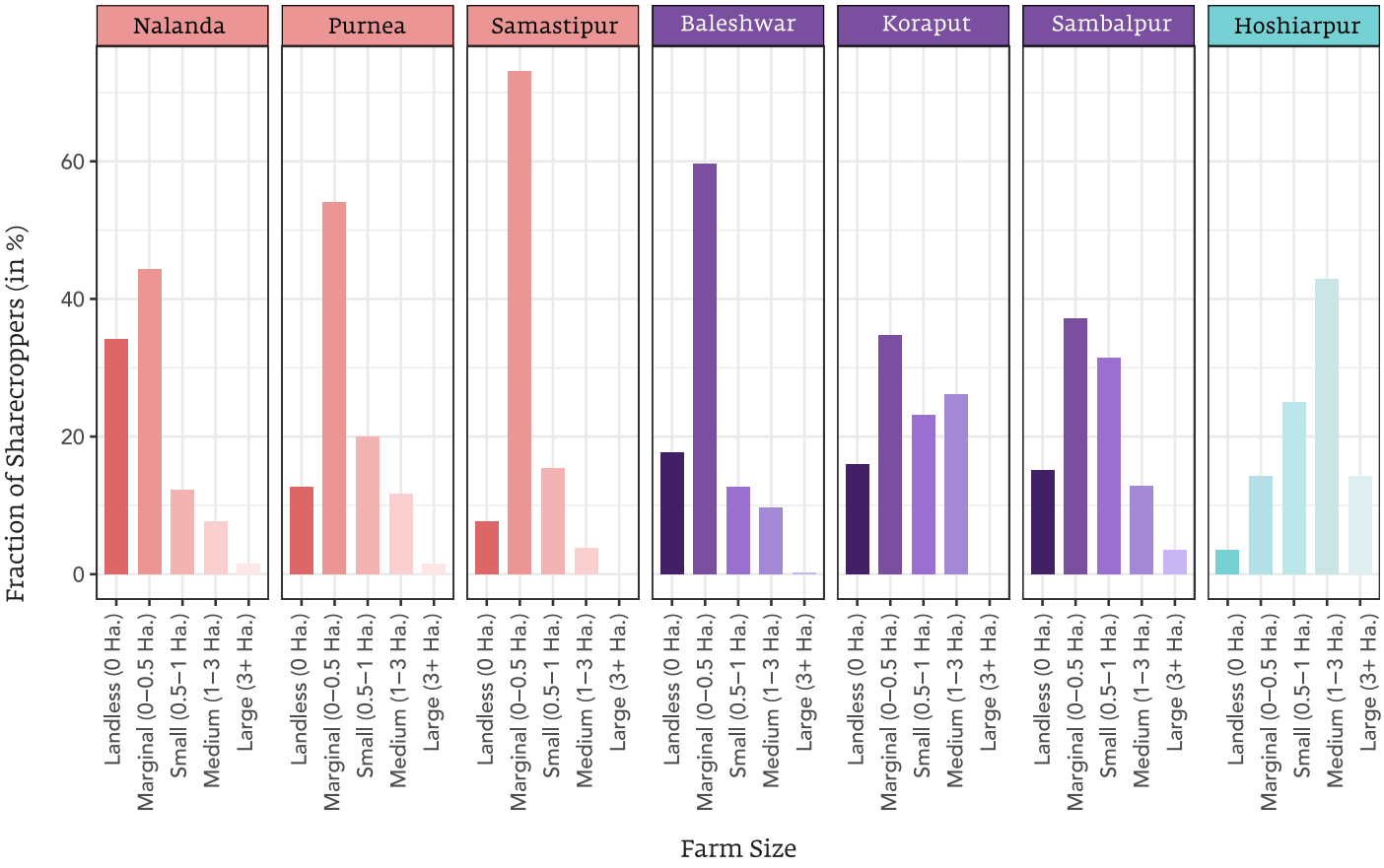


Figure 10.14 Tenancy by landownership

Across our survey districts, 28.2% of farmers lease in land—mostly marginal and small farmers—about double the percentage who take up land on sharecropping. For instance, in Samastipur district, while less than 2% of farmers take up land under a sharecropping arrangement, 47.7% lease in land, most of whom are marginal farmers (figures 10.13 and 10.14). We learnt from our field research that the reason behind this is the perception of many farmers that land leasing is a less exploitative form of tenancy than sharecropping.

In Bihar and Odisha, we found many instances of small farmers leasing in multiple plots of land from larger farmers in order to cultivate. In Nalanda, the erstwhile "labor class" is now turning to cultivation through lease and sharecropping arrangements, taking in multiple small plots. Crops which required more attention (paddy, vegetables) would be sown closer to the village, and fodder crops were sown in faraway plots. Similar accounts were narrated in Sambalpur, where almost all farmers we interviewed emphasized rising labor costs. In Koraput (Laxmipur block), a group of farmers from the same village gave up working in brick kilns in Hyderabad two years ago to come back and cultivate paddy and turmeric on leased-in land.

The difficulties of finding agricultural labor and rising labor costs are leading large farmers to lease out land. In principle, rising wages for rural labor (which has been further enhanced in recent years by the National Rural Employment Guarantee Scheme [NREGS]) should drive more farm mechanization. The latter, however, is being held back by small plot sizes and short-term lease contracts, which makes the fixed capital costs of owning farm machinery financially unviable.

Whereas in Bihar and Odisha, smaller farmers cultivate on land owned by medium and large farmers, Hoshiarpur illustrates a different land consolidation. Nearly half of the farmers who reported leasing in land are medium farmers. Observations from our ethnographic research also point to medium and large farmers expanding agricultural operations, while households with smaller holdings are finding farming unsustainable. Many households that have migrated overseas or have moved out of agriculture to other sources of livelihood are the ones who are leasing out land in Hoshiarpur.

The survey data also indicates that lease arrangements are largely intra-community, given the high proportion of lease-in and lease-out rates within OBCs across districts and among Scheduled Tribes (STs) in Koraput (tables 10.5a–b). Our ethnographic research found that lease arrangements were often intra-village. Due to the oral nature of most such contracts, trust, familiarity, and proximity were crucial to uphold agreements.

An important set of questions concerns the terms of sharecropping and tenancy and how these terms were settled upon? What are the factors that determine the value of land in such arrangements? To what extent do tenant farmers or sharecroppers exercise a choice as to what they can grow on leased/sharecropped land? If such farmers do exercise this choice, are there a set of crops that they tend to grow on such land? If yes, why? How is a tenant farmer's decision-making different from that of a landowner or from the parcel of land that he owns? Are tenant farmers/sharecroppers able to participate in public procurement systems and other state schemes? For instance, the decentralized procurement system in Odisha asks for a consent letter as proof of tenancy, which most tenant farmers and sharecroppers are unable to provide. Are they able to access credit from institutional sources and purchase inputs and seeds from cooperative societies?

Table 10.5a Percentage of farmers leasing in land, by caste group (%) (Kharif 2018)

		Percentage of total *leasing-in* farmers					
Districts	leasing in (%)	SC	ST	OBC	General	Don't Know	Total
Nalanda	40.8	30.0	1.0	63.9	5.2	0.0	100.0
Purnea	20.3	11.8	1.6	69.3	16.5	0.8	100.0
Samastipur	47.7	20.9	1.5	64.8	12.8	0.0	100.0
Balasore	25.9	26.9	5.7	46.9	20.3	0.3	100.0
Koraput	7.5	13.5	69.8	16.7	0.0	0.0	100.0
Sambalpur	20.6	21.0	39.1	36.0	3.2	0.8	100.0
Hoshiarpur	43.0	11.7	0.0	17.6	70.7	0.0	100.0
Total	28.2	21.5	8.8	52.0	17.4	0.2	100.0

Table 10.5b Percentage of farmers leasing out land, by caste group (%)

		Percentage of total *leasing-out* farmers				
Districts	leasing in (%)	SC	ST	OBC	General	Total
Nalanda	4.2	0.0	0.0	64.8	35.2	100.0
Purnea	1.7	4.8	0.0	76.2	19.1	100.0
Samastipur	2.4	10.3	0.0	27.6	62.1	100.0
Balasore	2.7	17.1	0.0	48.6	34.3	100.0
Koraput	7.5	11.5	80.2	8.3	0.0	100.0
Sambalpur	1.6	20.0	20	55.0	5.0	100.0
Hoshiarpur	4.0	4.2	0.0	41.7	54.2	100.0
Total	3.4	9.3	29.0	37.6	24.0	100.0

10.3.3 Tenancy arrangements in Bihar

In Bihar, tenancy takes three major forms:

a. ***Manjai:*** In this system, the landowner does not contribute to the cost of inputs. The tenant either gives 50% of the harvest or a fixed quantity per unit of land (e.g., 1 *man* per *bigha*). In most cases, the landowners have a say in the choice of crop that is grown by the tenants. This system is more prevalent in less-fertile areas where incidents of crop loss are high and landowners do not take the risk of paying input costs. This also makes the cultivators (often landless, from backward castes) more vulnerable as in some cases they are obligated to give the fixed quantity of grain in lieu of the land, even in the event of crop loss.

b. ***Battaiya:*** Here the landowner shares 50% of the input costs, while the tenant repays with 50% of the harvest. Usually, cereals are cultivated under this arrangement (not as labor intensive as vegetables). Landowners tend to rotate sharecroppers every two–four years and consequently ***bataidaars*** (sharecroppers) have little incentive to invest in the long-term productivity of the land.

c. ***Theka:*** This is a system of land leasing on fixed annual rents. Lease rates vary based on proximity of the plot to roads and markets (especially in horticultural belts), elevation (determines whether the plot is flood prone), and soil fertility. Landowners do not have a say in crop choice.

Tenant farmers in all three districts were neither able to avail credit from institutional sources nor input subsidies from cooperative societies. They were also unable to participate in state procurement of paddy, although the procurement quantities are quite modest to begin with.

10.3.4 Tenancy arrangements in Odisha

Like other states, Odisha passed several laws to strengthen the rights of cultivators. The most important was the amendment to the Odisha Land Reforms Act in 1974. The amendment banned leasing of land with the intention of ending exploitative tenurial arrangements which had existed since the colonial period. However, it simply drove the practice underground, and four and half decades later, sharecropping is still widely prevalent.

In the last few years, the issue of giving legal recognition to sharecroppers has been widely discussed in Odisha. The state government has made a concerted effort to ensure that sharecroppers are able to avail credit from institutional sources, participate in decentralized procurement, and benefit from various schemes and subsidies. However, these efforts have only had limited effects as sharecroppers often fail to get legal recognition or paperwork that certifies their status as cultivators.

The ban on leasing land in the state probably explains the low percentage of sharecropping and leasing reported in our survey. Respondents were reluctant to report that they are part of such arrangements. Data from the kharif sowing and marketing survey in Sambalpur seems to suggest that 20.6% of the farmers in the district have leased in land, whereas 7% of the farmers are sharecroppers. However, ethnographic data gathered through village visits and interviews with members of the Western Odisha Farmer's Union as well as members of the Regulated Marketing Committee indicate that sharecropping is widely prevalent in Sambalpur, and anywhere between 60–70% of the farmers in the district are part of sharecropping arrangements.

In Odisha, the principal terms of tenancy are as follows:

i. In some cases, the landowner bears some part of the cost of cultivation (50% or less), in exchange for a proportionate amount of the produce at the time of harvest.

ii. In other cases, the landowner does not bear any costs related to cultivation. The sharecropper either gives half of the produce at the time of harvest or a fixed quantity per unit of land (for example, 8 bags of paddy per acre, where each bag weighs 50 kg.). Even in the event of a crop loss, the sharecropping farmer is compelled to give the fixed quantity of grains or the equivalent amount in cash to the landowner. In such cases, sharecropping farmers either purchase paddy from the market or pay from stocks they would have stored from the previous harvest season, while bearing the entire burden of losses. Claims arising from crop insurance, if any, also benefit landowners.

iii. With regards to crop choice, we found that in Sambalpur, many sharecropping farmers are only permitted to grow paddy. Many landowners have signed up for schemes and subsidies offered by the

Primary Agricultural Cooperative Societies (PACS), and are obligated to sell paddy to them when procurement by the state government takes place. Thus, they prefer that sharecroppers grow paddy on these plots of land. It should be noted that the benefits from the credit support and subsidies offered by PACS, by and large, do not reach sharecropping cultivators. They are also unable to sell their produce to PACS at the Minimum Support Price (MSP). Participation in these schemes and programs continues to be contingent upon possession of land titles, despite a stated commitment by the Odisha government to include sharecroppers as beneficiaries.

10.3.5 Tenancy arrangements in Hoshiarpur

The large out-migration of landowning families has led to a large availability of land for tenancy. The tenancy agreements vary between one and five years, with part payment made in the beginning or at the end of the agricultural cycle depending on when the farmer has ready access to funds. Rents vary based on soil type and irrigation status. In certain instances, especially in lands closer to flood plains, migrant labor from Uttar Pradesh and Bihar takes up land for vegetable cultivation for a shorter time period (usually three–four months). This gives them a livelihood source in days when labor work is not readily available for them.

Unlike Bihar and Odisha, tenant farmers in Punjab regularly participate in state procurement. The state does not follow any policy of farmer registration. All the produce that comes into the *mandi* is picked up by the designated state agency operating in the mandi at the MSP declared by the Central Government for the ongoing procurement season. However, tenant farmers are unable to access agricultural credit from institutional sources.

10.3.6 Rents and sales

The discussion above demonstrates that all districts have vibrant rental markets in agriculture land. The average rent for a hectare of land in various districts is shown in table 6. Rents are lowest in Odisha, possible owing to low productivity. There isn't much variation in the land rent paid by farmers from different castes.

Table 10.6 Land rent

Districts	Rent (Rupees peer hectar per year)
Nalanda	39,536
Purnea	33,977
Samastipur	38,054
Balasore	8,604
Koraput	8,648
Sambalpur	12,355
Hoshiarpur	61,776

In table 10.7, we show the prevalence of land sale and purchase. Nearly a sixth of all farmers in the districts in Bihar have engaged in buying or selling in the last five years. Land markets appear less vibrant in the tribal-dominated districts in Odisha, and this could be because of legal proscription of land sales to non- tribals.

Table 10.7 Fraction of farming households that have bought or sold land in the last five years (%)

Districts	Nalanda	Purnea	Samastipur	Balasore	Koraput	Sambalpur	Hoshiarpur
% of farmers	15.6	13.5	17.4	12.9	5.3	3.1	5.9

A separate question related to land markets is the ease of land conversion from agriculture to non-agriculture purposes. The structural transformation of these economies would require land for industrial, commercial, and infrastructure purposes. Indeed, such a structural transformation is absolutely fundamental to accelerate the movement of the population out of agriculture, reverse land fragmentation, and raise the productivity (and incomes) of those remaining in agriculture.

In our interviews with political observers, cold storage and mill owners, and traders in Bihar, we gathered that it is difficult to convert land from agricultural to non-agricultural purposes. Many cited this as the primary reason behind the lack of processing industries in Bihar (more details in chapter 14) and that neighboring West Bengal was friendlier to such investments. Ironically, the uncompromising position on agriculture land conversion, ostensibly to protect the state's farmers, has undermined the development of agro and processing industries and value addition in the state, which feeds back into lower prices for farmers.

Koraput, Odisha Nandpur Haat

Chapter Eleven

Crops

11.1 Overview

Paddy in the ***kharif*** season and wheat in the rabi season dominate the landscape in our study regions. In kharif, paddy accounts for about 40% of the net cropped area in Samastipur and Hoshiarpur. However, in Nalanda, Purnea, Balasore, and Sambalpur, paddy is nearly the only crop cultivated. Moreover, in all our study districts, more cultivators grow paddy in kharif than any other single crop.

In the rabi season, wheat is the dominant crop in Nalanda, Samastipur, and Hoshiarpur, accounting for 56%, 49%, and 93% respectively in terms of net cropped area. Paddy is dominant in Balasore, Koraput, and Sambalpur, and maize in Purnea. As can be seen from figures 11.1 and 11.2, across districts, cropping patterns in rabi are more diverse than in kharif.

These patterns are largely unchanged even if we look at the number of cultivators, as opposed to cultivated area, as can be seen from figures 11.3 and 11.4. During kharif, paddy is grown by almost all farmers in our sample across districts. Some farmers diversify. In Samastipur, about 60% of all farmers grow another crop, principally potato, maize, mango and *janera* (a fodder crop sometimes used as a cereal). In Hoshiarpur, farmers diversify into *bajra* and maize.

Despite the dominance of wheat, maize, and paddy in rabi, many more farmers grow crops other than cereals. For instance, most farmers in Nalanda grow some oilseed, in addition to growing wheat. In Odisha, paddy occupies a large fraction of the net cropped area during Kharif and only 10% farmers report growing a vegetable. Net cropped area falls drastically during Rabi, owning to lack of irrigation. Therefore, the few farmers who have access to irrigation cultivate during Rabi and 55% of them grow vegetables.

Kharif is largely dominated by paddy in all districts, except in Samastipur and Hoshiarpur. In these two districts, paddy accounts for less than half the total cultivated area in kharif: farmers typically diversify into maize, potato, peas, and sugarcane. Almost 50% farmers in Odisha and 21% farmers in Bihar report growing just one crop—paddy. In addition to paddy, ***ragi*** emerges as another dominant crop in Koraput, accounting for a quarter of total cultivated area.

In rabi, a greater proportion of cultivators grow more than one crop. Median number of crops cultivated per farmer in rabi varied between two and five for all districts, except in Koraput and Hoshiarpur. In both Koraput and Hoshiarpur, most farmers grow a single crop. While Koraput and Hoshiarpur are multi-cropping districts in kharif and mono-cropping in rabi, the trends are reversed in Sambalpur. In Sambalpur, three-quarters of cultivators grow more than one crop in rabi as compared to only 12.6% in kharif.

Many farmers in the east choose to leave their land fallow in rabi. This results in substantial drops in the total cultivated area in Odisha in rabi compared to kharif. As shown in figure 11.5, the drop is highest in Koraput, where the rabi cultivated area is a mere 19% of the kharif cultivated area. For Sambalpur and Balasore, these numbers stand at 28% and 36% respectively.

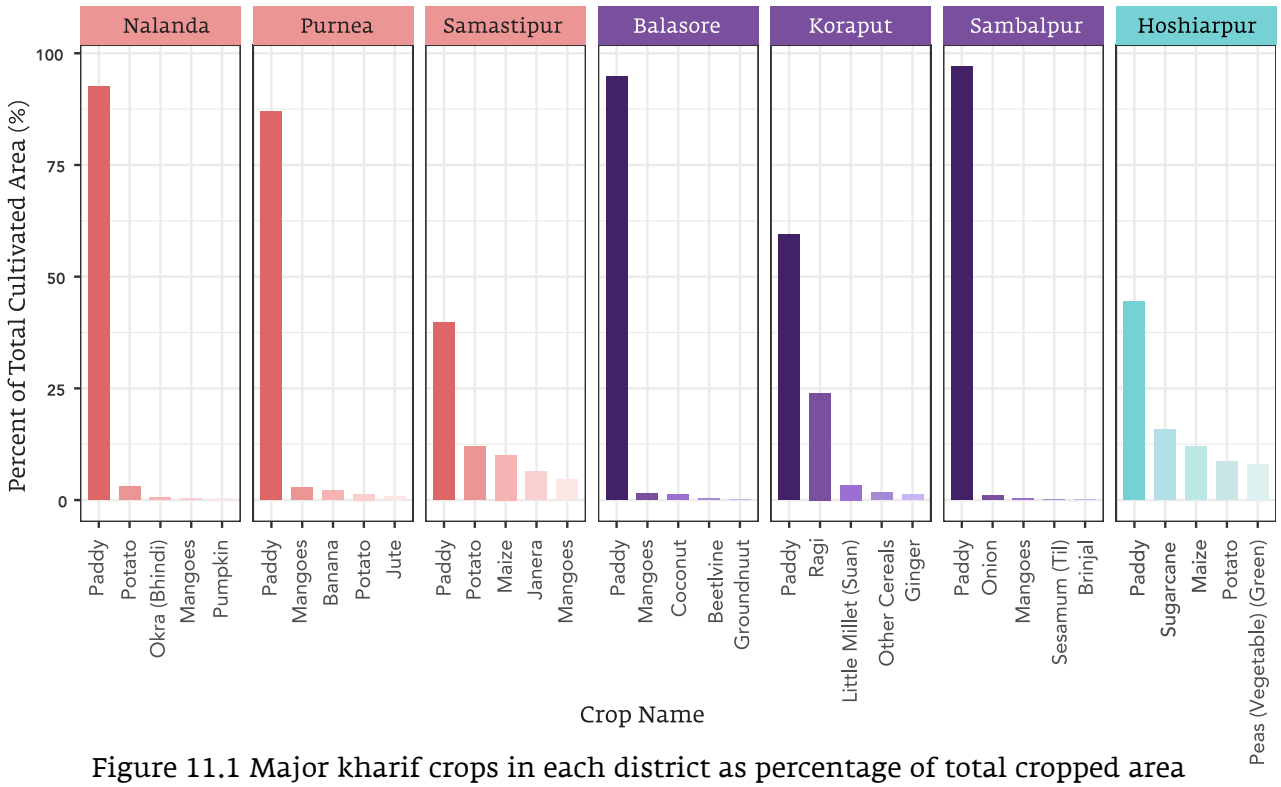


Figure 11.1 Major kharif crops in each district as percentage of total cropped area

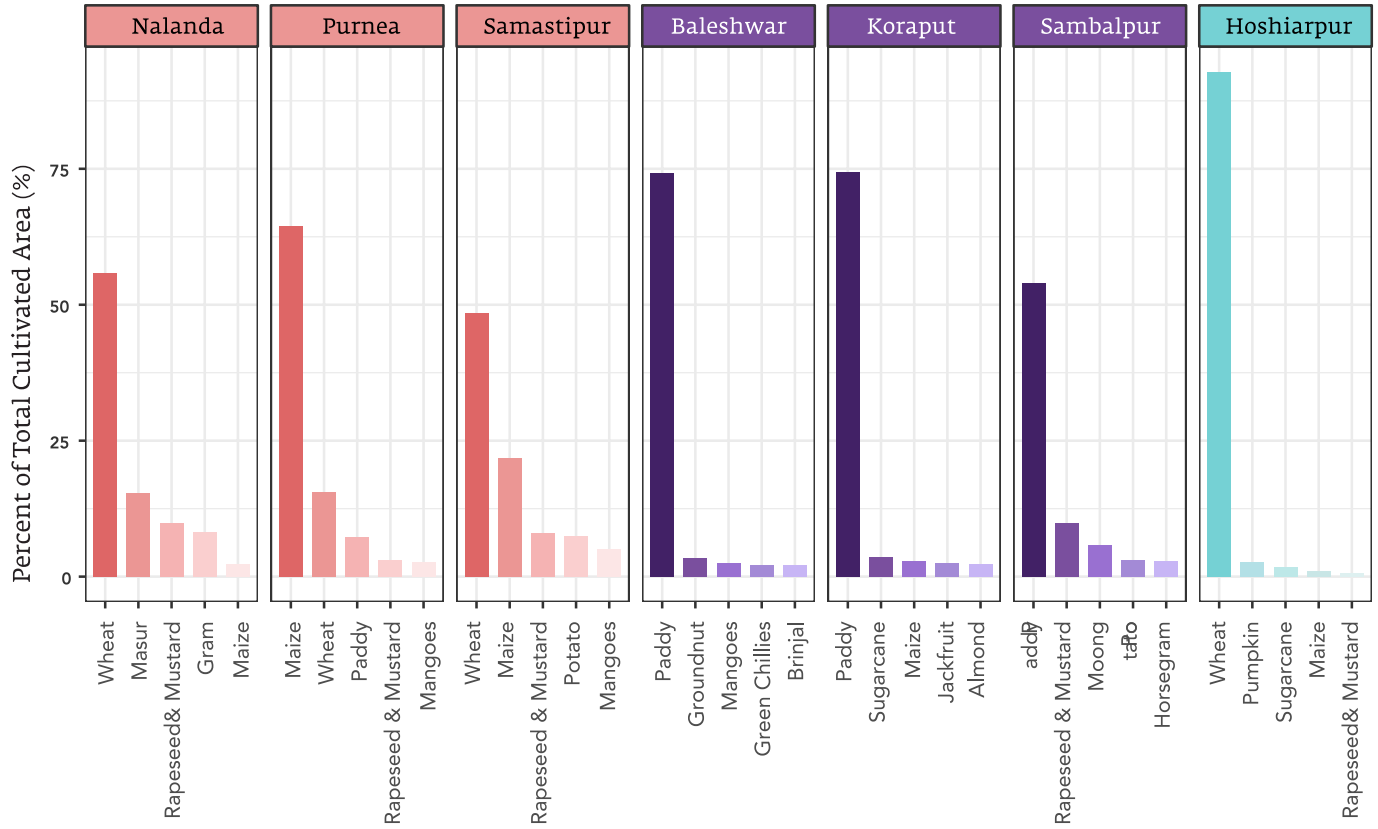


Figure 11.2 Major rabi crops in each district as percentage of total cropped area

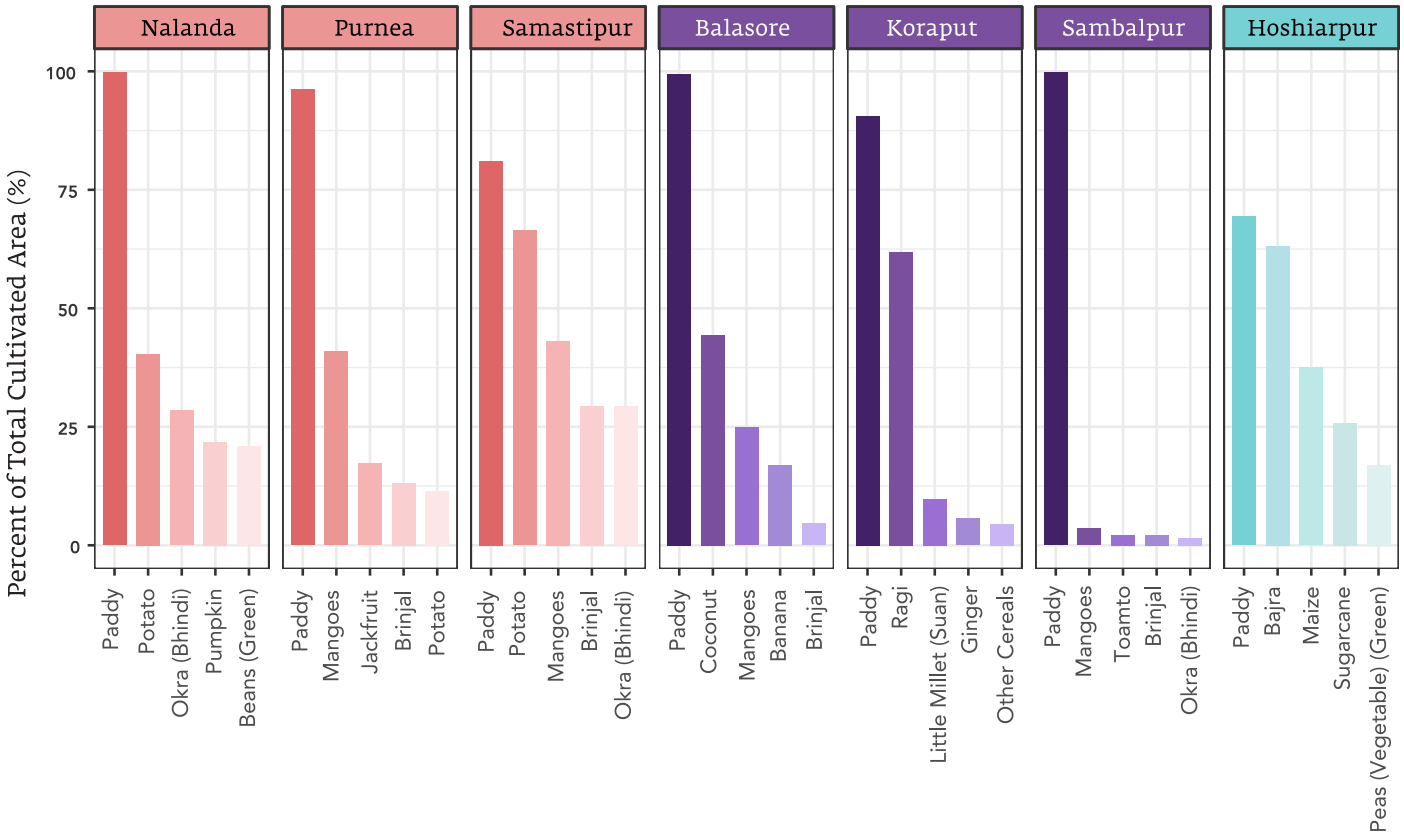


Figure 11.3 Major kharif crops by percentage of farmers cultivating

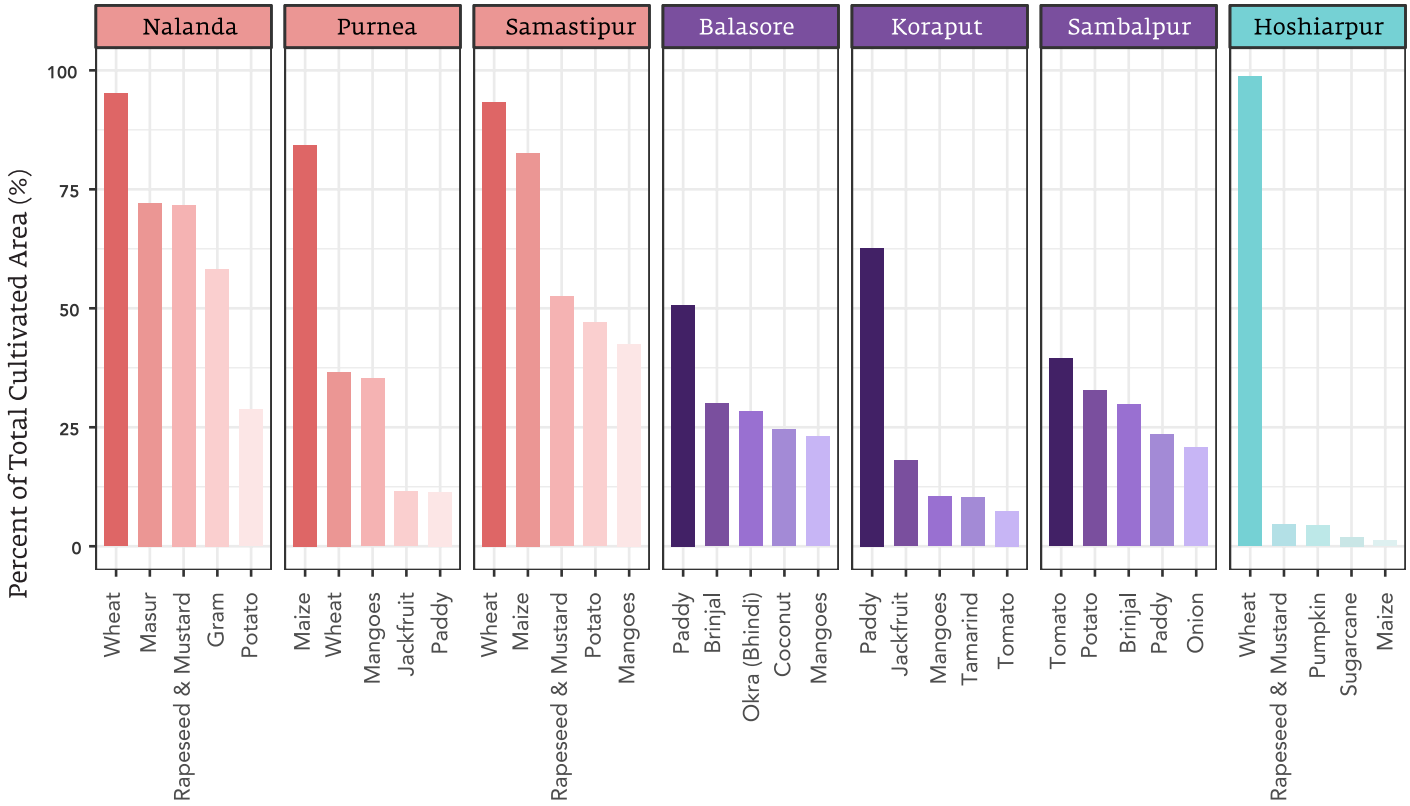


Figure 11.4 Major rabi crops by percentage of farmers cultivating

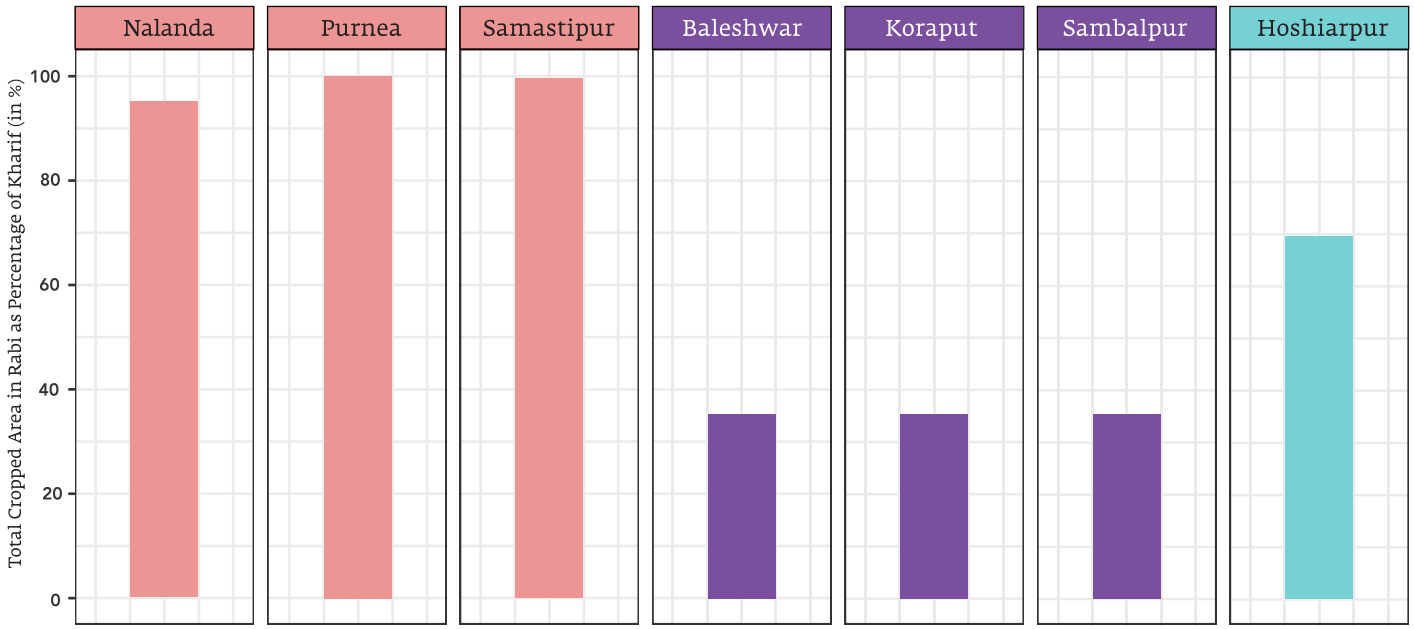


Figure 12.5 Total cultivated area in rabi as percentage of total cultivated area in kharif

Figure 11.5 Total cultivated area in rabi as percentage of total cultivated area in kharif

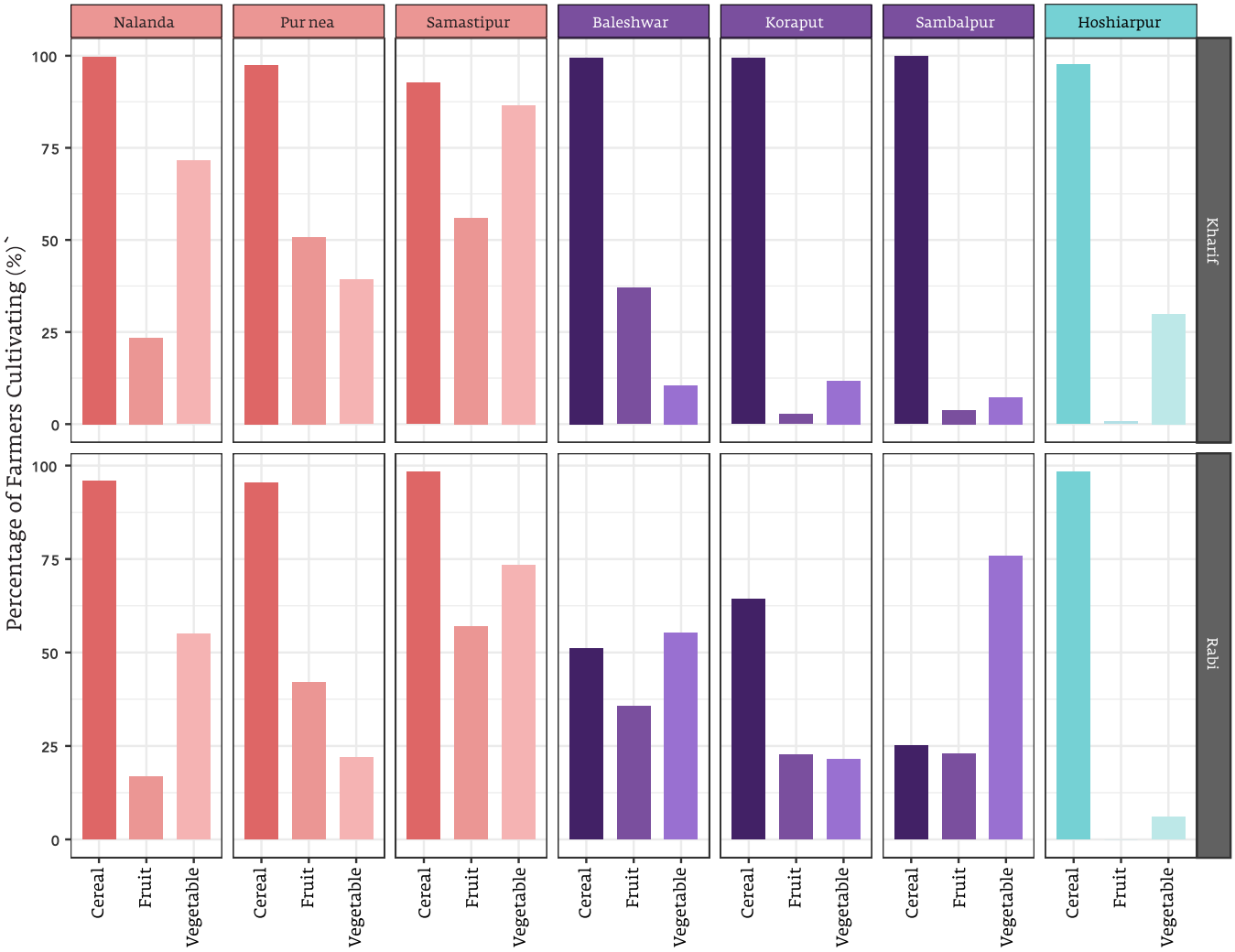


Figure 11.6 Crop type cultivated by farmers across seasons

11.2 Cropping patterns and agroecology

11.2.1 Bihar

A. Samastipur

Located in the central region of Bihar, Samastipur comes under the agroecological zone-I of the state, i.e., north-west alluvial plains. Samastipur's soil type is rich in organic matter suitable for the cultivation of vegetables and spices. The majority of farmers reported cultivating land with light textured soil.

The district is a part of great Ganga basin. The river Ganga skirts the district on the south and flows towards the east. Though a part of the district falls in the tail end of the Gandak canal, ground water serves as the main source of irrigation. Tube wells and hand pumps are reported as the most prominent sources of irrigation for farmers.

Historically, Samastipur has been a key district for the production of spices, especially chillies and turmeric. However, in the last few decades, an increase in the frequency of pest infestations led to a decline in spice production. Tobacco was also an important crop grown in the district, which has seen a significant decline in production due to a lack of proper marketing channels, although people continue to grow tobacco leaves (often for "recreational" purposes).is a mere 19% of the kharif cultivated area. For Sambalpur and Balasore, these numbers stand at 28% and 36% respectively.

Paddy remains the single-most widely grown kharif crop, accounting for 40% of cropped area, almost entirely in hybrid varieties, as the desi (local) variety is not preferred for household consumption.

Currently, vegetables are grown on a large scale in Samastipur, along with paddy, wheat, and maize— more than 85% and 70% farmers reported growing vegetables during kharif and rabi respectively. Multiple river drainage systems as well as high groundwater levels[28] in the district ensure the availability of ample water for irrigation, which has paved the way for vegetable cultivation on a commercial scale. Some farmers have also argued that the presence of multiple market sites in the district (see figure 11.8) has led to more farmers taking up vegetable cultivation. In winter 2018–19, low-lying areas of the district (locally referred to as chor areas), which are typically left fallow due to the risk of water logging, were used to cultivate vegetables in the event of lower than normal rainfall.

Samastipur is dotted with small farmers, and vegetables provide them with a constant source of income over the year.

[28] According to the Central Ground Water Board (CGWB) data, the stage of groundwater development in the district is at 49.1%. This means there is scope for further extraction without danger of depletion.

Availability of water is a binding constraint, but the majority of farmers in the district have tube wells for irrigation. The recent separation of agricultural feeders by the Bihar government has reduced irrigation costs even further, and farmers anticipate further intensification of vegetable cultivation in the area.

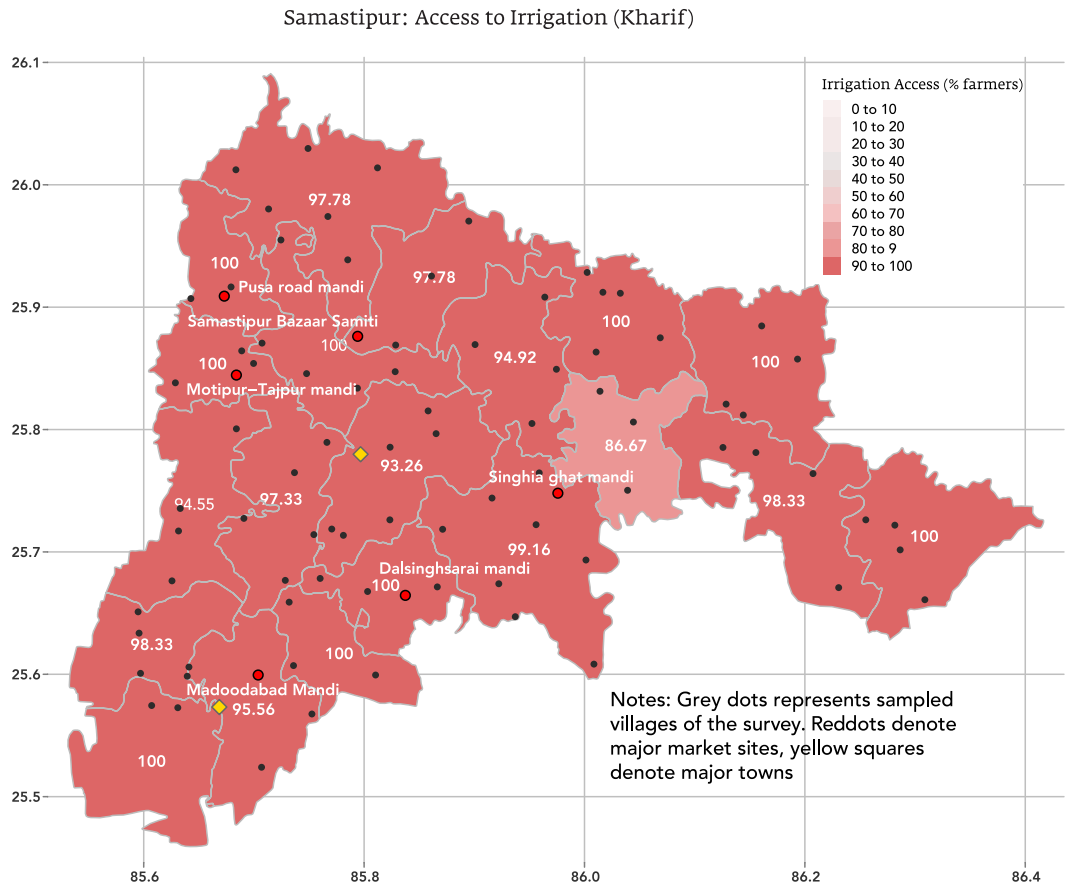


Figure 11.7 Access to irrigation in Samastipur during the kharif cropping season

Table 11.1 Cultivation pattern of paddy seed types:
Percentage of land under various seed types across districts

Districts	Desi	Hybrid	Other	Total
Nalanda	15.3%	79.8%	5.0%	100%
Purnea	16%	83.5%	0.6%	100%
Samastipur	4.3%	95.4%	0.3%	100%
Balasore	37.9%	61.7%	0.4%	100%
Koraput	55.2%	44.7%	0.2%	100%
Sambalpur	63.1%	32.7%	4.1%	100%
Hoshiarpur	45.3%	54.7%	0.0%	100%

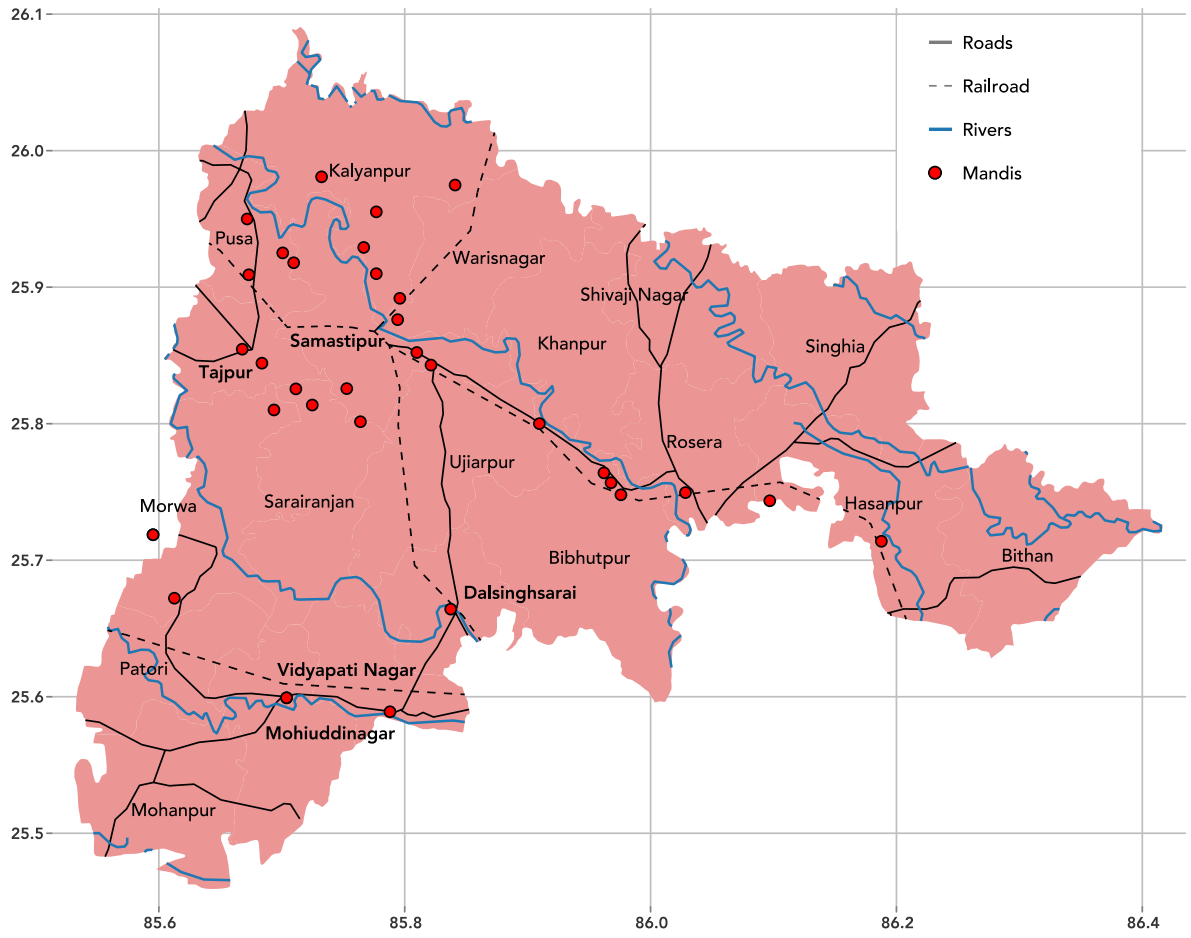


Figure 11.8 Samastipur markets and haats distribution

Table 11.2 Major Kharif Crops in Samastipur

Crop Name	Percentage of total cultivated area [28]
Paddy	39.7%
Potato	12%
Maize	10.1%
Jeera	6.4%
Mangoes	4.6%
Cauliflower	2.6%
Green Manures	2.6%
Sugarcane	2.2%
Elephant foot Yam	2.1%
Brinjal	1.5%
Other fodder crops	1.4%
Okra	1.3%
Cabbage	1.3%
Pointed gourd	1.2%
Turmeric	1.1%

[29] Cropped area may not add to 100% since we are only showing major crops

Samastipur: Fraction of Total Cultivated Area under Cereal Crops in Kharif

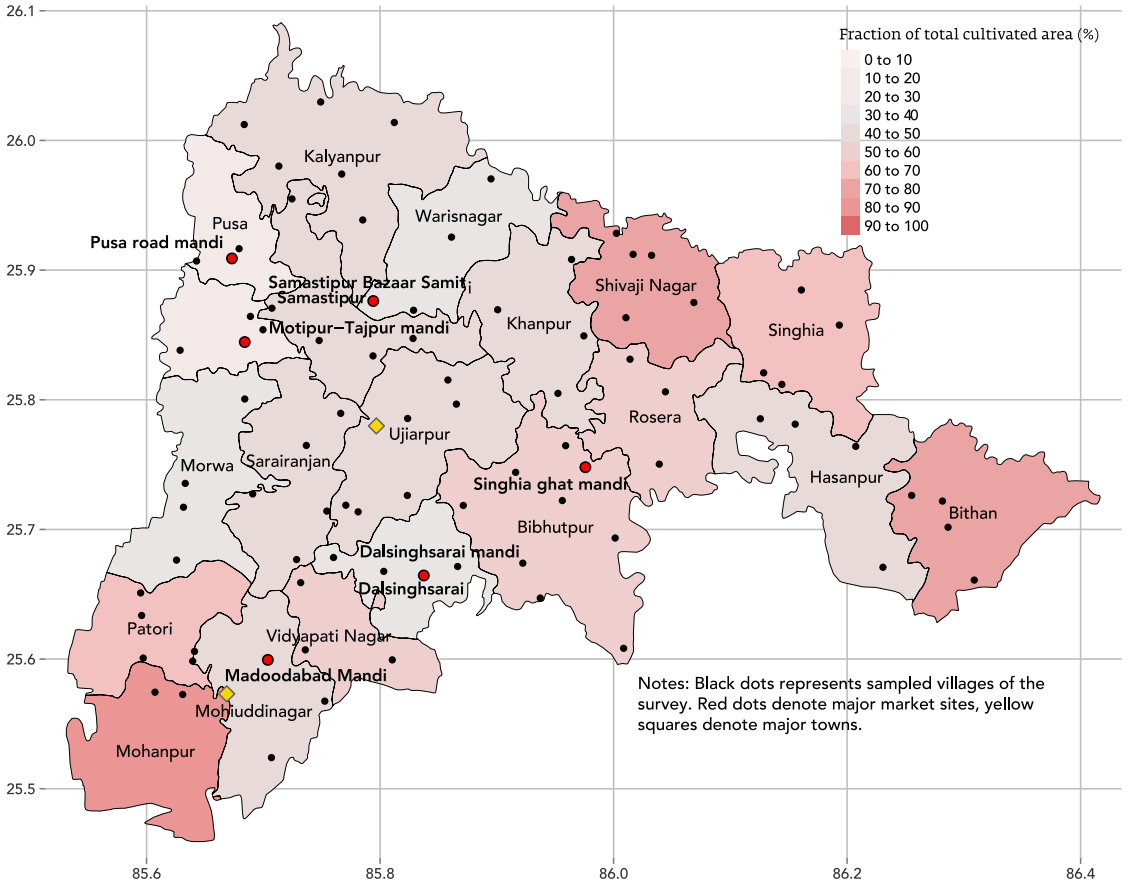


Figure 11.9 Cereal crop concentration in kharif (by cultivated land)

Samastipur: Fraction of Total Cultivated Area under Fruits and Vegetables in Kharif

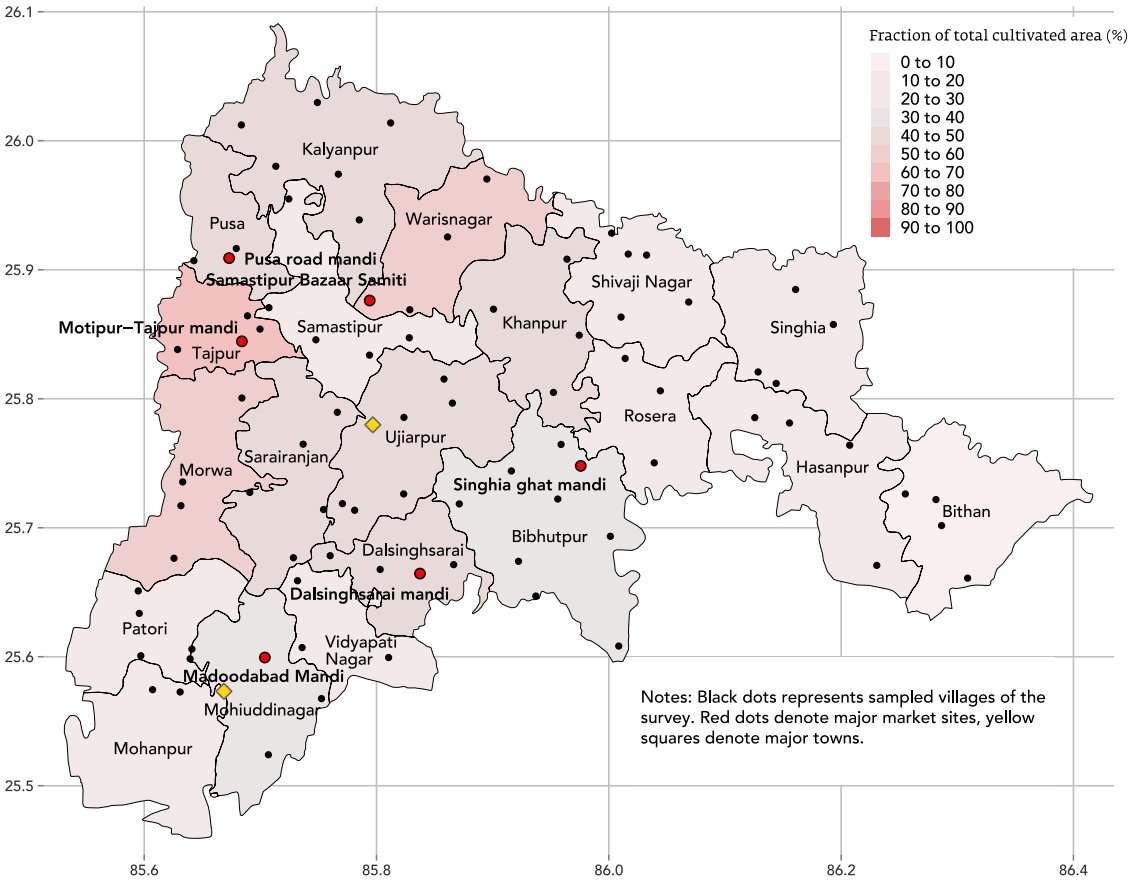


Figure 11.10 Vegetable and fruit crop concentration in kharif (by cultivated land)

Samastipur: Fraction of Total Cultivated Area under Cereal Crops in Rabi

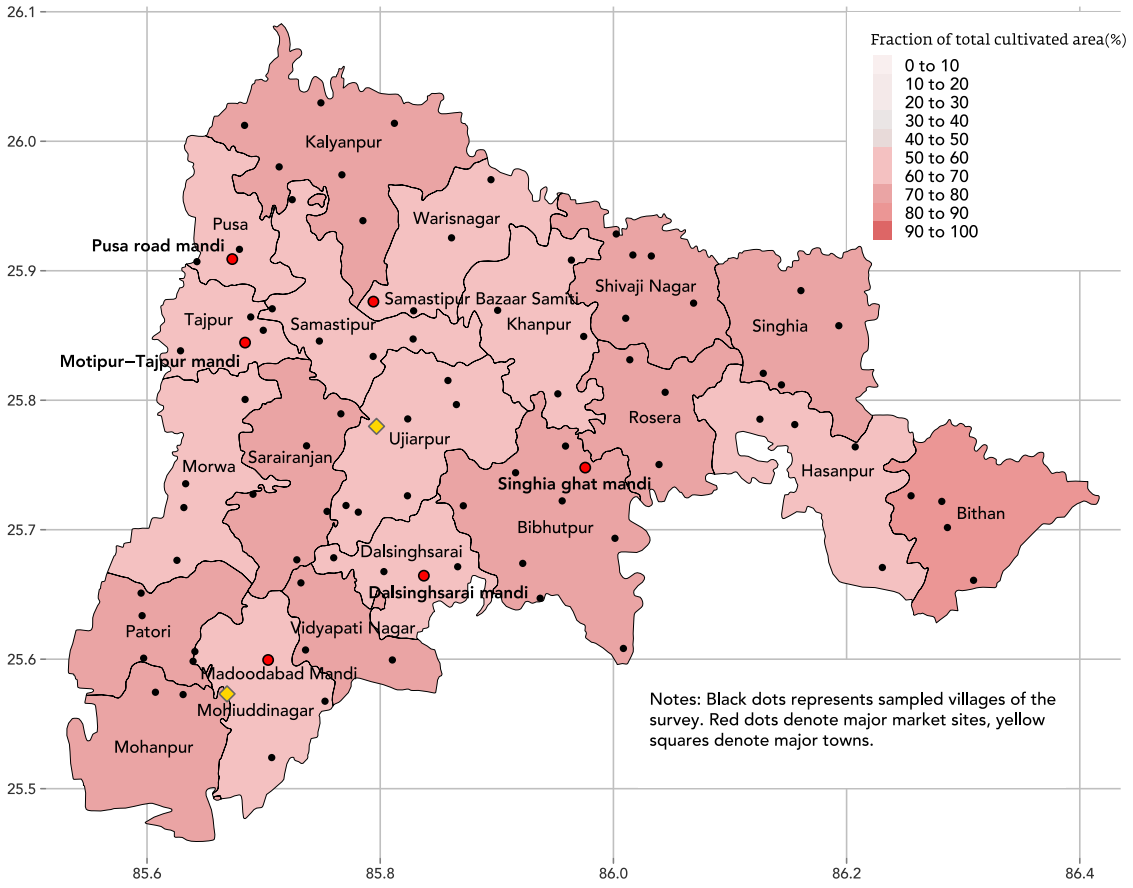


Figure 11.11 Cereal crop concentration in rabi (by cultivated land)

Samastipur: Fraction of Total Cultivated Area under Fruits and Vegetables in Rabi

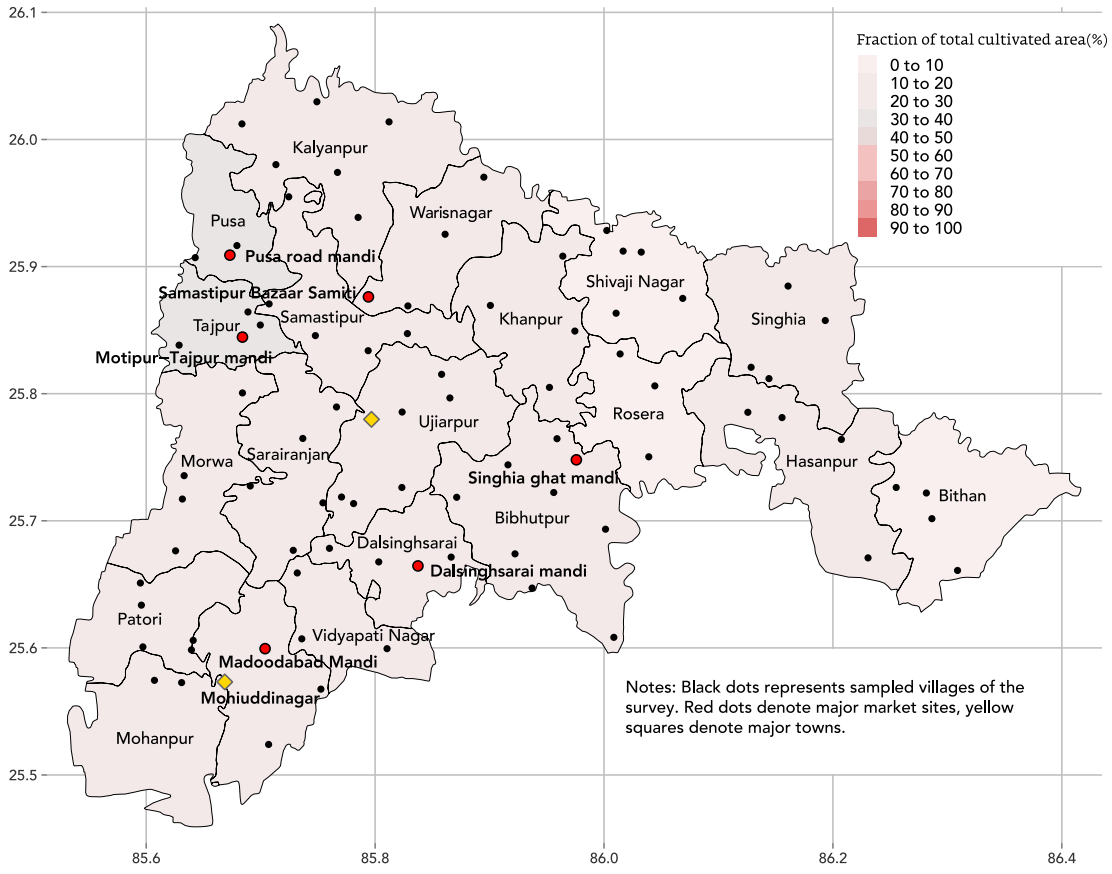


Figure 11.12 Vegetable and fruit crop concentration in rabi (by cultivated land)

B. Nalanda

Nalanda is located within the mid-Ganga basin in the southern margins of the Gangetic plains. It largely has a flat alluvial terrain with loamy soil, except for the hard rock areas in Rajgir. In the alluvial areas, a number of aquifers exist. Groundwater is the main source of irrigation, extracted predominantly through tube wells. Major crops grown here are paddy, wheat, potato, and onion, with paddy accounting for 93% of the kharif cropped area, and wheat 56% in rabi.

The ***taal*** area in the north-eastern part of the district is especially suited for the cultivation of pulses. Farming households located close to market sites also grow a variety of vegetables. Proximity to Patna as well as trading networks with Nepal and Bangladesh ensure that there is a steady local and non-local demand for horticultural produce.

Nalanda has historically been a hub of potato cultivation. In our sample, 40.3% of the farmers reported cultivating potato in kharif and 28.6% in rabi, accounting for 3.1% of cultivated area reported in the kharif survey and 1.8% in rabi; 18.2% farmers cultivate potato in both kharif and rabi.

Before West Bengal and Odisha started producing potatoes locally, they were dependent on Nalanda for their supply. Some of the first cold storage units were established in Nalanda in the 1950s to facilitate domestic and international potato trade. However, potato production has been on the decline in recent years. The emergence of newer production centers outside Bihar has reduced the demand for potatoes in Nalanda. Managers of currently operational cold storage owners reported that they have been reeling under losses for the last three years, and several cold storage units in the district have had to shut shop.

All blocks have some area under potato cultivation. Production is most concentrated in Noor Sarai, Rahui, Chandi, and Silao blocks. Key market sites like Soh Sarai (known to be a historic market for potato trade; according to local traders, it is the site of one of the first cold storages in all of Asia) and Bihar Sharif are nearby.

Onion production in the district has also seen a downturn in recent years. Despite the widespread use of tube well irrigation in Nalanda, water scarcity and two consecutive drought years have jeopardized the crop.

Nalanda, which is major trading hub for agricultural produce arriving from within as well as outside Bihar, has seen an increase in hybridization in order to make the local produce competitive against produce coming in from other states. The example of onion is illustrative: Nasik (in Maharashtra) is a major producer of onions and supplies the commodity to markets in Nalanda as well. Nasik onions are of a hybrid variety—larger in size, cheaper to grow, more competitive in the market. Desi varieties of onions in Nalanda were consistently losing out, as they were smaller in size (often perceived as a mark of poor quality, which retail consumers do not see value in) and more expensive. Thus, farmers have started sowing hybrid varieties to keep the produce viable in markets. However, many farmers commented on the lack of resilience in hybrid seed varieties, which increases their vulnerability to crop failure.

Overall, unlike Samastipur, Nalanda remains heavily reliant on paddy cultivation in kharif. The reasons for this may be explained in terms of a particularly higher landless cultivator percentage (22.5% in Nalanda, compared with 2.7% in Samastipur), marginally higher percentage of farmers reporting any level of access to irrigation in Nalanda, and concentration of marketing sites in Samastipur. Perhaps the greater degree of landlessness in Nalanda gives its farmers less control over cultivation decisions and less latitude for investing in crops other than paddy. Despite Nalanda's past history and current location where demand for horticulture crops is high, it has not so far replaced potato and onion as non-cereal crops.

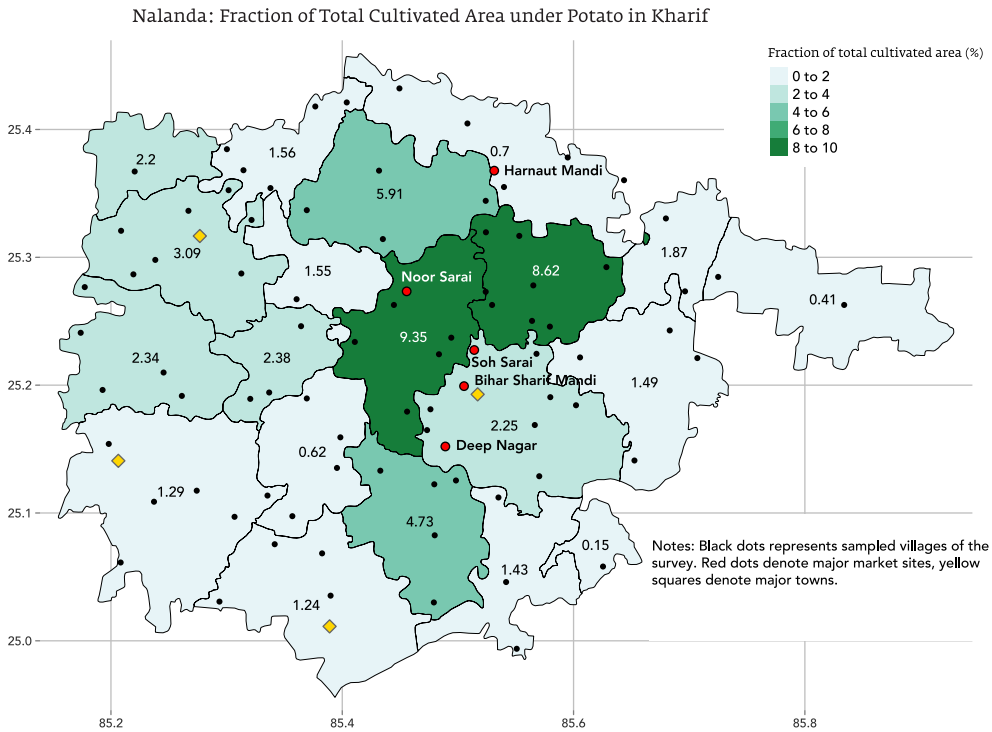


Figure 11.13 Block-wise distribution of potato cultivation in Nalanda during kharif

C. Purnea

Purnea's river drainage system consists of two main river basins in the district—the Kosi river basin and the Mahananda river basin. Alluvial deposits brought in by both these rivers make the region extremely fertile. In fact, some residents of the district have said that the soil in Purnea is fertile enough to grow anything. In Purnea, most farmers reported cultivating land with light textured soil. Irrigation is provided by groundwater, predominantly extracted using tube wells and bore wells.

Paddy is the main kharif crop, accounting for 86.9% of cropped area. Maize is Purnea's success story. It is the principal rabi crop, accounting for 64.5% of cropped area, by far the largest coverage of maize of all the districts.

Before the arrival of hybrid maize, the district was known for extensive jute cultivation. ***Chana*** (gram), pulses, and ragi were other major commodities grown in the district. However, introduction of hybrid maize in the 1990s, and the rapid rise it has seen in production ever since, driven in large part by the involvement of the private sector in extension and marketing, has pushed out all other rabi commodities. The Kosi belt, of which Purnea is a part, is now a hub for maize production during rabi season. This gives the region a seasonal advantage over other maize-producing regions as most of them cultivate maize in the kharif season. Maize is treated as a commercial crop and is supplied to processing industries of various kinds (starch, poultry feed, beverages, etc.). In recent years, maize has witnessed fluctuations in prices due to the impact of the international market for maize. As a result, farmers have started growing wheat in the rabi season, for which prices are usually more stable.

Banana is another important crop in the district (it is the third-most significant by cropped area). It was introduced in Purnea and the neighboring districts of Katihar and Bhagalpur (all of which form the Kosi belt) in the late 1960s. Banana cultivation has a medium- to long-term impact on soil fertility and suitability of the land for cultivation. It is an immensely extractive and input-intensive crop, and a plot of land used for growing banana can only be used for five to six years. During this period, no other crop can be inter- cropped along with banana. Once the banana has been cultivated on the plot of land for some period of time, the land has to be left fallow for some period of time before it can regenerate soil nutrients. Mango is another cash crop, though only cultivated by larger farmers who have orchards.

In some blocks of Purnea, fox nut (***makhana***) cultivation happens on a large scale. Fox nut is cultivated in ponds constructed on fallow land with water-holding capacity. The Malha caste is uniquely skilled in the cultivation of this commodity and tends to lease in several acres of land for their operations (as they themselves do not own much land). Fox nut is a high-value commodity but susceptible to crop loss and price volatility, making its cultivation a high-risk enterprise.

11.2.2 Odisha

A. Koraput

Located in the Eastern Ghats, Koraput district is distinctive by virtue of its highly variegated cropping pattern, reflecting its location, history, topography, access to water and social structure. Physiographically much of the district is occupied by dense forest, highly rugged mountains, interspersed with narrow intermontane valleys. The Kolab and Indravati rivers and their tributaries constitute the main drainage system of the district.

The district is divided into two subdivisions of Koraput and Jeypore. Jeypore subdivision lies in the northwest of the district, comprising of Boipariguda, Boriguma, Kotpad, Kundura, and Jeypore blocks. The Jeypore subdivision is at a lower elevation, comprising mostly flatland. The soil type in this subdivision was mostly reported to be of light textured type, as compared to a mix of heavy, sandy, and light in the Koraput subdivision.

Almost 65% of farmers in the district reported the absence of irrigation. However, farmers in Jeypore subdivision reported a higher access to irrigation in kharif than the Koraput subdivision. The entire district seems to be dependent on rainfall for irrigation purposes. Canals and creeks/streams form the second-most prominent source of irrigation. The blocks with higher median land cultivated and higher median plot size lie in the Jeypore subdivision. This is also where paddy cultivation in kharif is concentrated.

The Koraput subdivision in the south and east is hilly and forested. Broadly, there are four kinds of land in the subdivision:

i. ***Jhola:*** Lowland areas close to river beds, extremely fertile.
ii. ***Beda:*** Lowland areas prone to waterlogging. Most suitable for paddy cultivation, especially high-yielding hybrid varieties.
iii. ***Padda:*** Drier upland regions, suited for cultivation of vegetables
iv. ***Dangar:*** Hilly and rocky areas, often close to forests. Local communities may stake claim and cultivate on them without any *patta* or landownership rights. Suited for cultivation of millets, and local or desi varieties of paddy.

Farmers in the Koraput subdivision may often have multiple plots of land, which are a combination of the kinds mentioned above. In such cases, the crops grown and their variety and quality are closely related to land elevation and soil type. For example, ginger grown in red soil is preferred over ginger grown in black soil due to differences in quality and taste.

Corresponding to the diverse topography, Koraput subdivision itself has a very diverse cropping pattern. Each block has a distinct group of commodities that are grown, ranging from paddy, ragi, finger millets, and pulses to green vegetables, potatoes, cashews, and lemongrass. Commercial crops like ***nilgiri*** or eucalyptus are also grown on a large scale (both by individual farmers and by paper and wood companies through contract farming) due to the favorable hilly terrain. In recent years, support by the district Forest Department, and the presence of paper mills have led to a further rise in eucalyptus cultivation. High bauxite content and water-carrying capacity in

the soil makes it favorable for vegetable cultivation.

Paddy is the dominant crop (60% in kharif and 74.4% in rabi as percentage of total cropped area). In kharif, paddy is concentrated in the Jeypore subdivision where irrigation is provided by canals but accounts for less than 50% of cropped area in the Koraput subdivision. Little cultivation happens in rabi. Total cropped area is just 19% of area cultivated in kharif, and almost all of it is devoted to growing paddy.

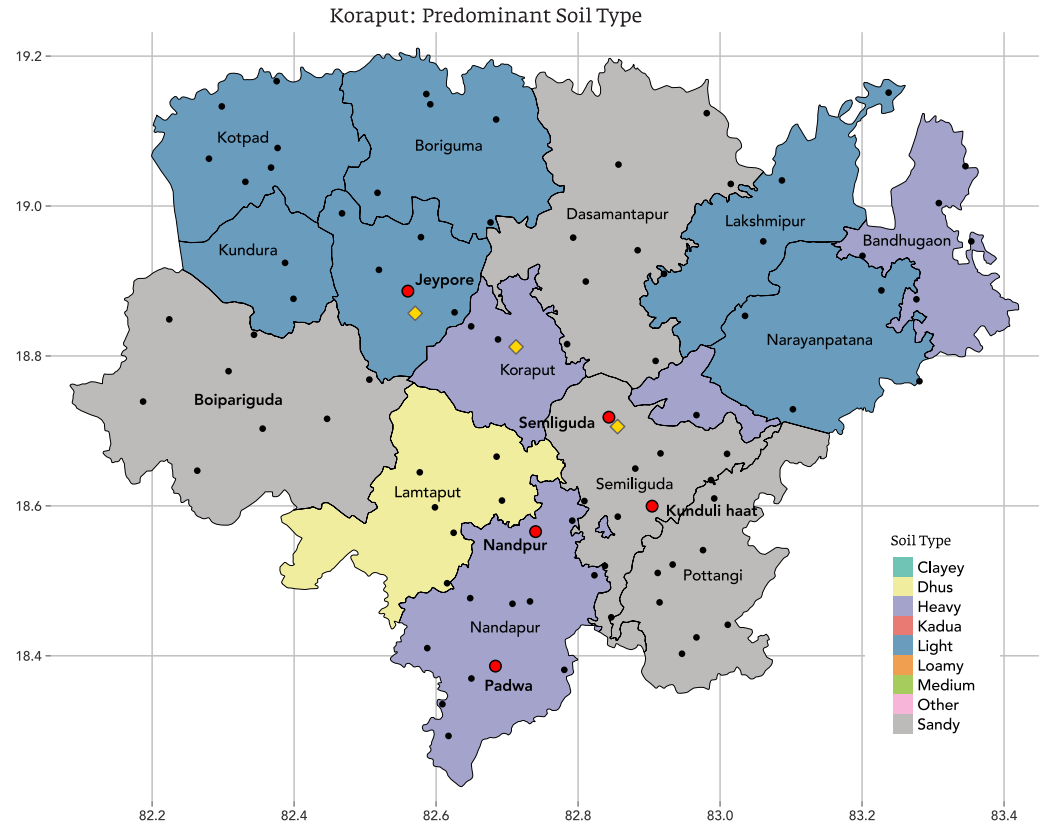


Figure 11.14 Soil map of Koraput

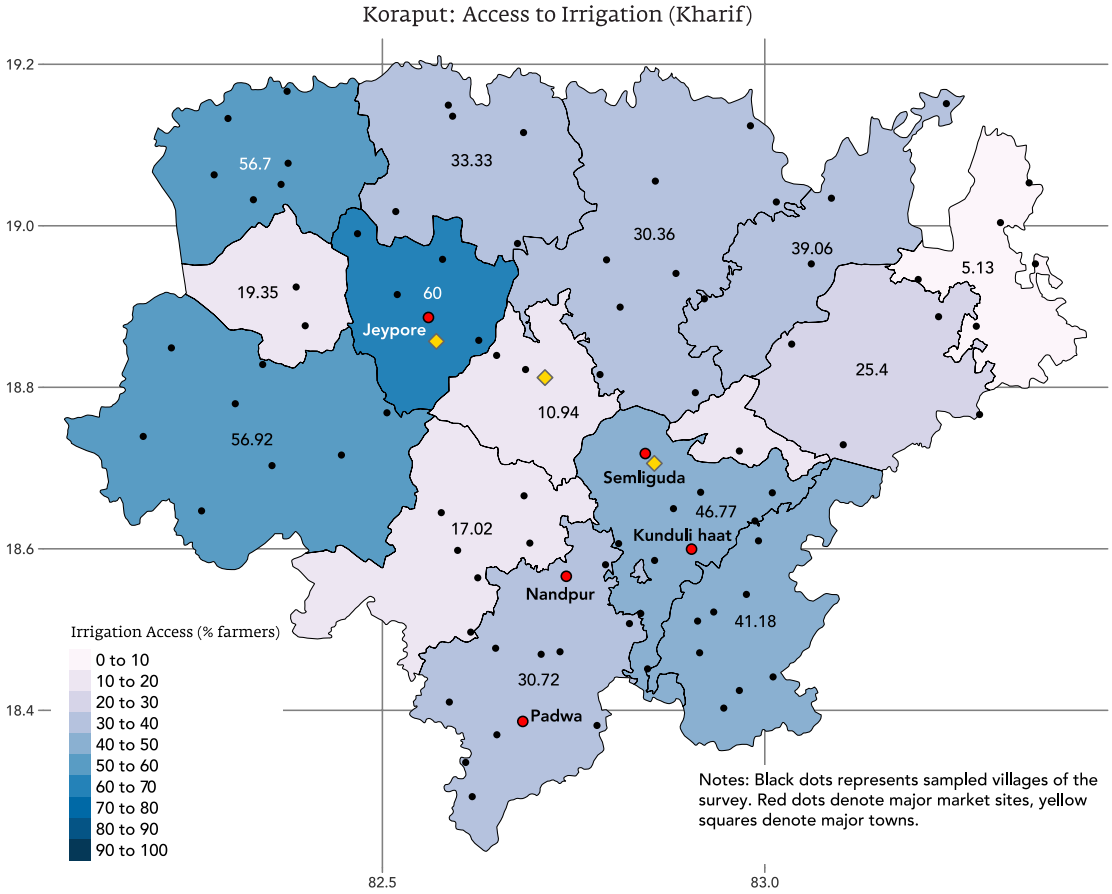


Figure 11.15 Access to irrigation in Koraput during kharif cropping season

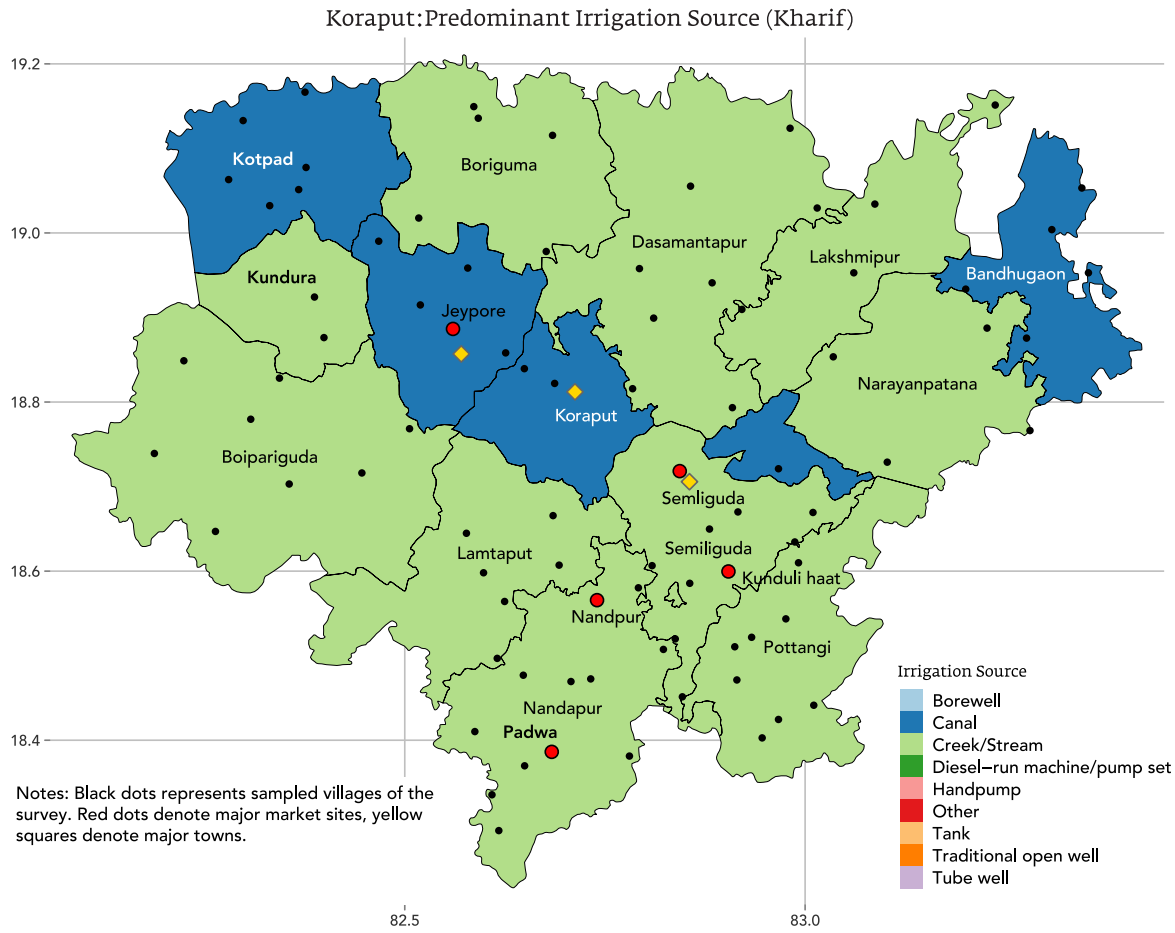


Figure 11.16 Block-wise distribution of predominant source of irrigation in Koraput during kharif

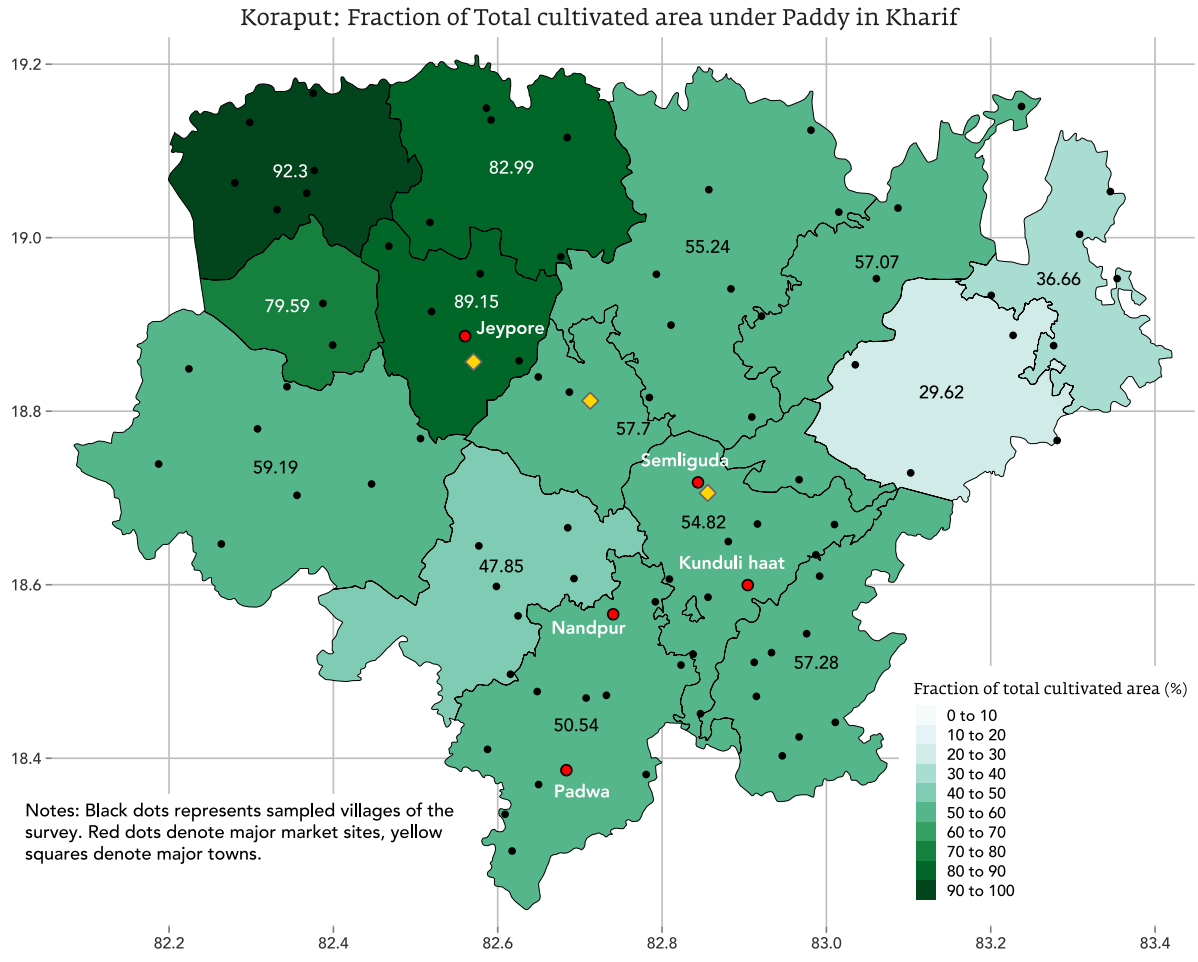


Figure 11.17 Distribution of paddy cultivation across Koraput blocks in kharif

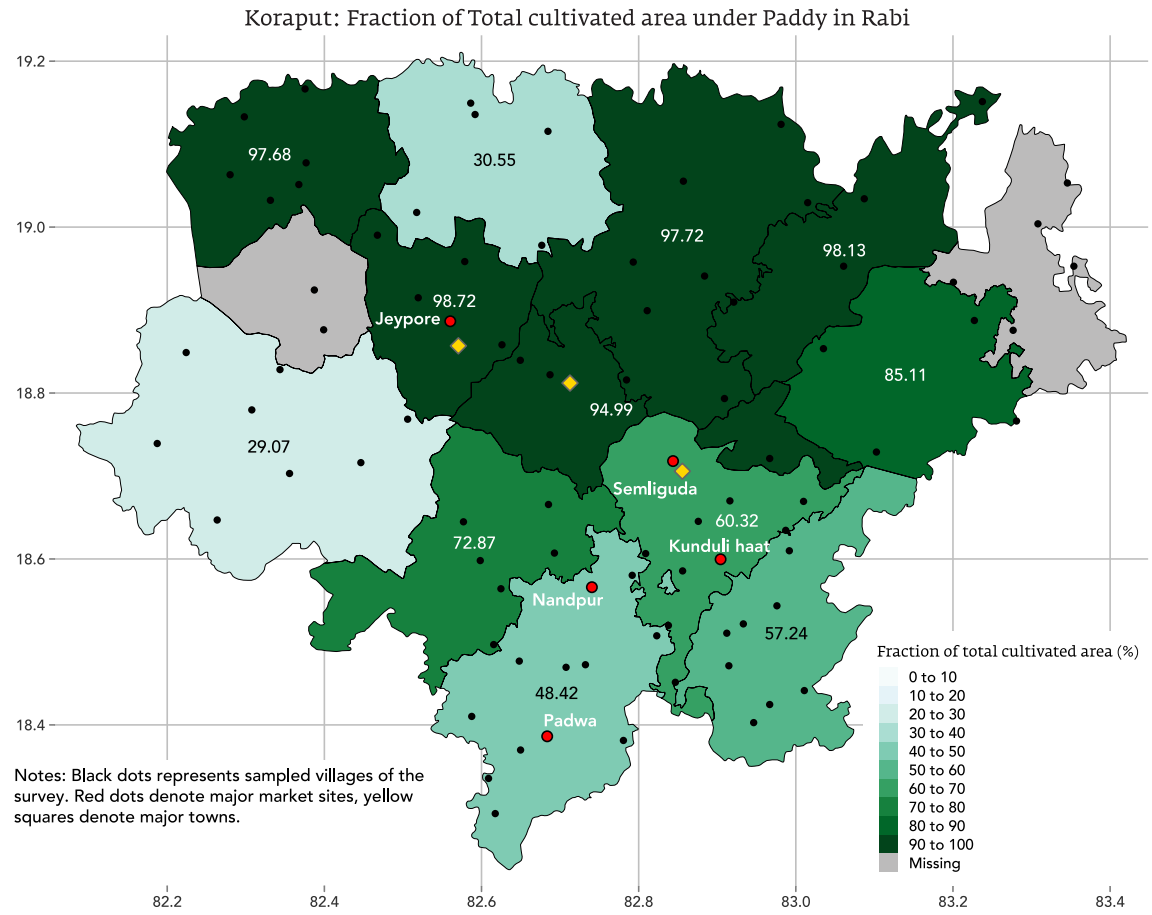


Figure 11.18 Distribution of paddy cultivation across Koraput blocks in rabi

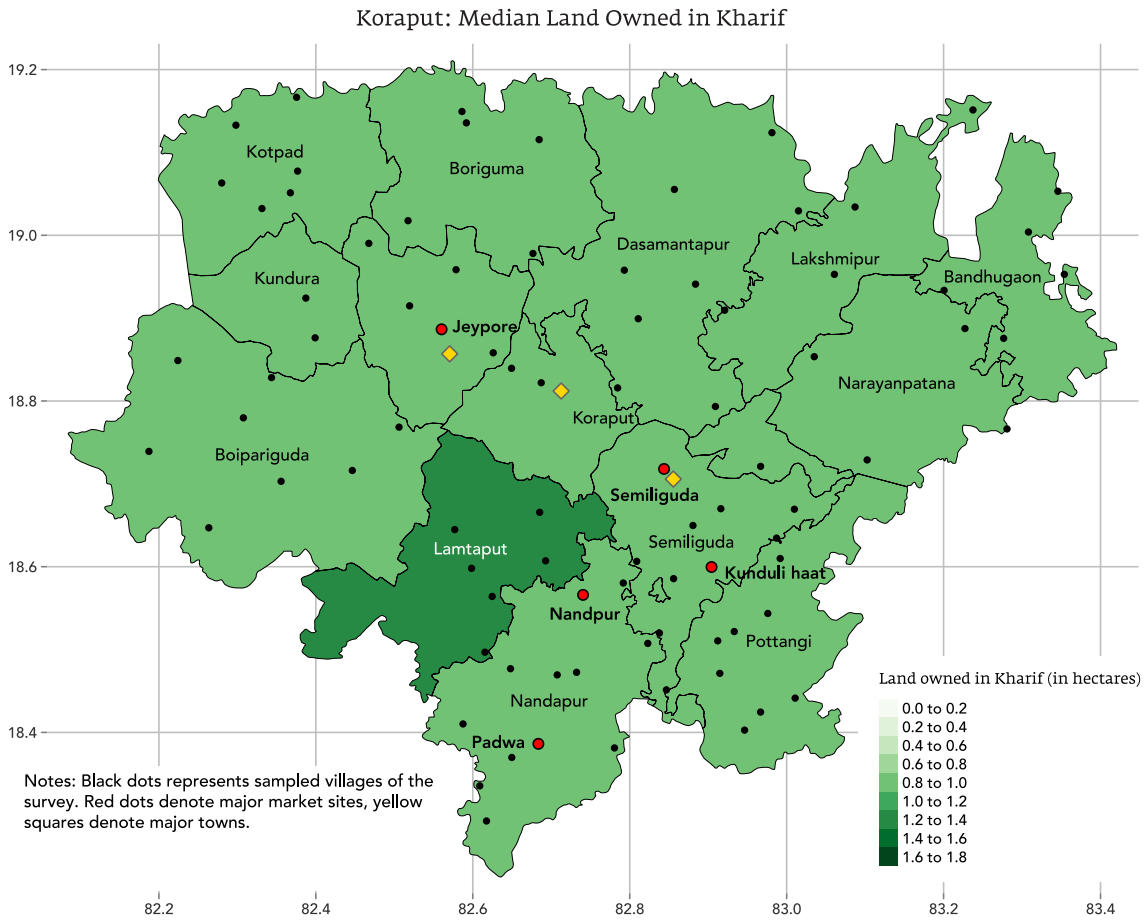


Figure 11.19 Median landownership across Koraput blocks in kharif

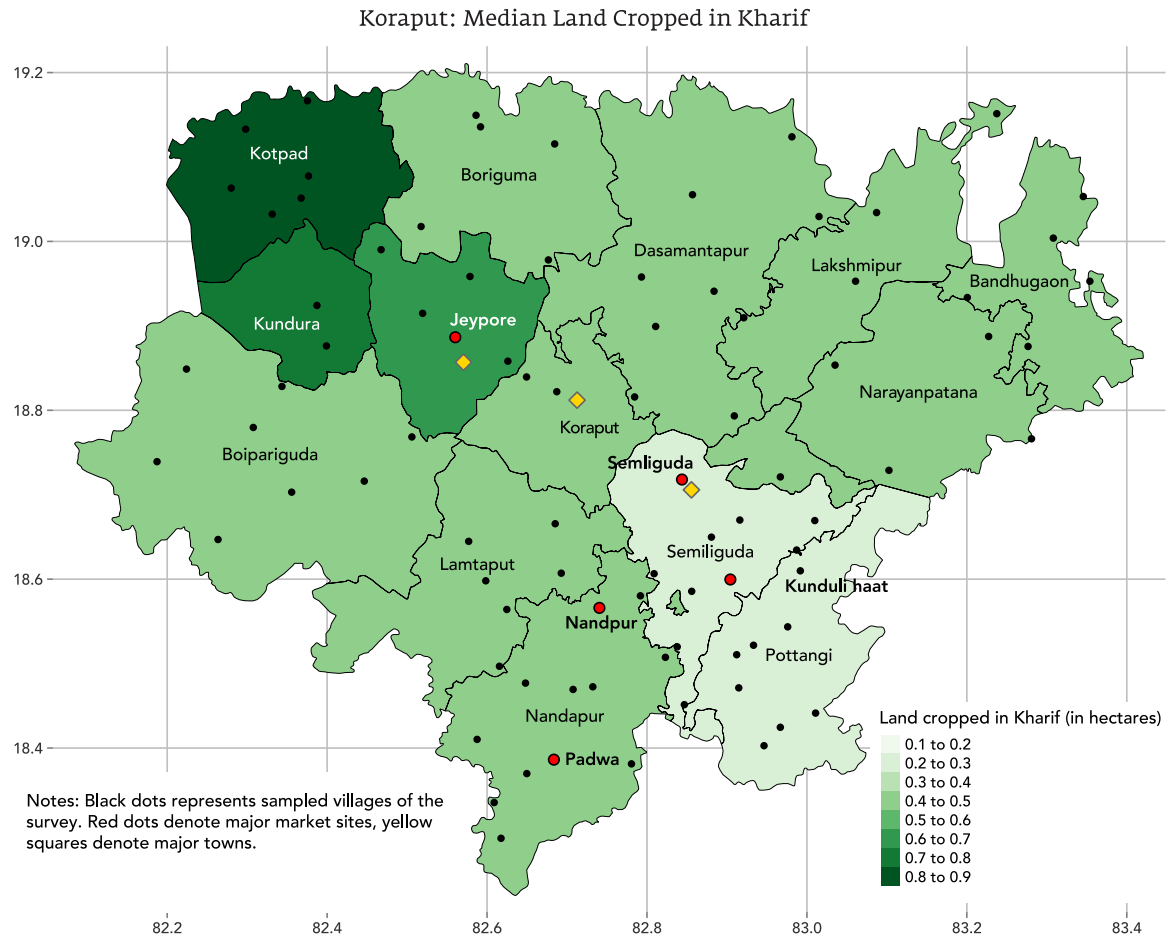


Figure 11.20 Median land cultivated across Koraput blocks in kharif

B. Sambhalpur

The district has three distinct agroecological divisions—hilly terrains of Bamra and Kuchinda in the north, plateau and ridges of Rairakhol in the south-east, and valley-plains of Dhankauda in the south-west. The Mahanadi river basin forms an important part of Sambalpur's geography. Areas under the Hirakud command area (only a few blocks close to the district headquarters) have benefited from the availability of irrigation facilities throughout the year. These are the areas that grow paddy in both kharif and rabi season, along with some vegetables. Large parts of the district are not under the command area and hence are rainfed. 72% of surveyed farmers report cultivating unirrigated land.

Paddy occupies almost all of the cultivated area (97%) in kharif, despite much of the area being unirrigated, which means many farmers depend heavily on rainfall. In rabi, paddy accounts for 54% of the cropped area, but not surprisingly, given the limited access to irrigation, the total cropped area in rabi is only 28% of the total cropped area in kharif.

The reliance on paddy in both kharif and rabi as well as the lack of irrigation limit the extent of non-cereal cultivation in Sambalpur. Nevertheless, 75.8% of surveyed farmers reported growing some vegetables in rabi, including tomato, potato, brinjal, and onion.

The Bamra and Kochinda blocks, both of which are outside the Hirakud command area, are known for extensive chili cultivation, along with litchis, mustard, pulses, and mango. Recently, however, there has been a rapid decline in chilli production. Some estimates brought forward by traders and the District Horticultural Office claimed that production levels in 2019 were 30% of what they used to be earlier. The major causes are instances of pest infestation, lack of any crop insurance that can provide risk mitigation to chili farmers, and fluctuation in chili prices in the last few years. Other blocks like Rairakhol and Naktideul are more suited to growing pulses and vegetables due to the limited availability of water.

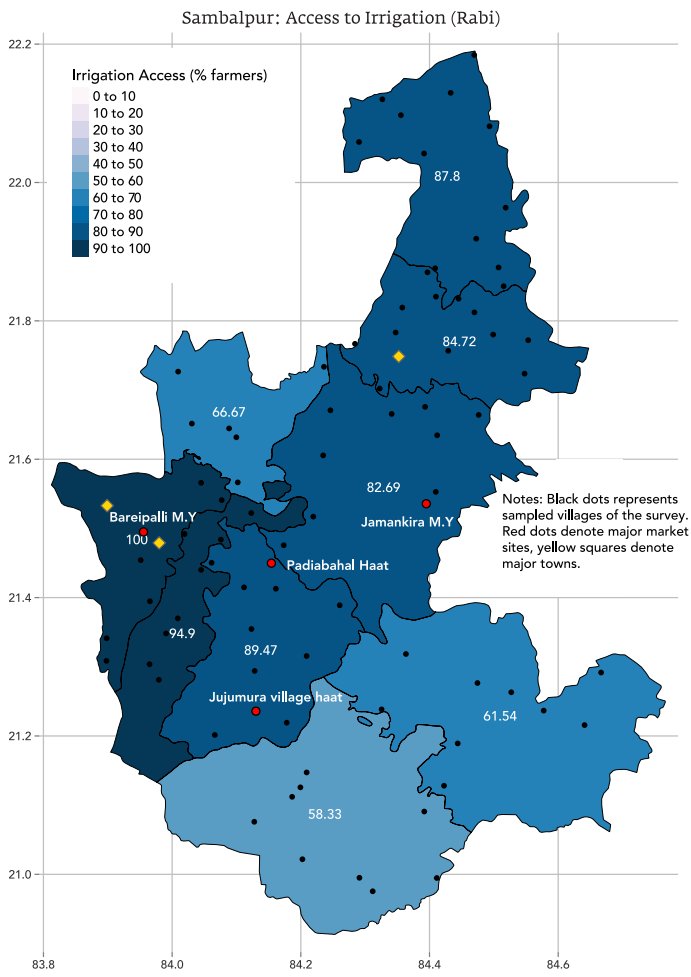


Figure 11.21 Access to irrigation in Sambalpur during rabi cropping season

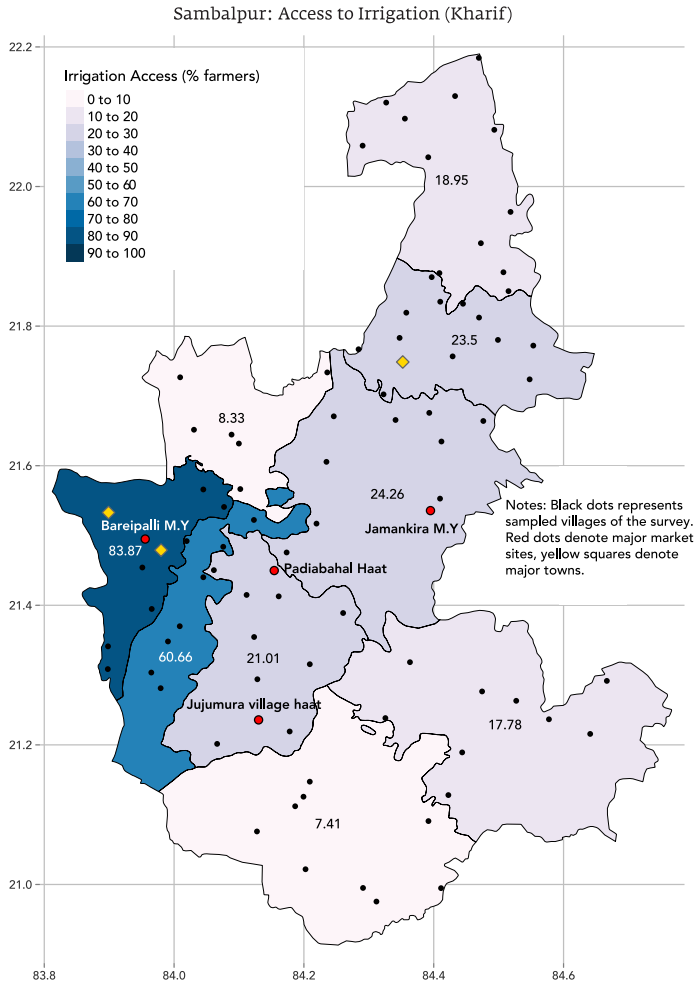


Figure 11.22: Access to irrigation in Sambalpur during kharif cropping season

C. Balasore

The district has an 81-km-long coastline, and because of its proximity to the sea, it is interspersed with a number of perennial rivers, rivulets, seasonal streams, and saline creeks. As a major portion of the district is situated in the deltaic region of Gangetic river systems, it possesses fertile alluvial deposits and is suitable for intensive crop production.

Paddy is the most important crop across the district, accounting for 94% of kharif and 74% of rabi cropped area. Although note that the total cultivated area in rabi is one-third of that in kharif. In kharif, paddy cultivation extends over almost the entire district, but in rabi, it is concentrated in the Gangetic delta region in the north-east where irrigation is more assured.

In kharif, a farmer on an average grows paddy in addition to one other crop. However, in rabi, farmers grow a mix of crops. These crops include mango, groundnut, chili, brinjal, and betel vine. Betel vine, which has been historically grown in Balasore, is grown in two northern blocks—Bhograi and Baliapal. Betel vine can only grow on sandy soil, and these coastal blocks provide the ideal conditions. It is grown mostly on holdings of less than half a hectare and is a source of cash for small holders. Green chili, brinjal, and other vegetables are grown in western blocks located further away from the sea, where salinity levels are low.

Mention must be made here of prawn cultivation, which has been on a steady rise in the district in the last decade. According to the District Fisheries Officer, land under prawn cultivation has been increasing by roughly 400 ha every year. Most of the production is geared for the international market. This makes prawn a highly volatile commodity, with possibilities of windfall gains in a good season. Several small farmers have made the shift from paddy to prawn cultivation to reap the benefits of such a possibility. From an agroecological point of view, prawn cultivation may have grave consequences for soil health in the long run as the breeding process requires saline water, which is artificially introduced into ponds constructed on agricultural land. This plot and areas around it then become unsuitable for cultivation of any other crop.

Balasore is prone to frequent cyclones and flooding, which has made diversification a major challenge. Most of the district comprises lowland areas, which are susceptible to floods. Thus, many farmers resort to growing only paddy in such areas.

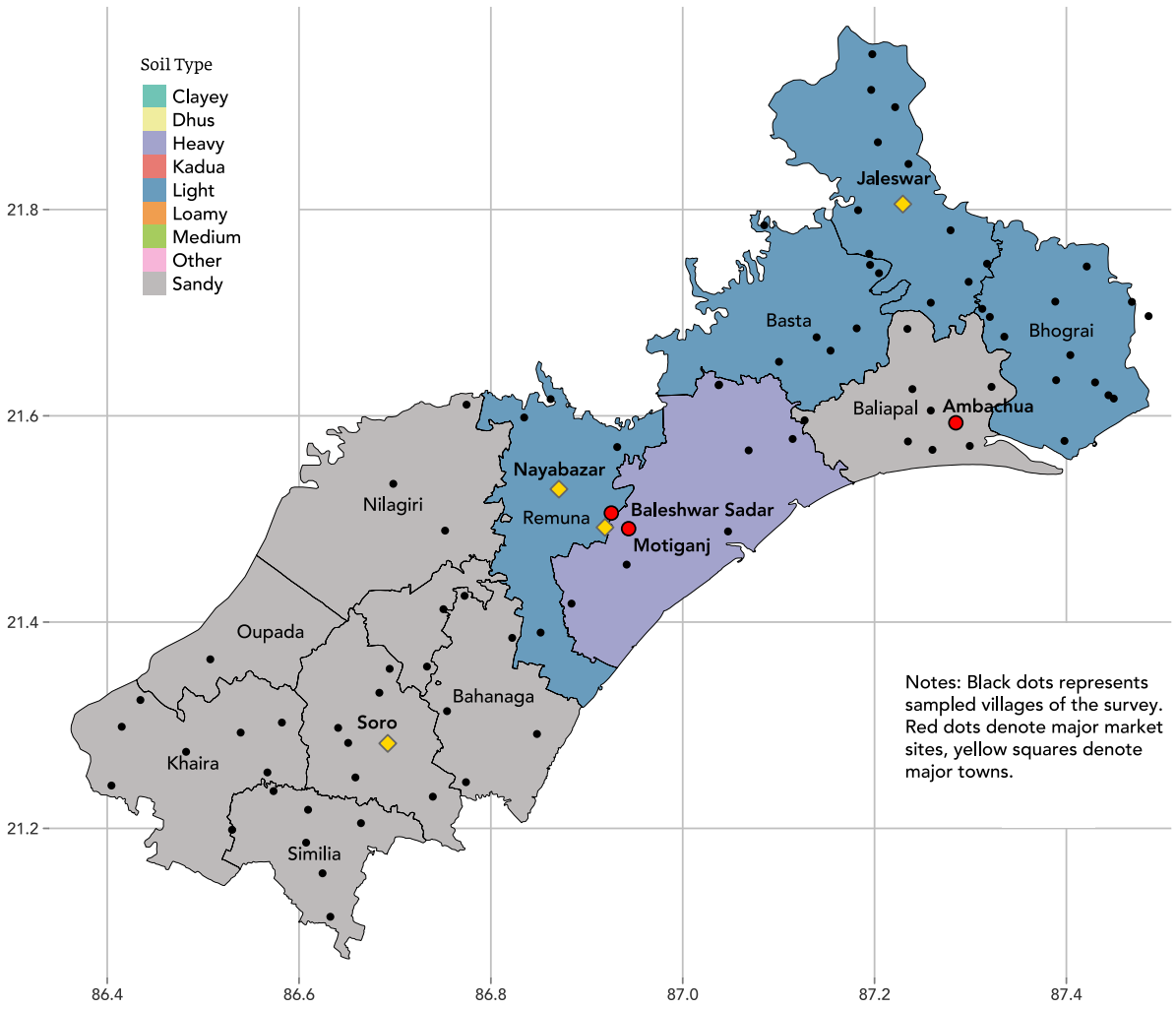


Figure 11.23 Soil map of Balasore

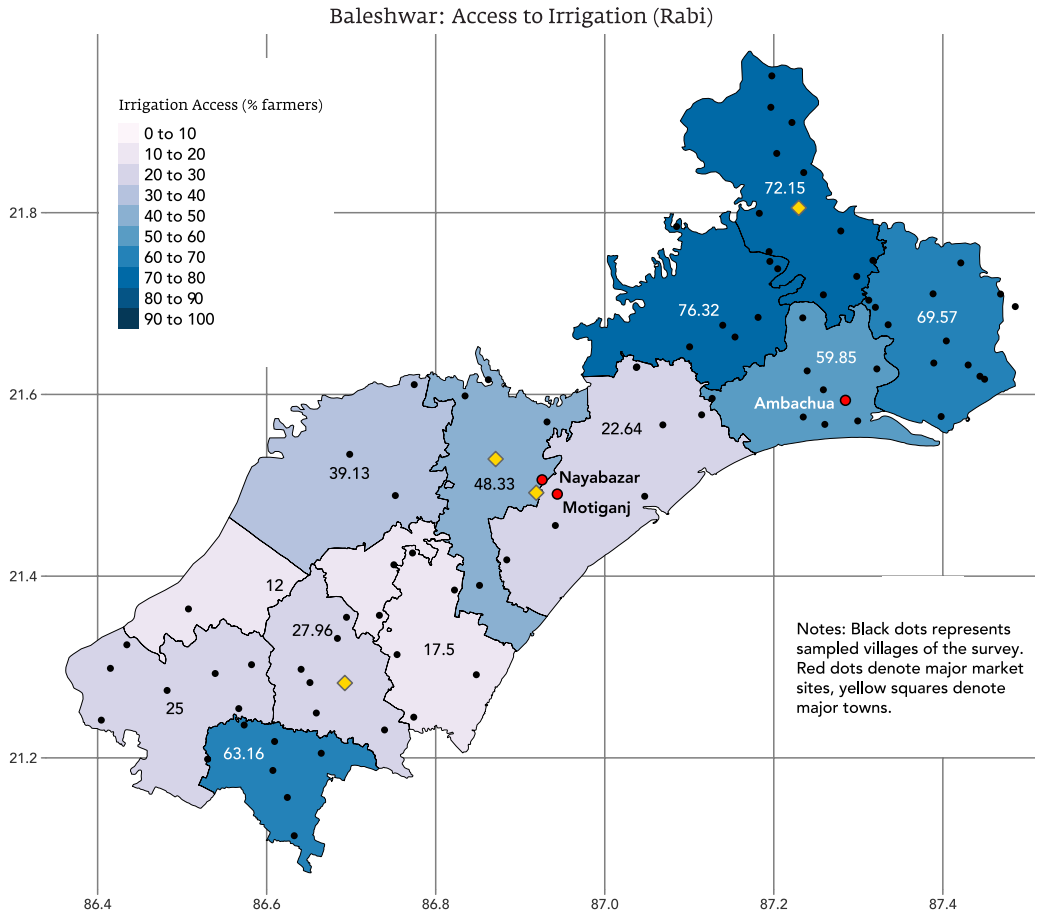


Figure 11.24 Access to irrigation in Balasore during kharif cropping season

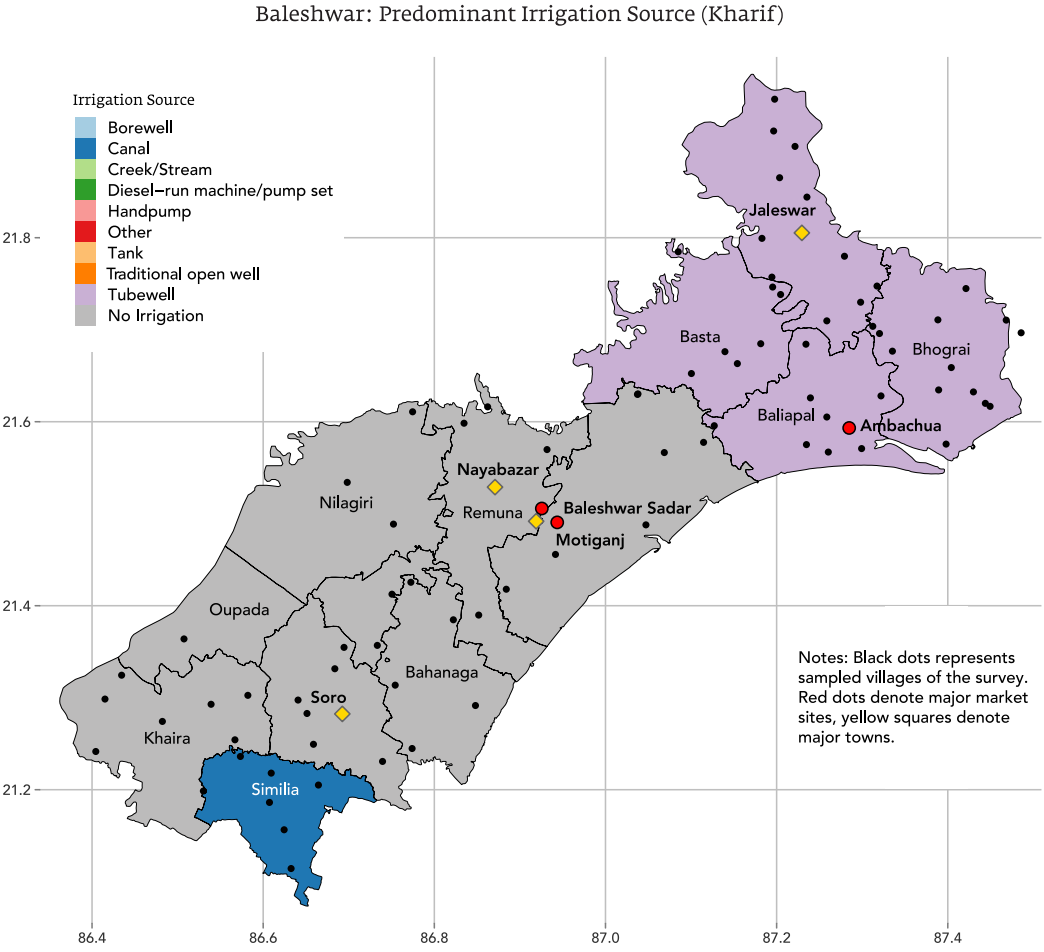


Figure 11.25 Block-wise distribution of the predominant source of irrigation in Balasore during kharif

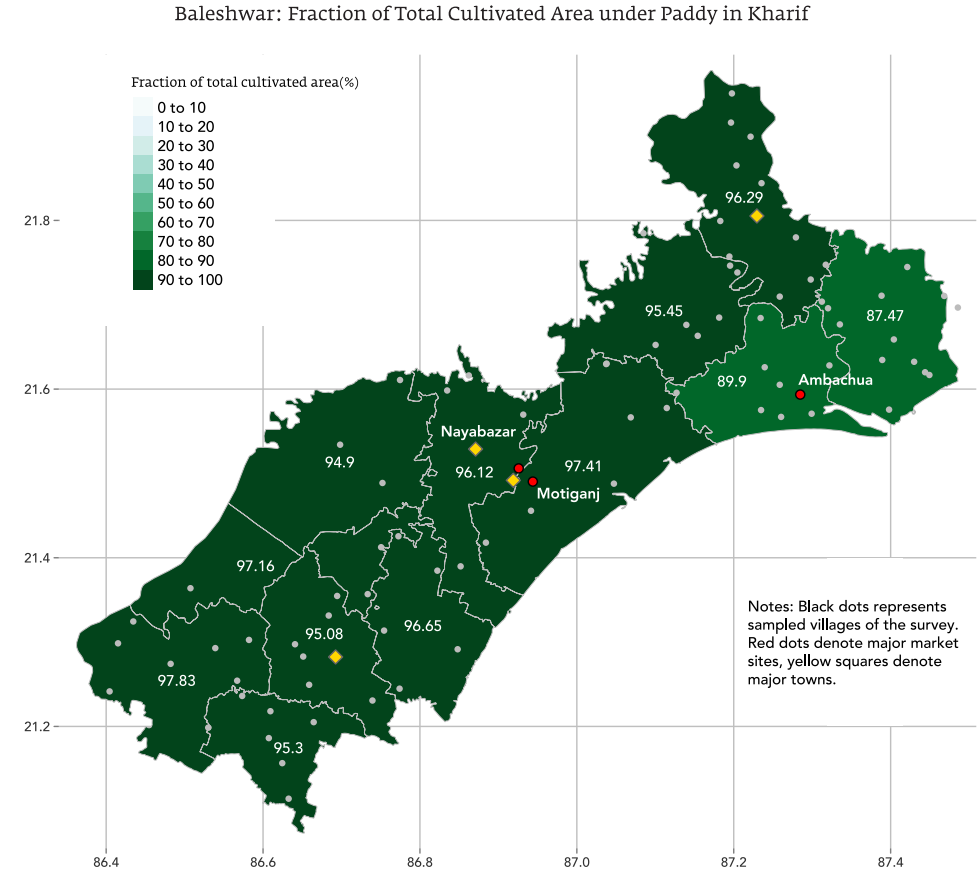


Figure 11.26 Distribution of paddy cultivation across Balasore blocks in kharif

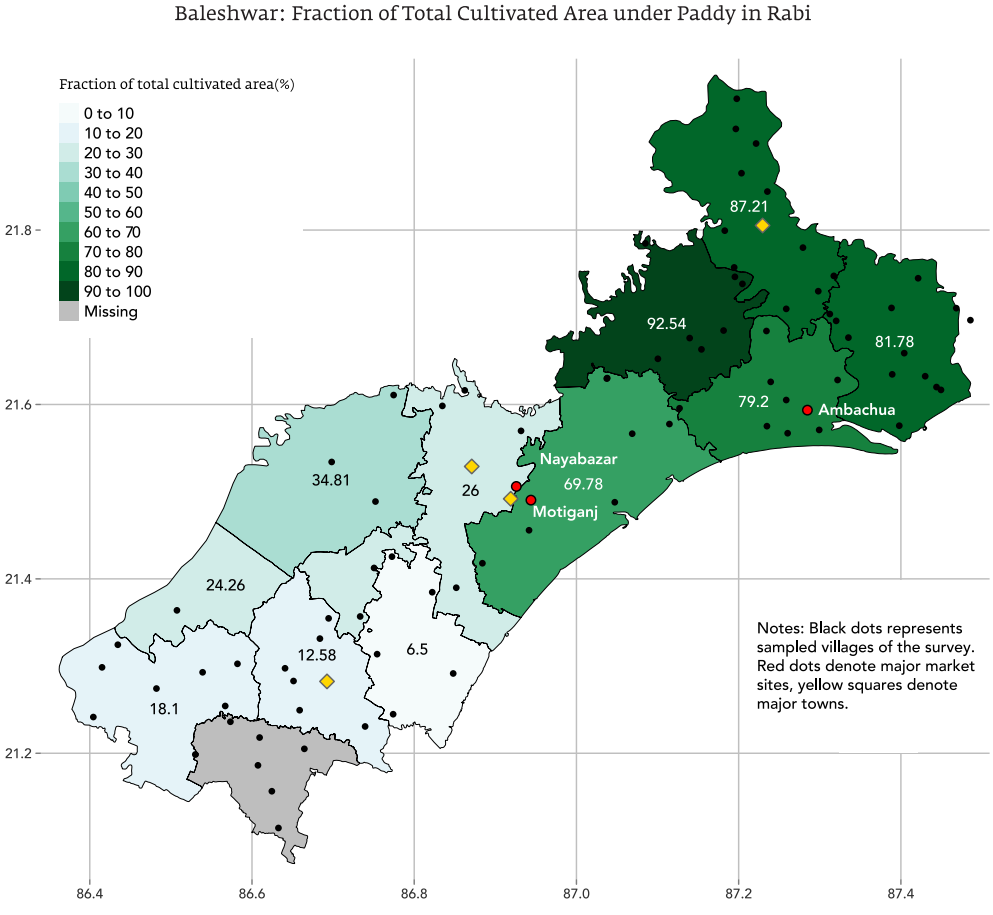


Figure 11.27 Distribution of paddy cultivation across Balasore blocks in rabi

11.2.3 Punjab: Hoshiarpur

Hoshiarpur is located between the Beas river in the north-west and the Satluj river in the south-east. Its fertile flood plains cover one-fourth of the district's total area. The rainfed Kandi belt falling in the Shivalik foothills covers half of the district, and the Bet region, characterized by undulating plains and sandy soil covers another part of the district. Farmers in the Kandi area tend to have smaller plots of land.

Paddy cultivation in kharif and wheat cultivation in rabi dominates the district. Historically, the district grew pulses, groundnut, sunflower, and mustard over large areas of land. However, the government's policy to procure paddy and wheat at MSP over the last five decades has led to a significant shift in the cropping patterns of the district. In dry and rainfed areas where paddy cultivation is not possible (like the Kandi region), farmers grow maize which has historically been a consumption crop but is now increasing in land area due to state policy (to promote diversification) and better prices in the mandi because of increasing demand for maize from various industries.

Despite the paddy–wheat dominance in Hoshiarpur, other crops play important and increasing roles in cropping diversity. Unlike many other study districts, in Hoshiarpur, it is in kharif that more area (56% of cultivated area) is given over to crops such as sugarcane, potato, peas, and maize. The rabi season, however, is dominated by cultivation of wheat which is also tuned to local dietary preferences.

The uphill plain areas of Garhshankar and Mahilpur have taken to vegetable cultivation after tube wells were made available. There is cultivation of peas and potato in the loamy soil of the flatter areas in the central and southern blocks along with groundnut and pulses in the drier parts of the district.

The paddy–wheat cropping pattern has had an adverse effect on the district's water table as well as soil quality as is the case with the rest of the state. The water table has reached 250–350 feet in many parts of the district, and farmers expect to be putting their submersible pumps 100 feet deeper in the next year or so. The continuous use of chemical fertilizers and pesticides has caused ecological damage to the soil.

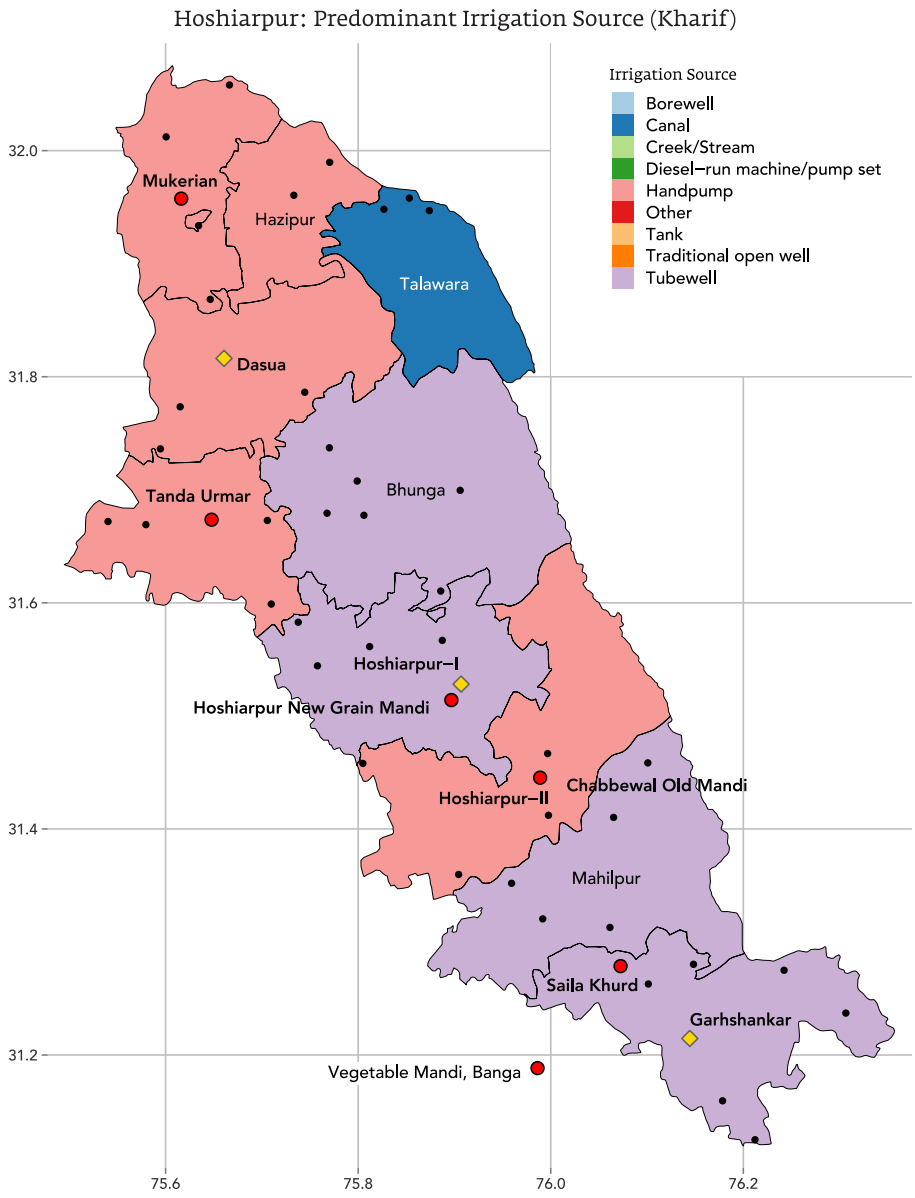


Figure 11.28 Block-wise distribution of the predominant source of irrigation in Hoshiarpur during kharif

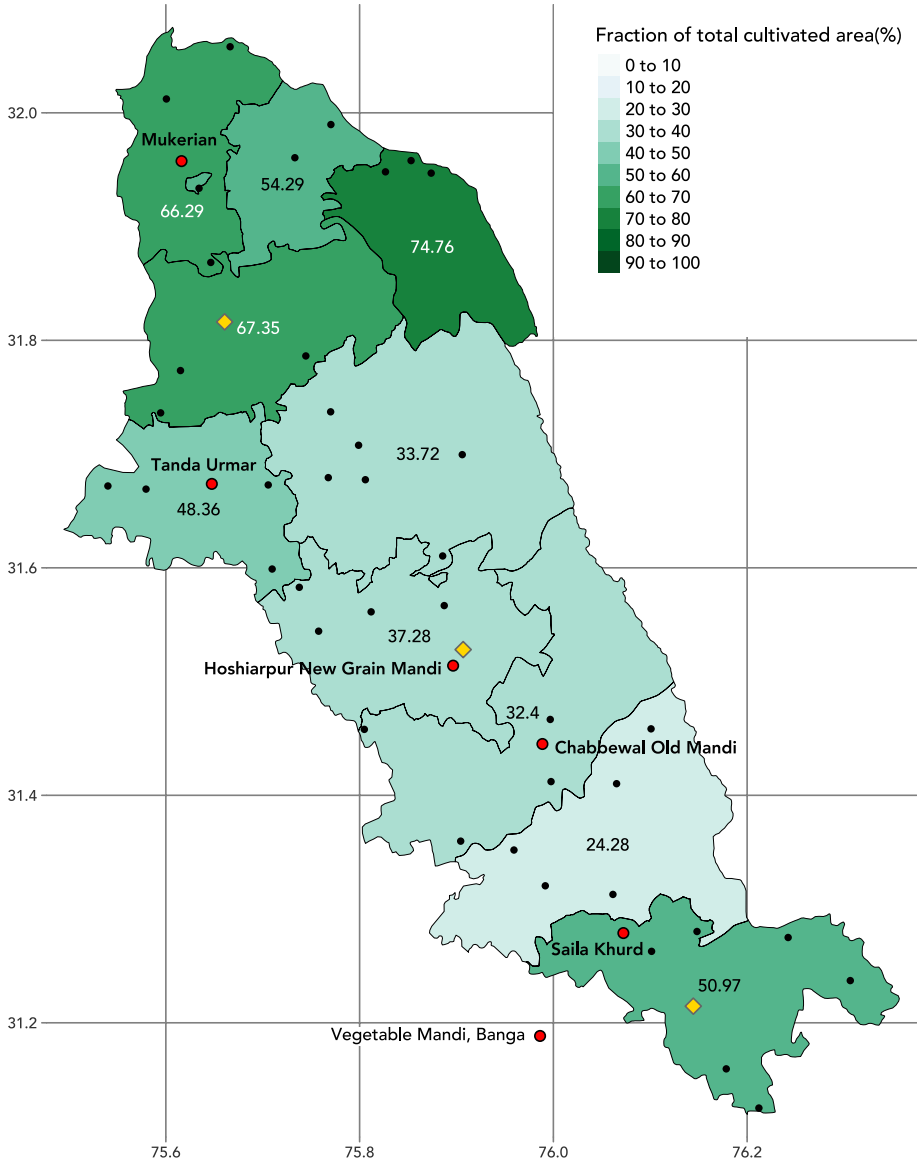


Figure 11.29 Distribution of paddy cultivation across Hoshiarpur blocks in kharif

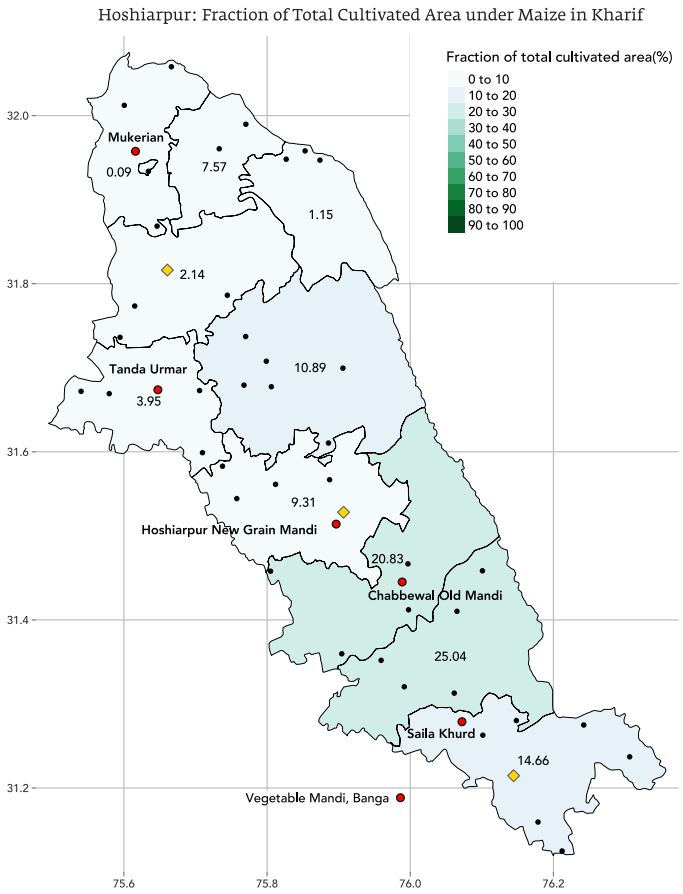


Figure 11.30 Distribution of maize cultivation across Hoshiarpur blocks in kharif

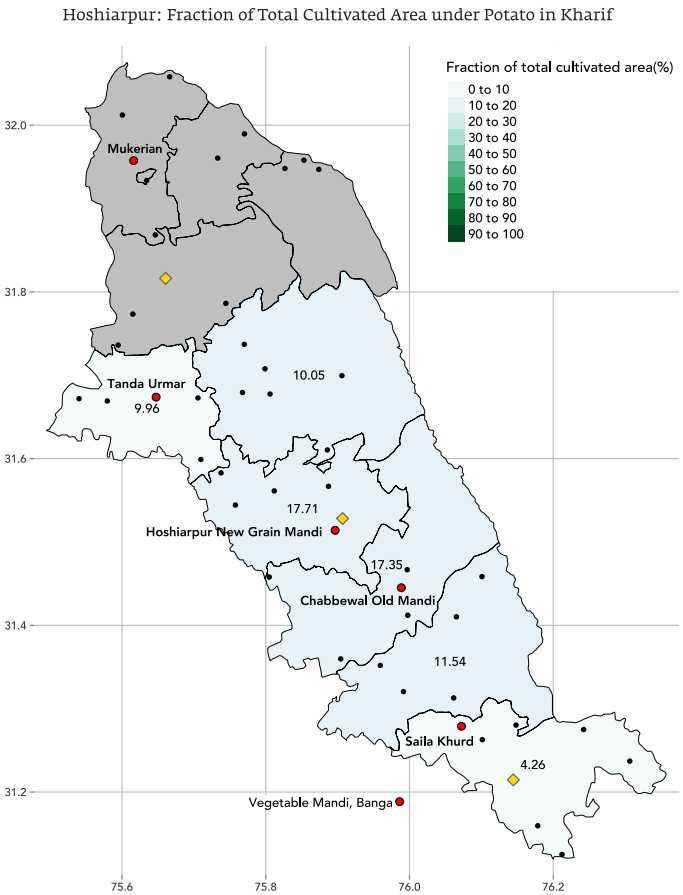


Figure 11.31 Distribution of potato cultivation across Hoshiarpur blocks in kharif

Note: Potato cultivation is concentrated in the central and southern blocks.

Production and Marketing Calendar -Jul18-Jun19

Bihar
Odisha
Punjab

Seasons — Monsoon · Autumn · Winter · Spring · Summer

Months	Nalanda	Purnea	Samastipur	Balasore	Koraput	Sambalpur	Hoshiarpur
July '18	Paddy Sowing	Vegetable Sowing, Harvesting & Marketing; Maize Marketing; Paddy Sowing	Vegetable Harvesting & Marketing; Paddy Sowing	Prawn Harvesting & Marketing; Paddy Sowing; Betel vine Sowing, Harvesting & Marketing	Paddy Sowing; Ginger Harvesting & Marketing; Cauliflower Sowing; Ragi Sowing; Cabbage Sowing	Paddy Sowing, Harvesting & Marketing; Dry Chili Marketing	Paddy Sowing; Maize Sowing, Harvesting & Marketing; Corn Cob Harvesting & Marketing; Cold Store Potato Marketing; Vegetable Harvesting & Marketing; Menthol Marketing
Aug '18	Paddy Sowing; Cauliflower Sowing	Banana Harvesting & Marketing; Paddy Sowing; Maize Marketing; Vegetable Harvesting & Marketing	Vegetable Harvesting & Marketing; Cauliflower Sowing; Elephant Yam Sowing	Prawn Culture; Paddy Sowing; Betel vine Harvesting & Marketing	Ginger Harvesting & Marketing; Tomato Sowing	Brinjal Sowing; Ladies Finger Harvesting & Marketing; Pointed Gourd Harvesting & Marketing; Long Beans Harvesting & Marketing; Dry Chili Marketing; Paddy Harvesting & Marketing	Potato Sowing; Corn cobs Marketing; Maize Harvesting & Marketing; Cold Store Potato Marketing
Sep'18	Cauliflower Harvesting & Marketing	Banana Harvesting & Marketing; Maize Marketing; Vegetable Harvesting & Marketing	Cauliflower Sowing,Harvesting & Marketing; Maize Harvesting & Marketing; Vegetable Sowing Harvesting & Marketing	Prawn Culture; Betel vine Harvesting & Marketing	Tomato Sowing; Cauliflower Sowing; Ginger Harvesting & Marketing; Niger Sowing; Cabbage Sowing, Harvesting & Marketing; Brinjal Sowing	Dry Chili Marketing; Brinjal Sowing; Ladies Finger Harvesting & Marketing; Chili Sowing	Potato Sowing; Green Peas Sowing; Corn Cob Marketing; Carrot Sowing; Maize Harvesting & Marketing; Cold Store Potato Marketing
Oct '18	Wheat Sowing; Potato Sowing; Paddy Harvesting & Marketing	Paddy Harvesting & Marketing; Banana Harvesting & Marketing; Wheat Sowing	Paddy Harvesting & Marketing; Cauliflower Sowing, Harvesting & Marketing; Vegetable Sowing, Harvesting & Marketing; Tobacco Sowing; Maize Sowing; Wheat Sowing; Potato Sowing	Prawn Culture; Betel vine Harvesting & Marketing; Green Chili Sowing	Cauliflower Harvesting & Marketing; Tomato Harvesting & Marketing; Brinjal Harvesting & Marketing; Paddy Harvesting; Ragi Harvesting; Ginger Harvesting & Marketing	Brinjal Harvesting & Marketing; Ladies Finger Harvesting & Marketing; Pointed Gourd Harvesting & Marketing; Chili Sowing	Paddy Harvesting & Marketing; Green Peas Sowing; Sugarcane Harvesting & Marketing; Maize Marketing; Cold Store Potato Marketing
Nov'18	Wheat Sowing; Paddy Harvesting & Marketing	Paddy Harvesting & Marketing; Banana Harvesting & Marketing; Wheat Sowing	Wheat Sowing; Paddy Harvesting & Marketing; Cauliflower Harvesting & Marketing; Maize Sowing; Potato Sowing; Vegetable Sowing, Harvesting & Marketing	Paddy Harvesting & Marketing; Prawn Harvesting & Marketing; Betel vine Harvesting & Marketing; Green Chili Sowing; Cauliflower Sowing	Paddy Harvesting & Marketing; Cabbage Harvesting & Marketing; Cauliflower Harvesting & Marketing; Ragi Harvesting & Marketing; Ginger Harvesting; Tomato Harvesting & Marketing	Paddy Harvesting & Marketing; Tomato Sowing; Cauliflower Sowing	Paddy Harvesting & Marketing; Sugarcane Harvesting & Marketing; Green Peas Harvesting & Marketing; Maize Marketing; Carrot Harvesting & Marketing; Potato Sowing, Harvesting & Marketing
Dec '18	Wheat Sowing; Paddy Marketing; Potato Harvesting & Marketing	Paddy Marketing; Maize Sowing; Wheat Sowing	Cauliflower Harvesting & Marketing; Vegetable Harvesting & Marketing; Paddy Harvesting & Marketing; Elephant Yam Harvesting &Marketing; Wheat Sowing; Maize Sowing	Paddy Sowing, Harvesting & Marketing; Betel vine Harvesting & Marketing; Green Chili Sowing; Cauliflower Sowing	Paddy Harvesting & Marketing; Cabbage Harvesting & Marketing; Cauliflower Harvesting & Marketing; Tomato Harvesting & Marketing; Ragi Harvesting & Marketing; Ginger Harvesting & Marketing	Brinjal Harvesting & Marketing; Paddy Harvesting & Marketing; Tomato Harvesting & Marketing	Wheat Sowing; Green Peas Harvesting & Marketing; Potato Sowing, Harvesting & Marketing; Maize Sowing & Marketing; Sugarcane Harvesting & Marketing
Jan '19	Paddy Marketing; Potato Harvesting & Marketing	Maize Sowing	Cauliflower Harvesting & Marketing; Vegetable Harvesting & Marketing; Elephant Yam Harvesting & Marketing	Paddy Sowing & Marketing; Betel vine Harvesting & Marketing; Cauliflower Harvesting & Marketing; Green Chili Harvesting & Marketing	Niger Harvesting; Paddy Sowing; Cabbage Harvesting & Marketing; Cauliflower Harvesting & Marketing; Ginger Harvesting & Marketing	Paddy Sowing; Tomato Harvesting & Marketing; Cauliflower Harvesting & Marketing	Potato Sowing, Harvesting & Marketing; Maize Sowing; Green Peas Harvesting & Marketing; Menthol Sowing; Sugarcane Sowing, Harvesting & Marketing
Feb'19	Potato Harvesting & Marketing; Onion Sowing	Banana Harvesting & Marketing	Tobacco Harvesting & Marketing; Potato Harvesting & Marketing; Elephant Yam Harvesting & Marketing; Turmeric Harvesting & Marketing; Vegetable Sowing, Harvesting & Marketing; Maize Sowing	Paddy Marketing; Cauliflower Harvesting & Marketing; Betel vine Harvesting & Marketing; Green Chili Harvesting & Marketing	Paddy Sowing; Tomato Sowing; Cabbage Sowing; Cauliflower Sowing; Brinjal Sowing	Paddy Sowing; Tomato Harvesting & Marketing; Dry Chili Harvesting	Potato Sowing, Harvesting & Marketing; Vegetable Sowing; Sugarcane Sowing,Harvesting & Marketing; Maize Sowing
Mar '19	Wheat Harvesting & Marketing; Potato Harvesting & Marketing	Maize Harvesting & Marketing; Banana Sowing, Harvesting & Marketing; Wheat Harvesting & Marketing	Turmeric Sowing; Maize Sowing; Moong Dal Sowing; Wheat Harvesting & Marketing; Elephant Yam Sowing	Paddy Marketing; Betel vine Harvesting & Marketing; Prawn Culture; Green Chili Harvesting & Marketing; Cauliflower Harvesting & Marketing	Cauliflower Harvesting & Marketing; Cabbage Harvesting & Marketing; Turmeric Harvesting & Marketing; Brinjal Sowing, Harvesting & Marketing; Tomato Harvesting & Marketing	Dry Chili Harvesting & Marketing; Tomato Harvesting & Marketing; Paddy Sowing	Potato Sowing, Harvesting & Marketing; Maize Sowing; Corn Cob Sowing; Sugarcane Sowing,Harvesting, & Marketing; Vegetable Harvesting & Marketing
Apr '19	Wheat Harvesting & Marketing; Onion Harvesting	Maize Harvesting & Marketing; Wheat Harvesting & Marketing; Banana Harvesting & Marketing	Moong Dal Harvesting & Marketing; Vegetable Harvesting & Marketing; Wheat Harvesting & Marketing	Paddy Harvesting & Marketing; Betel vine Harvesting & Marketing; Prawn Culture	Brinjal Sowing, Harvesting & Marketing; Ginger Sowing	Dry Chili Marketing	Wheat Harvesting & Marketing; Potato Harvesting & Marketing; Sugarcane Harvesting & Marketing; Vegetable Sowing, Harvesting & Marketing; Maize Sowing; Corn Cob Sowing
May'19	Onion Harvesting & Marketing	Maize Harvesting & Marketing; Banana Harvesting & Marketing	Moong Dal Marketing; Vegetable Harvesting & Marketing; Maize Harvesting & Marketing	Paddy Harvesting & Marketing; Betel vine Harvesting & Marketing; Prawn Culture	Paddy Harvesting & Marketing; Brinjal Sowing, Harvesting & Marketing; Ginger Sowing; Turmeric Sowing	Paddy Harvesting & Marketing; Dry Chili Marketing	Wheat Harvesting & Marketing; Maize Sowing; Potato Harvesting & Marketing; Sugarcane Harvesting & Marketing; Vegetable Sowing; Vegetable Harvesting & Marketing
June '19	Paddy Sowing; Onion Harvesting & Marketing	Maize Marketing; Vegetable Sowing	Vegetable Sowing,Harvesting & Marketing; Paddy Sowing; Maize Sowing, Harvesting & Marketing	Betel vine Harvesting & Marketing; Prawn Harvesting & Marketing	Paddy Sowing, Harvesting & Marketing; Ginger Sowing; Turmeric Sowing; Brinjal Harvesting & Marketing	Paddy Harvesting & Marketing; Brinjal Sowing; Ladies Finger Sowing; Long Beans Sowing; Dry Chili Marketing; Pointed Gourd Sowing	Paddy Sowing; Maize Sowing & Marketing; Menthol Harvesting & Marketing; Cold Store Potato Marketing; Potato Harvesting & Marketing; Vegetable Harvesting & Marketing; Corn Cob Harvesting & Marketing

Chapter Twelve

Costs of Production

In this chapter we describe and discuss the costs of various inputs used in agricultural production.

12.1 Fertilizers, Herbicides, and Pesticides

The use of chemical inputs, i.e., fertilizers, herbicides, and pesticides, is shown in tables 12.1–12.4. Table 12.1 shows that, on an average, smaller farmers are more input intensive—spending more per hectare of cultivated area. Tables 12.2–12.4 show that this is indeed due to using more fertilizer per hectare.

Tables 12.5a and 12.5b show that prices of urea are marginally higher in the ***rabi*** season on an average compared to the ***kharif*** season. However, farmers with different scales of operations are paying similar prices for chemical fertilizers within a season in a district.

Koraput is an exception where fertilizer usage is the lowest. This is because farmers in Koraput still largely rely on indigenous methods of cultivation.

Bihar presents a paradox. According to official data, it has relatively high fertilizer consumption—higher than the national average—and yet has low yields.[30] In 2016–17, while the average per hectare consumption of fertilizer across India was 123 kg/ha, it was more than 50% higher in Bihar (198 kg/ha) and almost double in Punjab (232 kg/ha). In Odisha, however, it was less than half the all-India average (57 kg/ha).[31]

One explanation might be that high urea subsidies in India made it profitable to smuggle the commodity into Nepal, and given the open and porous borders between Bihar and Nepal, this is quite plausible. The shift in the structure of the subsidy—from producers to farmers in the form of a direct benefit transfer (DBT)—might lead to more realistic data on actual fertilizer consumption in Bihar.

Input markets in Bihar are flooded with private players,[32] who offer credit as well as extension services to farmers, and are seen by some as one of the driving forces behind the greater intensity of input usage in the state. Although Bihar is below the national average in the disbursement of agricultural credit from institutional sources, there is increasing investment in inputs from private sources. Nonetheless, there is still a yield gap in two of Bihar's principal crops—paddy and wheat.[33]

In Odisha, both fertilizer usage and productivity are much lower than national averages.

Table 12.1 District-wise total expenditure on fertilizers (urea, DAP, MOP), compost, pesticide, and herbicide by size of land cultivated (in Rs/ha)

	Kharif		Rabi	
Districts	Marginal and Small (0-1 ha)	Medium and Large (1+ ha)	Marginal and Small (0-1 ha)	Medium and Large (1+ ha)
Nalanda	8338.72	5,971.43	6,243.27	6,084.58
Purnea	5,966.43	3,932.15	13,055.48	10,851.33
Samastipur	11,149.04	7,839.91	11,815.43	9,313.659
Balasore	8,651.65	6,208.68	15,269.23	11,510.46
Koraput	3,777.78	2,195.77	5,869.99	6,033.94
Sambalpur	6,322.73	6,164.91	10,303.89	9,934.50
Hoshiarpur	11,024.53	10,207.96	8,829.75	8,244.35

[30] Avinash Kishore, Bharat Sharma, and P.K. Joshi (2014), "Putting Agriculture on the Take-Off Trajectory: Nurturing the Seeds of Growth in Bihar, India," International Food Policy Research Institute and International Water Management Institute; Anwarul Hoda, Pallavi Rajkhowa, and Ashok Gulati (2017), "Unleashing Bihar's Agriculture Potential: Sources and Drivers of Agriculture Growth," ICRIER Working Paper 336.

[31] Reserve Bank of India (RBI) (2019), "State-wise per Hectare Consumption of Fertiliser (N+P+K)." Available at https://m.rbi.org.in/Scripts/PublicationsView.aspx?id=18877

[32] See Harish Damodaran in the Indian Express on the significant share held by MNCs in the maize seed market in Bihar: https://indianexpress.com/article/india/india-others/bihar-an-unlikely-corn-revolution/

[33] Ashok Gulati (2017), "Unleashing Bihar's Agriculture Potential: Sources and Drivers of Agriculture Growth," ICRIER Working Paper 336

Table 12.2 District-wise quantity of urea used per hectare by land cultivated (in kg/ha)

	Kharif		Rabi	
Districts	Marginal and Small (0-1 ha)	Medium and Large (1+ ha)	Marginal and Small (0-1 ha)	Medium and Large (1+ ha)
Nalanda	339.35	247.10	222.39	189.27
Purnea	222.76	137.29	292.62	238.28
Samastipur	220.60	144.77	234.71	185.32
Balasore	123.55	81.58	123.55	123.55
Koraput	110.31	41.18	74.13	92.66
Sambalpur	123.55	98.84	98.52	119.18
Hoshiarpur	247.10	247.10	222.39	222.39

Table 12.3 District-wise quantity of DAP used per hectare by land cultivated (in kg/ha)

	Kharif		Rabi	
Districts	Marginal and Small (0-1 ha)	Medium and Large (1+ ha)	Marginal and Small (0-1 ha)	Medium and Large (1+ ha)
Nalanda	136.2	93.1	101.1	87.1
Purnea	103.0	51.2	205.9	168.4
Samastipur	129.4	79.5	162.2	135.9
Balasore	123.6	98.8	154.4	175.1
Koraput	61.8	39.2	61.8	82.4
Sambalpur	123.6	98.8	112.3	123.6
Hoshiarpur	123.6	114.0	123.6	123.6

Table 12.4 District-wise quantity of MOP used per hectare by land cultivated (in kg/ha)

	Kharif		Rabi	
Districts	Marginal and Small (0-1 ha)	Medium and Large (1+ ha)	Marginal and Small (0-1 ha)	Medium and Large (1+ ha)
Nalanda	0.0	22.2	0.0	0.0
Purnea	0.0	33.2	102.4	76.5
Samastipur	89.2	46.2	80.8	64.0
Balasore	83.5	49.4	70.2	66.8
Koraput	0.0	17.7	0.0	41.2
Sambalpur	53.5	41.2	35.3	69.6
Hoshiarpur	0.0	0.0	0.0	0.0

Table 12.5a District-wise price of urea, DAP, MOP in kharif by size of land cultivated (in Rs/kg)

	Marginal and Small (0-1 ha)			Medium and large (1+ha)		
Districts	Urea price	DAP price	MOP price	Urea price	DAP	DAP
Nalanda	7.0	28.0	14.3	7.0	28.0	16.0
Purnea	7.0	28.0	18.0	7.0	28.0	18.0
Samastipur	7.0	28.0	18.0	7.0	28.0	18.0
Balasore	7.0	26.0	18.0	7.0	26.0	17.0
Koraput	7.0	26.0	18.0	7.0	26.0	18.0
Sambalpur	7.0	25.1	18.0	7.0	25.1	17.0
Hoshiarpur	6.0	26.0	15.0	6.0	26.0	15.0

Table 12.5b District-wise price of key fertilizers in rabi by size of land cultivated (in Rs/kg)

	Marginal and Small (0-1 ha)			Medium and large (1+ha)		
Districts	Urea price	DAP price	MOP price	Urea price	DAP	DAP
Nalanda	7.8	29.0	20.0	7.3	29.0	18.0
Purnea	7.8	28.0	18.0	7.8	28.0	18.0
Samastipur	7.8	28.0	18.0	7.8	28.0	18.0
Balasore	8.0	29.4	20.0	6.8	27.0	18.0
Koraput	8.0	28.0	20.0	7.0	28.0	19.0
Sambalpur	8.0	28.0	20.0	6.4	28.0	18.0
Hoshiarpur	6.0	28.0	18.0	6.0	28.0	18.0

12.2 Irrigation

In addition to the low use of fertilizers, Odisha's farmers also have limited access to irrigation (tables 12.6a and 12.6b). Reported figures show an increase in irrigation during the rabi season in Odisha because of selection. However, this is a statistical artefact since in the absence of rain only those farmers who have adequate access to water are able to cultivate their land. Hence average rates of irrigation among cultivating farms increase, even as we know from Chapter 12 that in the sampled districts the average cultivated area in rabi is 25–40% of the cultivated area in kharif.

On the other hand, Bihar and Hoshiarpur have almost universal access to irrigation in both seasons. In all three states, there is marginal difference in the access to irrigation between farmers of different sizes.

In Bihar, farmers mostly rely on private sources of irrigation or seasonal rented sources (especially tube wells). Public sources of irrigation are almost completely absent in Bihar. They are much more important in Odisha, accounting for almost all the irrigation in Sambalpur and the dominant source in Koraput (albeit on a small base).

In Sambalpur, the small fraction of farmers who are fortunate to live within the canal system of the Hirakud Dam are the ones who get access to irrigation. They basically get free water unlike the majority of farmers in the district who do not have access to any irrigation facilities. More than 75% of farmers across size categories have reported that they did not have a source of irrigation for their kharif crop. Figure 12.1 clearly illustrates the significant spatial inequalities in access to publicly subsidized irrigation water.

In the Hoshiarpur district of Punjab, farmers have to rely on deep tube wells due to the rapidly declining water table. This means that farmers incur some costs on power sources for pumping water. After the end of diesel subsidies (in October 2014), farmers switched to electric pump sets as electricity is heavily subsidized, imposing a large fiscal burden on the state.[34]

Figure 12.2 illustrates irrigation sources in Purnea district. Except for a small corner in the south-east, tube wells overwhelmingly dominate as the principal source of irrigation. This is also the case with Nalanda and Samastipur.

The limited and erratic availability of electricity in many parts of rural Bihar have led farmers to use diesel pump sets and hence spend on diesel. The ethnographic research in Bihar underscores this. Extensive rural electrification in recent years and separation of feeders for agricultural use are likely to lead farmers to shift from diesel to electricity, lowering costs by at least one-third (based on cost estimates made by farmers we interviewed). Farmers foresee lower irrigation costs heralding a move to high-value crops, especially vegetables on a larger scale. However, as of now, farmers continue to use diesel sets at very high operating costs.[35]

The observations from the sources of irrigation in Bihar indicate that there is a window of opportunity to provide farmers with solar-operated pump sets. These are more cost-effective in the case of shallow tube wells (which given Bihar's high water table are the most prevalent) and will sharply reduce power subsidies from a beleaguered state budget. It can also provide O&M opportunities for local entrepreneurs.

Access to irrigation in Odisha is substantially less compared to Bihar. The ethnographic research on rental markets for irrigation found that in Balasore, farmers who have access to a water source (e.g., a deep tube well), supply water to around 20–30 farmers in their villages. For example, a large farmer in Baliapal block reported charging Rs 3,500 per acre for providing water for irrigation in one season. Farmers in the area use this water for groundnut cultivation in the rabi season. In Koraput, dominant communities in villages tend to have primary access to sources of irrigation. In villages where Scheduled Castes (SCs) are a majority, they own land closest to the Kolab canal. In this case, farmers from other communities rely on sharecropping to cultivate land that is irrigated.

[34] Power subsidies for agriculture in Punjab in 2019–20 were nearly Rs 9,000 crore.

[35] The price of diesel increased by 670% between 1990 and 2006, while the farmgate price of paddy by only 60%. See Kishore et al. (2014), "Putting Agriculture on the Take-Off Trajectory."

Table 12.6a District-wise irrigation level in kharif by land cultivated (% of all farmers)

Size	Marginal and Small (0-1 ha)				Medium and large (1+ha)			
Districts	Fully irrigated	Mostly irrigated	Somewhat irrigated	Not irrigated	Fully irrigated	Mostly irrigated	Somewhat irrigated	Not irrigated
Nalanda	70%	24%	24%	2%	74%	19%	4%	3%
Purnea	89%	10%	10%	0%	88%	11%	0%	0%
Samastipur	88%	8%	8%	3%	93%	5%	1%	1%
Balasore	29%	18%	18%	51%	30%	20%	3%	47%
Koraput	9%	7%	7%	69%	14%	10%	23%	54%
Sambalpur	13%	6%	6%	75%	17%	7%	5%	71%
Hoshiarpur	75%	22%	22%	1%	92%	7%	0%	0%

Table 12.6b District-wise irrigation level in rabi by land cultivated (% of all farmers)

Size	Marginal and Small (0-1 ha)				Medium and large (1+ha)			
Districts	Fully irrigated	Mostly irrigated	Somewhat irrigated	Not irrigated	Fully irrigated	Mostly irrigated	Somewhat irrigated	Not irrigated
Nalanda	98%	1%	1%	0%	99%	1%	0%	0%
Purnea	100%	0%	0%	0%	100%	0%	0%	0%
Samastipur	97%	2%	1%	0%	95%	2%	3%	0%
Balasore	72%	24%	0%	4%	80%	19%	0%	1%
Koraput	44%	42%	6%	8%	77%	15%	0%	8%
Sambalpur	67%	12%	1%	20%	85%	6%	2%	8%
Hoshiarpur	92%	4%	0%	4%	95%	2%	1%	2%

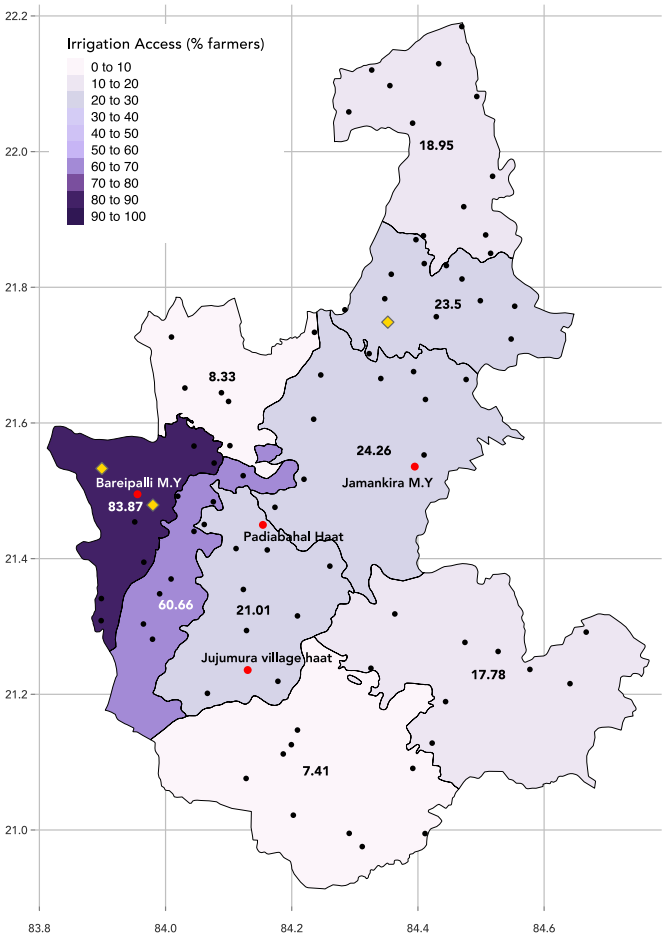
Table 12.7a District-wise irrigation source owner in kharif by land cultivated

Size	Marginal and Small (0-1 ha)						Medium and large (1+ha)					
Districts	Govt.	Own Source	Private	Rented	Part self-owned part rented	Other	Govt.	Own Source	Private	Rented	Part self-owned part rented	Other
Nalanda	5%	1%	13%	80%	3%	0%	10%	3%	40%	55%	7%	0%
Purnea	3%	22%	15%	60%	3%	0%	2%	14%	45%	44%	3%	0%
Samastipur	0%	1%	10%	88%	2%	0%	2%	4%	39%	66%	7%	0%
Balasore	14%	2%	7%	30%	0%	0%	21%	2%	9%	24%	0%	0%
Koraput	14%	8%	7%	0%	2%	0%	23%	6%	16%	1%	3%	0%
Sambalpur	23%	1%	0%	0%	0%	0%	28%	0%	1%	0%	0%	0%
Hoshiarpur	34%	19%	34%	18%	3%	0%	17%	14%	66%	24%	4%	0%

Table 12.7b District-wise irrigation source owner in rabi by land cultivated

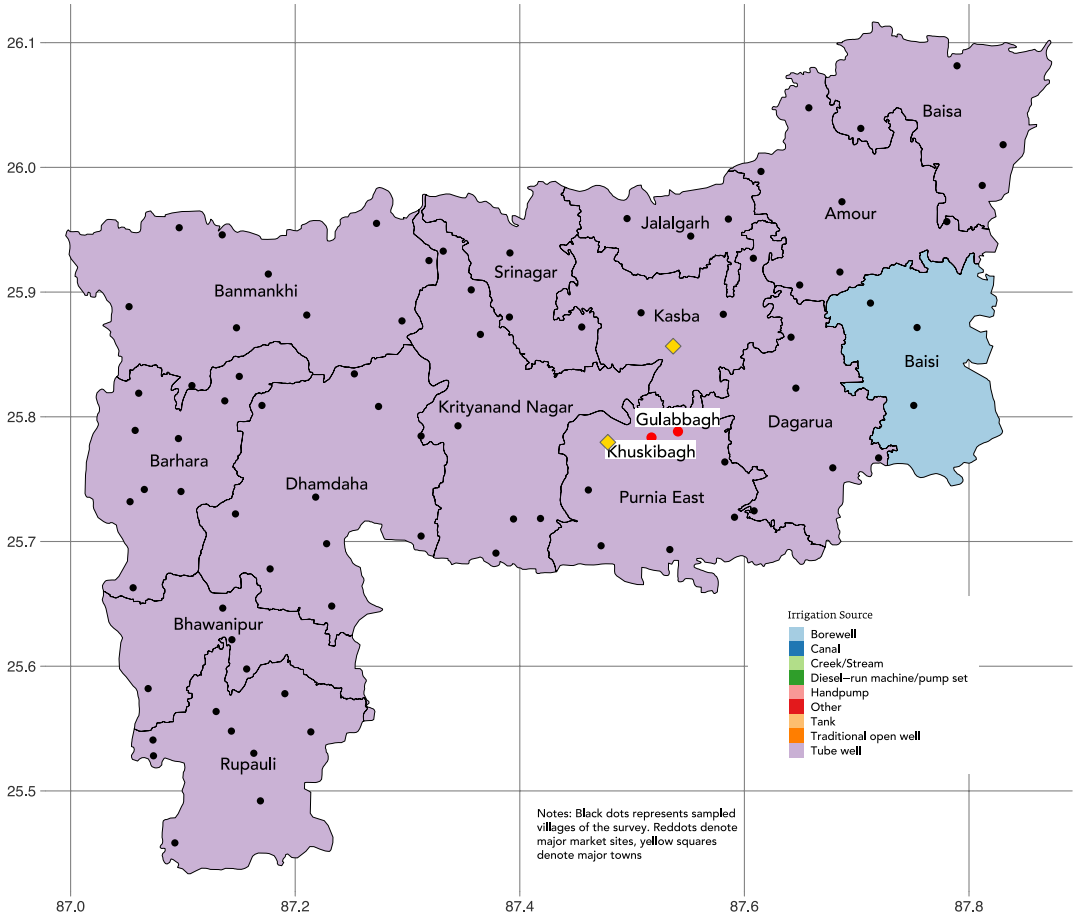
Size	Marginal and Small (0-1 ha)							Medium and large (1+ha)						
Districts	Govt.	Own Source	Private	Rented	Part self-owned part rented	Other	Natural Source	Govt.	Own Source	Private	Rented	Part self-owned part rented	Other	Natural Source
Nalanda	0%	0%	11%	91%	2%	0%	0%	1%	1%	41%	71%	10%	0%	0%
Purnea	1%	7%	21%	57%	18%	0%	0%	1%	4%	50%	41%	16%	1%	0%
Samastipur	1%	1%	17%	86%	1%	0%	0%	1%	0%	48%	58%	2%	0%	0%
Balasore	12%	4%	5%	77%	2%	0%	0%	19%	5%	16%	65%	6%	0%	0%
Koraput	47%	6%	19%	0%	1%	0%	19%	72%	0%	15%	0%	0%	0%	5%
Sambalpur	55%	7%	17%	3%	0%	0%	0%	83%	0%	10%	2%	0%	0%	0%
Hoshiarpur	22%	2%	53%	17%	2%	0%	0%	12%	0%	81%	8%	1%	1%	0%

Sambalpur: Access to Irrigation (Kharif)



Notes: Black dots represents sampled villages of the survey. Red dots denote major market sites, yellow squares denote major towns

Purnea: Trade Margins in Maize



In Bihar, most small farmers rent irrigation sources and thus incur no costs on diesel or electricity. Nalanda district has seen considerable improvements in electricity coverage, and small famers do use electric pump sets, while medium and large farmers still rely heavily on diesel pump sets.

In Odisha, since most farmers get water from government sources, they do not incur any expenditure. In Punjab, the fact that farmers do not incur any cost on electricity for irrigation in Hoshiarpur is due to heavily subsidized electricity costs.[36] However, there are areas in the district, especially uphill areas and the Kandi region, where accessing irrigation is difficult and farmers have to rely on rental markets to irrigate their crops. Additionally, in areas where electricity supply is erratic, farmers have to depend on diesel to operate their pump sets.

Table 12.8 District-wise expenditure on diesel by size of land cultivated (in Rs/ha)

	Kharif		Rabi	
District	Marginal and Small (0-1 ha)	Medium and large (1+ ha)	Marginal and small (0-1 ha)	Medium and large (1+ ha)
Nalanda	0.0	551.4	0.0	930.3
Purnea	0.0	738.3	0.0	1794.3
Samastipur	0.0	814.6	0.0	1773.6
Balasore	0.0	0.0	0.0	0.0
Koraput	0.0	0.0	0.0	0.0
Sambalpur	0.0	0.0	0.0	0.0
Hoshiarpur	0.0	3436.8	0.0	3261.8

Table 12.9 District-wise expenditure on electricity by size of land cultivated (in Rs/ha)

	Kharif		Rabi	
District	Marginal and Small (0-1 ha)	Medium and large (1+ ha)	Marginal and small (0-1 ha)	Medium and large (1+ ha)
Nalanda	780.7	379.2	0.0	383.4
Purnea	0.0	0.0	0.0	0
Samastipur	0.0	0.0	0.0	0
Balasore	0.0	0.0	0.0	2594.9
Koraput	0.0	0.0	0.0	0.0
Sambalpur	0.0	0.0	0.0	0.0
Hoshiarpur	0.0	0.0	0.0	0.0

Table 12.10 District-wise expenditure on other irrigation source by size of land cultivated (in Rs /ha)

	Kharif		Rabi	
District	Marginal and Small (0-1 ha)	Medium and large (1+ ha)	Marginal and small (0-1 ha)	Medium and large (1+ ha)
Nalanda	0	0.0	0.0	0.0
Purnea	1235.5	0.0	4093.3	0.0
Samastipur	3749.2	0.0	5436.3	1199.2
Balasore	0.0	0.0	0.0	0.0
Koraput	0.0	0.0	0.0	0.0
Sambalpur	0.0	0.0	0.0	0.0
Hoshiarpur	0.0	0.0	0.0	0.0

[36] The power subsidies for agriculture in Punjab's 2019-20 budget was Rs 8,969 crore.

12.3 Seeds

Farmers across the surveyed districts reported that they purchased seeds from their local input dealer, who would usually have a shop in the village or in the nearest block-level town. These dealers play a major role in distributing seeds in Bihar and Hoshiarpur as compared to Odisha. In Odisha, famers largely keep a part of their last harvest to be used as seeds. It is important to note that the input dealers are also often the source of farming knowledge for the famers. Few farmers purchased seeds from cooperatives, and also distrusted the quality of seeds distributed by cooperatives and agricultural universities. This was true in Hoshiarpur as well.

One crop with distinctive seed practices is potato. In Nalanda, many farmers store a part of their produce in cold storages for use as seeds the next year. In Hoshiarpur, it is common for farmers to purchase seeds from the larger farmers of Jalandhar who cultivate their own seed potato and store it in self-owned cold store chains. Some of the larger potato farmers within Hoshiarpur (10 acres and more) also retain their seed from the rabi harvest of potato. They store in cold stores in the month of April and withdraw it between September and November for the kharif season.

Table 12.11a District-wise seed source by land cultivated in kharif

Districts	Nalanda		Purnea		Samastipur		Balasore		Koraput		Sambalpur		Hoshiarpur	
Farm Size	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)
Own farm	23%	35%	37%	51%	62%	77%	79%	74%	81%	85%	56%	56%	22%	39%
Governemt	0%	1%	0%	1%	0%	0%	6%	16%	1%	2%	7%	12%	0%	0%
Cooperative	0%	0%	1%	1%	2%	2%	7%	14%	8%	10%	5%	5%	0%	1%
Other farmer	10%	11%	10%	13%	28%	38%	19%	18%	4%	7%	11%	10%	7%	11%
Local farmer	31%	31%	36%	48%	63%	73%	35%	45%	28%	33%	28%	35%	3%	6%
Input dealer	89%	92%	86%	89%	74%	84%	9%	10%	8%	11%	10%	19%	91%	97%
FPO	3%	4%	4%	8%	1%	2%	1%	2%	0%	2%	1%	1%	1%	1%
NGO	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%

Table 12.11b District-wise seed source by land cultivated in rabi

Districts	Nalanda		Purnea		Samastipur		Balasore		Koraput		Sambalpur		Hoshiarpur	
Farm Size	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)	Mar& Small (0-1ha)	Med& Large (1+ha)
Own farm	64%	84%	30%	39%	51%	62%	41%	44%	65%	47%	55%	30%	35%	27%
Governemt	1%	0%	0%	1%	0%	1%	2%	5%	1%	2%	4%	18%	0%	1%
Cooperative	1%	2%	0%	1%	2%	4%	5%	9%	3%	16%	4%	10%	0%	0%
Other farmer	19%	16%	5%	7%	16%	17%	8%	10%	9%	9%	16%	10%	2%	2%
Local farmer	27%	29%	28%	26%	46%	50%	61%	76%	26%	26%	54%	64%	1%	2%
Input dealer	80%	86%	88%	95%	84%	86%	33%	35%	9%	19%	27%	19%	63%	82%
FPO	4%	3%	3%	8%	2%	1%	2%	3%	1%	2%	1%	2%	1%	1%
NGO	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	1%	2%	0%	0%
University	1%	2%	4%	7%	6%	8%	0%	0%	0%	0%	0%	0%	1%	2%
Other	1%	1%	1%	0%	0%	1%	1%	1%	0%	0%	0%	0%	1%	1%

12.4 Access to inputs and input subsidies

In Bihar and Odisha, inputs such as fertilizers and seeds are available from retail shops at local markets (village, panchayat, or town level). Cooperatives do not provide timely inputs, and when they do, they sell to larger farmers first or charge higher rates. Thus, most farmers are dependent on buying inputs from private retail shops. These input dealers serve a dual role as "merchants of knowledge," keeping farmers aware about newer varieties as well updates on new methods and techniques.

Across districts in Bihar and Odisha, larger farmers seem to have better access to subsidies, especially if subsidies are tied to cooperatives. They frequently visit the block- or district-level agriculture offices, participate in trainings, and benefit from being part of information networks. In Bihar, many of them are closely associated with JEEViKA. The following example is illustrative:

VR owns 3 ***bighas*** of land in Samastipur. He is a JEEViKA village resource person and has been able to avail subsidies, such as drought relief, provided by the government. The ***krishi salahkar*** (extension worker) is a frequent visitor to the village and helps him and other farmers to apply for various schemes and subsidies offered by the government. Around two years back, he received a subsidy of Rs 10,000 from the government to buy a new water pump set, and he bought it for Rs 28,500.

Last year, he received drought relief for the 1 acre of paddy he had cultivated. Land Possession Certificate (LPC) is required for availing subsidies and other benefits.

An interesting case was observed in the case of prawn sub-dealers in Balasore: A major input for prawn is feed. For each ton of prawn, a minimum of 1.5 ton of feed in required. For each acre of prawn ponds, a harvest of 2 to 4 ton can be expected. For each pond, a maximum of 6 ton of feed is required. The feed is a major way through which the sub-dealers or the financers in the village derive their income. The financers offer credit to farmers who can pay once the harvest is completed. They help the farmers from providing feed to the final sale of the prawn, but instead of keeping a high margin in the sale to exporters, they make high margins on the feed input. The current price of the feed is Rs 72/kg but only for immediate payments. If a farmer wants to buy feed on credit, he will be charged Rs 82/kg which translates into a profit of Rs 10,000 per ton minus the opportunity cost of the dealer's money locked into the feed.

For each pond, a sub-dealer stands to gain an average of Rs 50,000 just in higher margins, which is effectively an interest payment. The feed dealers are organized as the Balasore Feed Dealer Association and work closely with shrimp exporters, managing village-level purchase of prawns on behalf of the exporters. Landless farmers are unable to avail subsidies as they are unable to furnish paperwork that proves their status as cultivators.

12.5 Farm machinery

The fixed capital costs of farm machinery rule out their purchase by most farmers who have tiny plots. Have rental markets for farm machinery emerged to cater to small farmers? How accessible and affordable are these markets? Who are the major actors in these markets?

The survey data reveals a high degree of variance across districts and types of machinery. Intra-state variance is as much as inter-state variance, indicating that the drivers are more than just state-level factors. The rental markets in Purnea and Balasore seem to be particularly active. Tillers, rotavators, and threshers are rented quite a bit in Bihar. In contrast, rental markets for farm machinery are almost absent on Koraput in kharif.

Part of the variance is undoubtedly shaped by the crops being grown, but that still leaves unexplained variance. A disc plough does the task of primary opening and loosening of the soil, a task that all farmers need to do. Yet in four of the seven districts, there was no evidence of its usage. However, in Purnea, three of four farmers rent it. Similarly, while there was a thriving rental market for harrow (used for secondary tillage) in Purnea, it was virtually absent in other districts. In contrast, there was a thriving rental market for heavy-duty equipment such as rotavators (also called rotary tiller) in Nalanda, Samastipur, and Balasore but not in other districts.

Our ethnographic research found that in Balasore (where a quarter of farmers reported renting combined harvesters), the preference for harvesting their paddy using a harvester instead of using manual labor was driven by two factors: one, labor costs and labor shortages and, two, apprehension of heavy rains or cyclones in the harvest season. The latter drove many farmers to cut the paddy as soon as possible, and renting a harvester speeds up the process. This is even though manual harvesting would allow the paddy straw to be stored and sold later (which is not possible when using a harvester).

Most recent innovations in farm machinery such as a "Happy Seeder" (which takes just over an hour to plant an acre of wheat) or laser land levelers will only diffuse widely if there are thriving rental markets.

Most of the rental market for machineries is run by private actors, usually large farmers. A farmer we interviewed in Balasore bought a combined harvester as an investment to start the business of equipment rental for harvesting paddy. Usually, a farmer would pay up to Rs 14,000 in labor charges per acre to harvest paddy and the process would take a few days. However, using a harvester, 1 acre of paddy can be harvested in 75 minutes, with a per acre cost for renting around Rs 3,000. The driver of the machine is paid Rs 40,000 in a season. The operator during the rabi season in 2019 came from Bangladesh, and during the previous kharif season in 2018, the operator was from Haryana.

Tables 12.15–12.17 provide costs (per hectare) for renting combined harvesters, threshers, and rotovators respectively. In general, small farmers (below 1 ha land) pay higher rental rates. This may be in part because they have less bargaining power but also because they may cultivate smaller plots, which increases the transaction costs of each rental.

Here, again, we observe high variance in rental costs for the same machinery across districts. In districts with a high degree of fragmentation and very small plots of land (such as Samastipur), where plots are often at considerable distance from one another, it is much more difficult (and expensive) to operate farm machinery. Farmers rent ploughs in the village at Rs 40/*kattha*[37] if they do not have access to their own. For renting threshers, the owners usually charge 12% of the threshed grains. The combine harvester owners charge Rs 80 per kattha (approximately Rs 4,400/ha) for harvesting of paddy.

The twin constraints of rising labor scarcity in the district and small fragmented plots are leading to forms of induced innovation (a hypothesis associated with the work of Hayami and Ruttan (1971)[38] , who argued that technologies emerge to loosen constraints arising from factor scarcities), in this case the emergence of miniature versions of machinery (especially tractors).

In Koraput, topographical challenges and undulating land make it difficult to use machinery. Several farmers were found to rent land levelers. The owners would usually charge around Rs1,100 per hour. It takes 12 hours to level 1 acre of land. A farmer we interviewed while his land was being leveled hoped that he would recover this cost by selling paddy over two seasons.

[37] 1 acre = 22 katthas.

[38] Hayami, Yujiro, and Vernon W. Ruttan. *Agricultural development: an international perspective.* Baltimore, Md/London: The Johns Hopkins Press, 1971.

Table 12.12 District-wise ownership of farm machinery (fraction of farmers %)

Machine/District	Nalanda	Purnea	Samastipur	Balasore	Koraput	Sambalpur	Hoshiarpur
Combine harvester	0.3%	0.3%	0.1%	0.6%	0.2%	0.7%	1.5%
Potato harvester	0.1%	0.1%	0.1%	0.2%	0.2%	0.1%	1.5%
Sugarcane harvester	0.5%	0.4%	0.0%	0.4%	0.1%	0.2%	0.5%
Grain dryer	0.2%	0.2%	0.1%	0.2%	0.1%	0.1%	0.5%
Baler	0.1%	0.2%	0.0%	0.3%	0.2%	0.0%	0.3%
Thresher	0.1%	1.8%	0.4%	2.3%	2.3%	1.5%	7.4%
Tiller	0.1%	0.9%	1.5%	0.2%	0.2%	0.3%	43.7%
Power tiller	5.6%	0.4%	0.4%	1.9%	1.5%	8.2%	7.9%
Disc Plough	0.2%	5.0%	0.6%	0.0%	0.1%	0.2%	33.3%
Harrow	0.2%	3.9%	0.5%	0.1%	0.0%	0.3%	19.7%
Rotavator	2.4%	1.4%	1.3%	1.2%	0.7%	0.7%	10.3%
Reversible plough	0.0%	0.4%	0.2%	0.1%	0.3%	0.1%	1.0%
Happy seeder	0.3%	0.4%	0.1%	0.1%	0.2%	0.2%	1.3%
Paddy straw chopper	0.3%	0.1%	0.1%	0.1%	0.1%	0.3%	0.8%
Weeder	0.4%	0.2%	0.1%	0.2%	0.1%	0.1%	0.7%

Table 12.13 District-wise rental of farm machinery in kharif (fraction of farmers %)

Machine/District	Nalanda	Purnea	Samastipur	Balasore	Koraput	Sambalpur	Hoshiarpur
Combine harvester	6.1%	2.8%	0.0%	25.6%	0.0%	16.8%	51.6%
Potato harvester	0.0%	0.0%	0.0%	0.2%	0.0%	0.7%	0.0%
Sugarcane harvester	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Grain dryer	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%
Baler	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Thresher	2.3%	59.8%	0.3%	41.5%	6.4%	46.3%	1.7%
Tiller	0.2%	24.6%	29.0%	0.2%	0.0%	0.0%	25.4%
Power tiller	13.8%	0.6%	0.2%	30.9%	3.9%	16.2%	4.7%
Disc Plough	0.0%	77.2%	18.0%	0.0%	0.0%	0.0%	15.8%
Harrow	0.2%	51.2%	10.1%	0.0%	0.0%	0.0%	2.4%
Rotavator	60.1%	27.3%	75.0%	75.8%	0.2%	5.8%	11.9%
Reversible plough	0.1%	0.2%	0.3%	0.1%	0.0%	0.1%	0.0%
Happy seeder	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%
Paddy straw chopper	0.0%	0.2%	0.2%	0.0%	0.0%	0.0%	0.2%
Weeder	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 12.14 District-wise rental of farm machinery in rabi (fraction of farmers %)

Machine/District	Nalanda	Purnea	Samastipur	Balasore	Koraput	Sambalpur	Hoshiarpur
Tractor	0.8%	0.1%	0.2%	28.6%	15.9%	22.5%	4.0%
Sowing Machine	0.3%	0.1%	0.2%	0.1%	0.2%	0.0%	16.1%
Transplanter	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
Plough	31.9%	78.7%	73.6%	26.6%	13.7%	26.1%	36.0%
Spiral cleaner	0.2%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%
Combine harvester	11.3%	0.2%	1.3%	28.1%	0.0%	4.3%	66.9%
Potato harvester	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%
Sugarcane harvester	0.0%	0.0%	0.0%	0.1%	0.2%	0.0%	0.0%
Grain dryer	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	11.3%
Baler	0.2%	0.1%	1.1%	0.0%	0.0%	0.0%	0.0%
Thresher	76.1%	91.6%	85.6%	5.1%	10.0%	16.2%	25.1%
Straw reaper	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	45.4%
Tiller	0.2%	11.0%	3.7%	0.1%	0.0%	0.0%	3.6%
Power tiller	11.6%	0.0%	1.4%	13.0%	7.7%	14.3%	0.0%
Disc plough	0.1%	79.1%	24.3%	0.0%	0.0%	0.0%	24.3%
Harrow	0.1%	0.2%	6.0%	0.0%	0.0%	0.1%	1.0%
Rotavator	59.4%	25.2%	94.2%	25.0%	0.0%	10.1%	8.8%
Reversible plough	0.0%	0.1%	0.2%	0.0%	0.0%	0.1%	0.3%
Happy seeder	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
Paddy straw chopper	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.3%
Weeder	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 12.15 Average rent (Rs/ha) paid for combined harvester

	Kharif		Rabi	
District	Small & marginal (Below 1 ha)	Medium and large (above 1 ha)	Small & marginal (Below 1 ha)	Medium and large (above 1 ha)
Nalanda	3,953.7	3.163.7	2,665.7	2,848.3
Purnea	2,723.2	1,612.5	3,520.9	-
Samastipur	-	-	4,448.7	2,619.9
Balasore	5,271.6	4,308.8	6,177.6	6,177.6
Sambalpur	2,754.6	3,421.5	5,599.9	5,401.9
Hoshiarpur	3,088.8	2,171.2	3,459.5	3,421.5

Table 12.16 Average rent (Rs/ha) paid for thresher

	Kharif		Rabi	
District	Small & marginal (Below 1 ha)	Medium and large (Above 1 ha)	Small & marginal (Below 1 ha)	Medium and large (Above 1 ha)
Nalanda			2,733.4	2,321.4
Purnea	1,308.3	1,114.4	2,198.2	1,989.3
Samastipur		-	1,779.0	1,753.6
Balasore	1,772.6	1,235.5	2,315.7	2,174.5
Koraput	2,471.1	1,647.4	2,471.1	1,812.1
Sambalpur	1,976.8	1,710.7	2,471.1	2,353.4
Hoshiarpur	-	-	4,942.1	4,942.1

Table 12.17 Average rent (Rs/ha) paid for rotavator

	Kharif		Rabi	
District	Small & marginal (Below 1 ha)	Medium and large (above 1 ha)	Small & marginal (Below 1 ha)	Medium and large (above 1 ha)
Nalanda	4,666.6	4,349.9	4,561.9	4,518.5
Purnea	2,382.6	1,566.5	2,471.1	2,059.2
Samastipur	3,397.7	2,718.2	3,261.8	3,003.5
Balasore	4,942.1	4,118.4	5,018.8	4,942.1
Sambalpur	2,265.1	1,976.8	3,425.2	3,658.5
Hoshiarpur	2,013.9	1,482.6	2,471.1	2,816.8

12.6 Labor markets

Labor rates are highest in a rich district like Hoshiarpur and lowest in a poor district like Koraput. Labor rates for male workers are higher than for female workers (Table 12.18). Interestingly, the rate for young adults (below 15 years of age) is similar to that for women.

Table 12.18 Average labor rate (Rs/day) in kharif

	Kharif			Rabi		
District	Male	Female	Child	Male	Female	Child
Nalanda	300.0	250.0	250.0	300.0	250.0	250.0
Purnea	250.0	150.0	150.0	250.0	150.0	150.0
Samastipur	300.0	150.0	200.0	300.0	200.0	200.0
Balasore	300.0	250.0	100.0	300.0	250.0	100.0
Koraput	200.0	100.0	100.0	200.0	120.0	100.0
Sambalpur	200.0	150.0		200.0	150.0	
Hoshiarpur	350.0	250.0	150.0	350.0	250.0	150.0

The cost incurred (weekly) increases with increase in the number of crops cultivated. This could be because of diversifying into more labor-intensive crops.

Table 12.19 Cost incurred on labor (in Rs/ha) by number of crops grown in Bihar

	Kharif			Rabi		
Crop count	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium & Large (1-3ha)	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium & Large (1-3ha)
1	4,633.2	3,751.1	3,138.6	-	1,042.9	1,976.8
2	4,908.1	4,180.8	2,892.9	-	-	1,614.9
3-4	4,430.5	3,843.6	3,624.2	-	1,243.3	1,795.0
4+	4,735.5	4,291.8	3,849.4	-	1,146.9	1,672.7

Table 12.20 Cost incurred on labor (in Rs/ha) by number of crops grown in Odisha

	Kharif			Rabi		
Crop count	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium & Large (1-3ha)	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium & Large (1-3ha)
1	4,942.1	3,294.7	3,294.7	-	4,942.1	5,118.6
2	12,237.1	7,200.1	5,295.1	-	8,462.9	7,310.8
3-4	12,232.9	8,859.6	6,782.4	-	4,914.0	6,354.5
4+	16,666.4	9,150.5	7,065.6	-	3,013.0	4,775.0

Table 12.21 Cost incurred on labor (in Rs/ha) by number of crops grown in Punjab

	Kharif			Rabi		
Crop count	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium & Large (1-3ha)	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium & Large (1-3ha)
1	8,189.8	6,589.5	8,685.0	1,235.5	906.1	1,588.5
2	21,964.9	5,776.5	8,354.5	-	2,471.1	2,571.2
3-4	-	-	10,443.1	10,707.9	1,602.8	308.9
4+	-	-	-	-	-	2,841.7

In Samastipur, the bulk of farmers who grow vegetables and tobacco are fully reliant on family labor (including women and children). Since there is scarcity of labor across Samastipur, family labor has helped intermediate castes like Kushwahas prosper and diversify into high-value crops, when compared to farmers from upper castes, who still consider making female members of their families work on the farm taboo.

There seems to be a degree of reversal of labor migration from Bihar. A farmer noted that that during the earlier regime (when crime and violence in Bihar was known to be high), people started migrating to other places for work, and once Nitish Kumar (the present Chief Minister) came to power, with a better law and order situation, they started returning to Bihar.

Contract labor is usually hired for paddy and wheat harvesting, as well as potato harvesting. Whether farm labor or non-farm work, there was a clear preference in Sambalpur and Nalanda for migrant labor, which is perceived to be more pliant and hardworking due to the precarity of having moved away from their home state/district. Migrant labor is also willing to settle for lower wages compared to local laborers. In Odisha, many laborers came from West Bengal and Jharkhand. In Bihar, some of the laborers were locals, while others came from West Bengal.

In Chhamunda village (in Sambalpur district), the village sangathan (association)—which includes members from various stakeholder groups including farmers, panchayat members and laborers—collectively decides on the wage rates for different tasks. The local laborers are paid on the basis of the rates decided by the sangathan. However, these rates do not apply to migrant labor.

In Hoshiarpur, family labor is extremely uncommon in farms. Usually a single male member or a father–son duo work on the fields. Women rarely work in the farms. Farmers hire migrant labor available during the season of paddy transplanting, and peas and potato harvest. Labor is usually brought in by a contractor who guarantees them a minimum level of income, failing which the contractor has to take a cut on his own earnings to ensure trust of his labor team and a reliable supply of labor where he works.

This is in contrast to the conditions of the Kandi region (in Hoshiarpur) where these crops are rarely grown. Most farms in the higher reaches of Kandi are small in size, usually about an acre and it is neither possible to grow crops like paddy nor possible to hire labor due to the low returns from the small-size plots of land with low productivity due to the sandy nature of the soil and limited water availability.

In Hoshiarpur, specific crops are associated with labor sourced from particular regions in north and east India where that particular crop is grown, ensuring labor's familiarity with specific crops. Labor engaged in sugarcane farming comes from western Uttar Pradesh, potato sowing is done by labor from eastern Uttar Pradesh and Chambal region of Madhya Pradesh, green pea harvesting is done by labor from the Kosi region of Bihar and eastern Uttar Pradesh. Labor rates also vary by crop where they take a standard amount for paddy transplanting, harvesting, sugarcane peeling, potato sowing, and pea harvesting per acre. Local Punjabi labor works in some areas of the district.

In Koraput, most of the laborers are Adivasi farmers who own little land, and even if they do, they do not have access to water. In such cases, they do not cultivate anything in the summer months and prefer to take up non-farm sources of employment. During summer months, laborers get higher wages by working in stone blasting and construction work in nearby towns, both within the district and in neighboring Andhra Pradesh. Vegetable cultivators rely on family labor. We also came across a barter system of labor where in order to overcome labor scarcity in the village, farmers would work as laborers in other farmers' farms, especially during the harvest period. In return, they would receive help in order to harvest their own crop.

In Kuchinda block of Sambalpur, chili cultivation during the rabi season seems to have taken a hit due to scarcity of labor. Sambalpur and neighboring cities like Jharsuguda and Raipur have a large number of industries where laborers prefer to work. Furthermore, implementation of central government schemes such as Pradhan Mantri Gram Sadak Yojana (PMGSY) and Pradhan Mantri Awas Yojana (PMAY)[39] has drawn labor away from the farm. In the rabi season, lack of irrigation drives a lot of small cultivators towards non- farm labor work, creating a further shortage of agricultural labor. This seems to have driven up costs for labour-intensive rabi crops like chili, leading many farmers to give up its cultivation altogether.

12.7 Finance and credit

In addition to the many risks farmers face—weather, price, infestations—they also face severe liquidity constraints. Cash outflows for inputs are largely upfront, while cash inflows come only after the harvest, often after a gap of many months. Since most farmers have few resources to begin with, this raises the question of how farmers meet these costs. What are the dominant sources of agricultural credit and how do these sources differ between and within districts across different categories of cultivators?

A second question relates to the primary sources of credit, between public institutional (public sector banks, cooperative societies, loans from Kisan Credit Cards [KCCs]), private institutional (private sector banks, microfinance institutions, producer companies, self-help groups [SHGs]), and private informal lenders (large farmers, family, moneylenders, input dealers, traders, commission agents).

A third question relates to the conditions of lending. What are the factors that determine access to credit and the terms of lending, be it interest rates or term structure of loans across various sources?

[39] Central government schemes for building roads and housing respectively.

Finally, how competitive are credit markets? Do some villages and/or social groups have more sources of credit available than others? If so, why? What effect does this have on the terms of borrowing?

According to data from the National Sample Survey Office (NSSO), slightly more than half of agriculture households had an outstanding loan in 2013, with the average outstanding amount being Rs 47,000 (table 12.22). Farming households in Odisha were a third more likely to have an outstanding loan compared to their counterparts in Bihar, with average outstanding loans that were nearly three-fourths greater. All size classes of farmers in Punjab were likely to have larger outstanding loans, reflecting the greater input intensity of agriculture in Punjab.

Table 12.22 NSSO-SAS[40] (2013) data on outstanding loans of agricultural households

State Count	<0.01	0.01-0.40	0.41- 1.00	0.01-0.40	0.41- 1.00	0.41- 1.00	0.01-0.40	0.41- 1.00	Proportions of household with outstanding loan
Bihar	73	138	132	341	279	424	1,494	163	42.5
Odisha	88	167	337	181	326	1,302	22,281	282	57.5
Punjab	131	246	516	1,641	2,292	3,266	9,274	1,195	53.2
All India	311	239	354	548	949	1,827	2,903	470	51.9

Our survey data paints a somewhat different picture. In particular, it reveals a much higher variance in farmers taking loans across districts in Odisha compared to Bihar. While Balasore district is at one extreme, Koraput district is at the other, reflecting the latter's low input agriculture (table 13.23).

Table 12.23 Percentage of farmers who reported taking any loans, by size of land owned

District	Landless (0 Ha.)	Marginal (0-0.5 Ha.)	Small (0.5-1 Ha.)	Medium (1-3 Ha.)	Large (3+ Ha.)
Nalanda	40.7%	36.3%	29.7%	33.6%	42.9%
Purnea	50.0%	54.2%	56.7%	65.1%	53.8%
Samastipur	54.5%	52.8%	58.7%	54.5%	69.6%
Balasore	37.8%	51.0%	62.9%	67.3%	68.0%
Koraput	7.3%	8.5%	20.3%	20.7%	15.1%
Sambalpur	6.4%	16.0%	21.3%	25.2%	27.8%
Hoshiarpur	21.4%	29.8%	36.9%	54.9%	61.2%

Table 12.24 Percentage of farmers who reported taking any loans, by size of land cultivated in kharif

District	Landless (0 Ha)	Marginal (0-0.5 Ha)	Small (0.5-1 Ha)	Medium (1-3 Ha)	Large (3+ Ha)
Nalanda	35.9%	36.3%	35.8%	34.1%	51.4%
Purnea	56.6%	52.0%	56.0%	63.9%	56.8%
Samastipur	54.7%	52.7%	50.6%	62.3%	75.0%
Balasore	55.8%	48.9%	55.4%	63.9%	55.2%
Koraput	16.5%	9.4%	18.5%	20.8%	11.1%
Sambalpur	20.5%	10.2%	18.1%	25.5%	29.9%
Hoshiarpur	47.8%	22.5%	32.7%	50.7%	62.3%

Public institutional sources (public sector banks, cooperative societies, loans from KCCs) are the largest source of borrowings (51.4%). Private institutional sources (private sector banks, microfinance institutions, producer companies, SHGs) are the second-largest source of borrowings (SHGs comprise 23%), while 16.2% borrowed from for private informal lenders (***mahajan/bania***). SHGs constitute the single-largest source of borrowings (Table 12.25). In our sample, 23% of the farmers reported borrowing from SHGs. Many farmers in Samastipur reported borrowing from SHGs run by JEEViKA.

The median interest rate differential between the mahajan (informal borrowing) and SHGs is wide—2% versus 5% (per month).

Table 12.26 Interest rate in % (per annum)

	By land owned					By land cultivated				
Loan source	Avg. interest rate	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium (1-3 ha)	Large (3+ ha)	Avg. interest rate	Marginal (0-0.5 ha)	Small (0.5-1 ha)	Medium (1-3 ha)	Large (3+ ha)
KCC public	7	6	7	7	7	7	6	7	7	7
Bank	5	4	2	7	7	5	3	3	7	7
Cooperative	2	2	2	2	2	2	2	2	2	3
Mahajan/ bania*	5	5	5	5		5	5	5	5	
SHG/ Mahila Samuh*	2	2	2	2		2	2	2	2	

Note: *Here, interest period for bank, KCC public and cooperative are yearly and for mahajan/bania and SHG monthly.

Table 12.27 Different sources of finance by caste category (in percentage) overall in survey

Caste category	KCC Public	Bank	Cooperative	Mahajan	SHG
SC	10.0	12.3	13.0	18.9	34.2
ST	13.7	32.5	20.5	9.2	17.7
OBC	16.4	12.2	16.9	17.8	26.2
General	27.0	20.9	26.3	12.2	8.0
Total	17.5	15.4	18.5	16.2	23.0

Table 12.28 Interest rate charged from different social groups by sources of finance (%) overall in survey

	Average interest rate			
Loan source	SC	ST	OBC	General
KCC public	7	2	6	7
Bank	4	2	7	7
Cooperative	1	2	2	2
Mahajan/bania*	5	5	5	5
SHG/ Mahila Samuh*	2	2	2	1

Note: *Here, interest period for bank, KCC public and cooperative are yearly and for mahajan/bania and SHG monthly.

While interest rates paid by farmers depend on the source of finance, are they also affected by farm size and social group? While socially marginalized groups tend to pay somewhat higher rates, this is not always the case (Table 12.27). What matters most is the source of borrowing, which overwhelms the class or social group. The major source of finance for the marginal farmers (Table 12.25) and for SCs (table 12.27) is SHGs and the mahajan (moneylender), who charge 2% and 5 % per month respectively.

Thus, what matters most is who has access to institutional sources of credit and, lacking which, who is forced to go to lenders in the informal sector who charge exorbitant interest rates.

The institutional design of JEEViKA and its interventions tend to focus on small and marginal farmers. Indeed, the ethnographic research revealed that many upper-caste farmers considered borrowing from SHGs as beneath their status. In Bihar, in Nalanda and Samastipur, almost 80% of the farmers who borrowed from SHGs were landless and marginal. In Purnea, this percentage number dropped to 60%, possibly because of a weaker SHG ecosystem.

The maximum loan amount in SHGs in Bihar ranges from Rs 50,000 to Rs 1 lakh, depending on the credit history of the group. While interest rates are low (1–2% per month), credit limits and the unavailability of immediate loans in the event of an emergency are two major drawbacks of SHG loans. These are also the reasons why farmers end up borrowing from moneylenders.

Of our respondents, 15.4% reported borrowing from banks. Marginal, small, and medium farmers are the largest borrowers from banks. The landless are almost completely shut out (except in Nalanda), and large farmers are surprisingly absent as well (except in Hoshiarpur district). Overall, only 3.8% of the borrowers were landless. During our field work, Nalanda was cited as a front-runner when it came to progressive change as it is home to the Chief Minister's electoral constituency.

Landless farmers are also shut out of cooperatives and KCCs (only 1.6% overall), which means that other than SHGs, they lack access to any form of institutional credit. In the case of cooperatives, across districts in Bihar and Odisha, field interviewers heard accounts of resource capture by larger and influential farmers (often those who were politically active). The bulk of borrowers are medium farmers, and landless farmers have not borrowed from cooperatives anywhere, except for a small number of farmers in Balasore and Hoshiarpur. In

Sambalpur, large farmers are able to borrow from Primary Agricultural Cooperative Societies (PACS).

In our sample, 17.5% of the farmers borrowed from KCCs issued by public sector banks. The beneficiaries were usually marginal, small, or medium farmers. Across districts, landless farmers were unable to make use of KCCs as these require land titles or some proof of cultivator status to be issued. In Koraput, only farmers with land titles (locally called ***pattedaars***) were able to borrow using KCCs. Landless farmers depended on local traders and moneylenders for credit. In some villages, mortgaging gold for loans was found to be a common practice.

Farmers across our districts have reported taking inputs on credit from local input dealers. These are usually thought of as an "advance" and not perceived as loans (hence these may not reflect in data on reported loans). In most cases, no interest is charged by the input dealer either.

Most farmers in Hoshiarpur restrict themselves to institutional sources for loans and this is attributed to the high literacy rate of the district. Commission agents (called ***arhatiyas***) also give loans to farmers without any collateral and support their farming as well as non-farming consumption needs. In these cases as well, loans are usually given to the farmer in the form of an "advance" payment for purchase of crop inputs. The arhatiya expects the farmer to repay by selling the crop to him. While one might expect that interlinked markets—linking inputs (credit) with output markets (produce)—would be more prevalent in the case of small farmers who lack bargaining power, in reality, it is mostly large farmers who take credit from commission agents, who in turn are more comfortable giving credit to the larger farmers. Commission agents usually finance their own credit to the farmers through bank loans. They pay a 12% rate of interest to the bank annually and charge farmers anywhere between 24–36%. It is not clear why the large farmers do not take (or get) credit from banks directly.

Table 12.29 Major source of finance by landownership (in percentage)

Loan source	Land size	KCC public	Bank	Cooperative	Mahajan	SHG
Nalanda	Landless (0 ha)	1.2	18.6	0.0	34.3	33.5
	Small & marginal (0-1 ha)	24.7	55.8	20.0	54.8	63.5
	Medium & large (1+ ha)	74.1	25.6	80.0	10.9	3.0
	Total	100.0	100.0	100.0	100.0	100.0
Purnea	Landless (0 ha)	1.8	7.1	0.0	34.3	33.5
	Small & marginal (0-1 ha)	45	58.6	0.0	54.8	63.5
	Medium & large (1+ ha)	53.2	34.2	100	10.9	3.0
	Total	100.0	100.0	100.0	100.0	100.0
Samastipur	Landless (0 ha)	0.4	0.0	0.0	4.5	4.4
	Small & marginal (0-1 ha)	60.8	72.3	71.5	83.3	88.4
	Medium & large (1+ ha)	38.8	27.7	28.6	12.3	7.2
	Total	100.0	100.0	100.0	100.0	100.0
Balasore	Landless (0 ha)	2.4	4.3	2.5	10.1	13.6
	Small & marginal (0-1 ha)	65.9	64.5	67.0	66.6	68.2
	Medium & large (1+ ha)	31.7	31.2	30.6	23.2	18.2
	Total	100.0	100.0	100.0	100.0	100.0
Koraput	Landless (0 ha)	2.4	4.3	2.5	10.1	13.6
	Small & marginal (0-1 ha)	65.9	64.5	67.0	66.6	68.2
	Medium & large (1+ ha)	31.7	31.2	30.6	23.2	18.2
	Total	100.0	100.0	100.0	100.0	100.0
Sambalpur	Landless (0 ha)	0.0	0.0	0.0	7.1	8.9
	Small & marginal (0-1 ha)	46.3	48	43.3	78.6	68.9
	Medium & large (1+ ha)	53.8	52	56.7	14.3	22.2
	Total	100.0	100.0	100.0	100.0	100.0
Hoshiarpur	Landless (0 ha)	0.0	0.7	0.9	0.0	50.0
	Small & marginal (0-1 ha)	30.7	25.9	16.5	0.0	50.0
	Medium & large (1+ ha)	69.4	73.5	82.6	100.0	0.0
	Total	100.0	100.0	100.0	100.0	100.0

Table 12.30 Major source of finance by land cultivated (in percentage)

Loan source	Land size	KCC public	Bank	Cooperative	Mahajan	SHG
Nalanda	Small & marginal (0-1 ha)	27.2	62.8	0.0	75.3	82.1
	Medium & large (1+ ha)	72.8	37.2	100.0	24.7	17.9
	Total	100.0	100.0	100.0	100.0	100.0
Purnea	Small & marginal (0-1 ha)	46.2	61.4	0.0	73.7	78.6
	Medium & large (1+ ha)	53.9	38.6	100.0	26.3	21.5
	Total	100.0	100.0	100.0	100.0	100.0
Samastipur	Small & marginal (0-1 ha)	51.8	51.1	71.4	75.0	86.2
	Medium & large (1+ ha)	48.2	48.9	28.6	25.0	13.8
	Total	100.0	100.0	100.0	100.0	100.0
Balasore	Small & marginal (0-1 ha)	60.8	59.6	71.5	83.3	88.4
	Medium & large (1+ ha)	38.8	40.4	28.6	12.3	7.2
	Total	100.0	100.0	100.0	100.0	100.0
Koraput	Small & marginal (0-1 ha)	2.4	40.0	2.5	10.1	13.6
	Medium & large (1+ ha)	65.9	60.0	100.0	100.0	77.8
	Total	31.7	100.0	0.0	0.0	22.2
Sambalpur	Small & marginal (0-1 ha)	31.3	36.0	31.9	64.3	46.7
	Medium & large (1+ ha)	68.7	64.0	68.1	35.7	53.3
	Total	65.9	64.5	100.0	100.0	100.0
Hoshiarpur	Small & marginal (0-1 ha)	16.1	22.5	10.4	0.0	-
	Medium & large (1+ ha)	83.9	77.6	89.6	100.0	-
	Total	100.0	100.0	100.0	100.0	-

12.8 An Ethnographic overview of costs of cultivation

In this section, we leverage the ethnographic component of the research to give a broad sense of costs incurred by individual farmers, across a variety of crops in different districts. These farmer profiles also give details about the range of processes involved in cultivation and the amount of labor needed.

Across sites, farmers seem to make an assessment about what to grow on the basis of not only cost of production but also perception of risk (weather or market related), volatility of prices in the previous season, and expectation of returns.

A common narrative emerged in Nalanda (where both paddy and wheat are consumed as staples) as regards growing paddy: Compared to other crops (see table 12.31), paddy requires greater investment in terms of labor and inputs. About half of the income from paddy sold in the previous season ends up being invested as input cost in the next season compared to a third for wheat. Farmers believe that paddy is the only crop that they can grow in the kharif season. However, in rabi, they feel comfortable in growing multiple crops (like ***chana, masoor,*** mustard, potato, vegetables, maize), with the choice of crops varying based on agroecological conditions.

Table 12.31 Comparing input costs/acre for paddy and wheat in Nalanda (Rs)

Crop	Paddy	Wheat
Sowing	Rs. 1500	Rs. 900
Seed	5 kg paddy (Rs.500)	2.5 kg/ *katha* Rs. 12,250/acre
Labour cost	Rs. 1,800	NIL
Fertilizer	DAP (1 packet): Rs. 1,500 Urea (2 packets): Rs. 600	DAP (1 packet): Rs. 1,500 Urea (2 packets): Rs. 600
Weed clearing	30 laborers: Rs. 60/labor Total: Rs 1,800/acre/day	NIL
Harvesting	Harvester: Rs. 1,800/acre Laborer: 5 *man*[41] paddy/bigha (650*8 = 5,200/acre)	Harvester: Rs. 1,800/acre
Total	**Rs 13,500-15,500/acre**	**Rs 8,000-9,000/acre**

[40]Estimates provided by a farmer in Chandi block, Nalanda
[41] 1 man= 40kg.

As we have discussed in Chapter 5 of this report, farmers' crop choices are shaped by weather risks and price risks as well as labor constraints. In Samastipur (which has faced periodic floods), farmers expressed a preference for growing paddy to vegetables since the former is more resilient to floods.

In contrast, in Koraput (which has faced periodic droughts), farmers said that between maize and paddy, maize had higher input costs and required more labor, especially during application of fertilizers. However, it also fetches a better income than paddy. It also does not need as much water as paddy, making it a less risky choice compared to paddy in the event of a dry spell.

We heard a different narrative in Purnea, part of the "maize belt" in Bihar, which saw a boom in maize production after the introduction of hybrid maize on a large scale in the 2000s. In recent years, after maize experienced price fluctuations because of volatility in international commodity markets, some farmers seem to be making the move to growing wheat, a less risky rabi crop with more stable prices. Indeed some farmers stated that it was difficult for those who cultivated maize to get access to credit as the crop was seen as volatile.

In Nalanda, labor shortage led some farmers to substitute labor-intensive crops like onion with maize. A landless farmer stated that in 2018 she cultivated onion over 5 katthas of land and maize on 3 katthas. This year, she cultivated only maize. The reason for this substitution, she stated, is because onion requires higher investment in inputs and also has a higher price risk compared to maize. Furthermore, onion is also labor intensive. As a single farmer who does not employ agricultural labor on her land (to limit costs), it is easier to harvest maize than onions. Onion is labor intensive and needs labor at all stages right from sowing to harvesting. In the case of maize, she was able to manage on her own.

Another important reason cited for not growing onions in 2019 was the previous year's slump in the onion market. Many farmers in major onion-producing blocks like Rajgir could not even sell their produce in 2018, and they chose not to cultivate onions the following season.

Across districts, farmers agreed that even though vegetables were costlier to grow and were more labor intensive, the longer period over which they could be grown and daily/weekly harvests meant that for a period ranging from two to five months (depending on which vegetable they grew), vegetables offered the possibility of regular sales and cash payments. Even if one part of the season witnessed a slump in prices, other periods of better returns made up for any losses. Since farmers often grow more than one vegetable in a season, losses from one vegetable can usually be compensated by gains in another. For example, tomato is a five-month crop, and cauliflower a two-month crop. The longer duration of tomato on the farm means a longer duration of tomato supply in the market, leading to more stable prices usually. On the other hand, a shorter cauliflower season can often mean a supply glut during the period of marketing (especially in districts like Samastipur, Nalanda, and Sambalpur, where cauliflower is grown extensively), leading to greater price risks. For a farmer growing both tomato and cauliflower, losses from one can be offset by gains from the other.

In the next section, we present six case studies of different crops in different districts, to illustrate the level and variation in input costs.

12.9 Case studies

12.9.1 Case study 1: Nalanda (wheat)

Mr NK lives in Amdaha village, Bihar Sharif block, Nalanda. He owns 6 bighas, which he has given out to sharecroppers. He asks them to cultivate two crops—paddy and wheat. Table 12.31a shows the input cost for growing wheat and highlights the list of costs incurred per land unit area in a sharecropping arrangement for wheat cultivation.

Table 12.31a An estimation of input costs for growing wheat

Inputs	Per kattha	Total cost (5 bighas)
Seed (2.5kg/kattha)	Rs. 55/katha	Rs. 5,500
IFFCO fertilizer (2kg/kattha) (DAP)	Rs. 25/kg	Rs. 2,500
Urea (1kg/kattha)	Rs. 8/kg	Rs. 800
Tractor rent	Rs. 60/kattha	Rs. 6,000
Irrigation (2 times in a gap of 1 month)	Rs. 40/kattha	Rs. 4,000
Fertilizer: Urea	Rs. 20/kattha	Rs. 2,000
Harvest (labour cost) (1 labour=3kattha)	1 man wheat/11 man wheat* 16.25*9= Rs. 146/kattha	9 man/100 man 9*650= Rs. 5,850
Total expense	**Rs. 354/kattha**	**Rs.26,650**
Total expense incuurred by NK*		Rs.26,650/2= Rs.13,325

Note: *In sharecropping arragements, both the landowner and tenants may or may not share in input costs. In this case study, the landowner bears a part of the cost. Here the input shared between owner and sharecropper is 50%

12.9.2 Case study 2: Samastipur (vegetable)

Mr VR lives in Hansa village, Warisnagar block, Samastipur. He cultivates on 3 bighas of land, of which 10 katthas are leased in. He grows vegetables like pointed gourdd, cauuliflower, brinjal, and okra.

Table 12.31b An estimation of input costs for growing pointed gourd (parwal)

Inputs	Quantity use (per katha)	Cost per kattha	Total cost (per 25 kattha)	Total cost (per 25 kattha) OBC	Remarks General
Structure	1 unit	Rs. 2500/ kattha	Rs. 62,500	Pointed gourd requuires a structure to support its growth and this cost is inclusive of labor cost as well. Around 20 plants are grown on 1 katha of land.	
Ploughing	3 times ploughing	Rs. 40/kattha	Rs. 3,000		
DAP	2 kg	Rs. 28/kg	Rs. 1,400		
MOP	1 kg	Rs. 14/kg	Rs. 450		
Oil cake	5 kg	Rs. 16/kg	Rs. 1,750		
Compost	20 kg	Rs. 2,976	Rs. 8,000		
Total		Rs. 2,976	Rs. 74,700		

Table 12.31c Labour costs for growing pointed gourd on 25 katthas of land

Particular	Cost per kattha	Rate	Total cost	Remarks
Weeding	2 women * 5 times	Rs. 150	Rs. 1,500	-
Labor for fungicide spraying	1 male	Rs. 100	Rs. 4,000	Fungicide is sprayed every 15 days, which amounts to approximately 8 times across the entire cycle.
Labor for harvesting	15 women	Rs. 50	Rs. 750*36 = Rs. 27,000	The harvesting is done approximately 4 times a month; this is a 9-month crop, which means the crop is harvested 36 times over this period.
Total labour cost			**Rs. 32,500**	-

Total Input Cost for cultivating pointed gourd on 25 katthas of land= Rs. 1,06,900

Cost per kattha: Rs. 4,276

This case study highlights the input costs in growing vegetables and in particular the labor intensity (and hence high labor costs) and chemical inputs (e.g., fungicides).

12.9.3 Case Study 3: Samastipur (multiple crops)

Mr RP from Harpur Ailoth village, Samastipur block, owns 3 bighas. He leases in 2 bighas and therefore cultivates 5 bighas. He grows paddy, maize, wheat, potato, cauliflower, cabbage, tomato, pointed gourd, coriander, mustard, and brinjal.

Figure 12.3 Crop layout of the farmer's field

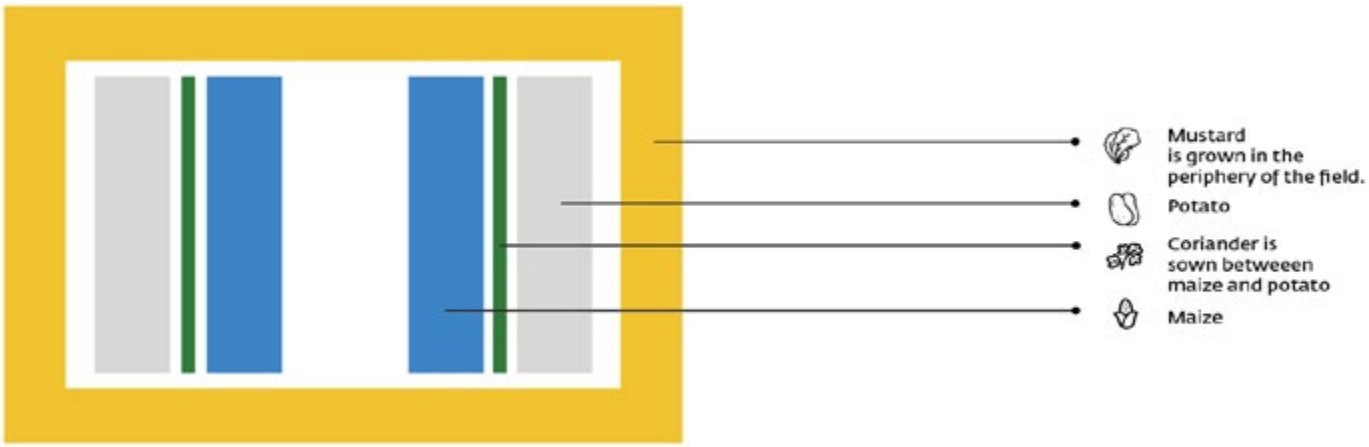


Table 12.31d An estimation of input costs for growing mustard, potato, coriander, maize

Inputs	Units (per kattha)	Total Cost of 70 cents* of ginger	Total Cost per acre	Total amount
Cultivators	2 units	Rs. 40/katha	Rs. 80	1 st Ploughing
Rotavator	2 units	Rs. 70/katha	Rs. 140	2 nd Ploughing
Zinc	0.5 kg	Rs. 60/kg	Rs. 30	Incorporated in the plot after 2nd ploughing
Enzyme	0.5 kg	Rs. 60/kg	Rs. 30	
Manure (no direct financial cost since source is his own cattle)	200 kg	Rs. 1.5/kg	Rs. 300	
DAP	2.5 kg	Rs.28/kg	Rs. 70	
MOP	2.5 kg	Rs. 18/kg	Rs. 45	
Mustard Oil Cake	10 kg	Rs. 20/kg	Rs. 200	
PVC powder	0.5 kg	Rs. 20/kg	Rs. 10	
Potato Seeds	40 kg	Rs. 7.5/kg	Rs. 300	-
White Mazie seeds	400 gm	Rs. 250/kg	Rs. 100	-
Coriander seeds	200 gm	Rs. 200/kg	Rs. 40	No financial cost since the seeds come from the previous year only and there is no storage cost
Mustard seeds	40 gm	Rs. 125/kg	Rs. 5	
Dithane M-45 (Fungicide)	50 gm	Rs. 500/kg	Rs. 20	For seed treatment
Bavistin (Fungicide)	20 gm	Rs. 900/kg	Rs. 500/kg	
DAP	5 kg	Rs. 28/kg	Rs. 500/kg	Incorporated post harvesting of potato.
Mustard oil cake	5 kg	Rs. 20/kg	Rs. 500/kg	
Irrigation Costs	7 hours	Rs. 150/hour	Rs. 500/kg	Irrigation is done twice. First time (post 20 February), the land is irrigated for 5 hours; second time (1st week of March), it is irrigatted for 2 hours.
Total Agri input cost per kattha			**Rs. 2,678**	

Labor cost: RP employs both family and external labor. The labor rate is around Rs 300 per day for male laborers and Rs 150 per day for female laborers. He and his wife work on the field as family labor. In the case of harvesting of produce such as potato and grains, the laborers are paid cash in the event of a good harvest. Otherwise the laborers take 10% of the total harvest as their charge and share the produce among them equally.

This case study highlights the difficulties of estimating crop-specific costs for farmers who practice inter- cropping. Since some inputs are common to multiple crops, farmers are unable to distinguish quantities used for each crop and hence ascribe precise input costs to specific crops.

12.9.4 Case study 4: Sambalpur (paddy)

Mr BKN from Themera village, Maneswar block, cultivates 10 acres. He owns 5 acres and leases in another 5 acres. He grows paddy both in the kharif and rabi seasons.

Table 12.31e An estimation of per acre input costs for growing paddy in kharif

Inputs	Per kattha	Quantity and rate	Total amount
Seeds	30 kg	Rs. 50/kg	Rs. 1,050
Labor	Employs 8-10 laborers for main processes in a season (harvesting, maintainance, & sowing)	Male labor: Rs. 250/day Female labor: Rs. 200/day	1. Sowing: Rs. 3,500 2. Maintainence (during rainfall) Rs. 2,000 3. Harvesting (Rs.200/quintal)= Rs, 4,400
Tractor	3 hours	Rs. 1,200/hr	Rs. 3,600
DAP	2 packets	Rs. 1,300/packet	Rs. 2,600
Potash	1 packet	Rs. 900/packet	Rs. 900
Pesticide (Vitamin)*	1 litre	Rs. 600	Rs. 600
Pesticide	-	-	Rs. 500
		Total expense	Rs. 19,150 (Note: The expense increases to up to Rs. 22,000 during years of increased crop diseases, as the expneses on pesticide increase. The above figure is for normal year)

*A particular pesticide is locally called vitamin.

This case study highlights input costs for the bread-and-butter kharif crop—paddy—for a relatively large cultivator.

12.9.5 Case study 5: Koraput (paddy)

Mr PJ is an Adivasi farmer from Podabagri village, Dasmanthpur block. He owns 30 acres of land of which 3 acres are under paddy cultivation. Other major crops grown by him are nilgiri (Eucalyptus), ragi, and maize.

Table 12.31f An estimation of per acre input costs for growing paddy in kharif

Inputs	Quantity	Cost	Remarks
Fertilier	50 kg	Rs. 1,100	Brought from Dasmanthpur LAMPS.
Seeds	-	-	Desi seeds: Aa few generations old.
Labor	-	-	Household labor
Plough	-	-	Daught animal is his own.

This case exemplifies the low-input farming practiced in tribal areas. Note the contrast between tables 13.31e and 13.31f in the use of inputs. It poses the question whether the appropriate way to increase the income of such farmers is to increase the use of inputs (better seeds, more fertilizers and chemicals, and irrigation) and hence yields and output, or instead promote organic farming so the farmer can get a price premium for the crops grown.

12.9.6 Case study 6: Koraput (ginger)

Mr S from Malikhuri village, Semiliguda block, owns and cultivates 7 acres of land with his family. He grows paddy, ragi, vegetables, and ginger.

Table 12.31g An estimation of per acre input costs for growing ginger

Inputs	Rate per hour/ per 50 kg/ per day/ per kg	Total Cost of 70 cents* of ginger	Total Cost per acre	Total amount
Seed				He used his own seed for 70 cents of land.
Ploughing the land with tractor (rented)	Rs. 800/hour	Rs. 2,960	Rs. 4,228	He ploughs the land 3-7 hours by tractor
Ploughing by own bullock				He ploughs the land two times
Labor for bed preperation of ginger	Rs. 250/day	Rs. 1,000	Rs. 1,428	To plough the land, he hires 2 male laborers from outside. He and his father join in.
Labor for plating of ginger	Rs. 100/day	Rs. 400	Rs. 571	To plant ginger he hires 2 female laborers from outside and his mother and his wife join in.
Labor for weeding	Rs. 100/day	Rs. 900	Rs. 1,285	For weeding, he hire 3 female laborers for 3 days.
Harvesting of old ginger	-	-	-	He uses his own family labor. It takes nearly 4 to 5 days, if they harvest using 4 people.
Total cost		Rs. 5,260	Rs. 7,512	

Note; *1 acre = 100 cents.

This case exemplifies the possibilties of crop diversification in tribal areas.

Nalanda, Bihar, Farmgate buying

Chapter Thirteen

Commodity Supply Networks

13.1 Bihar

13.1.1 Nalanda

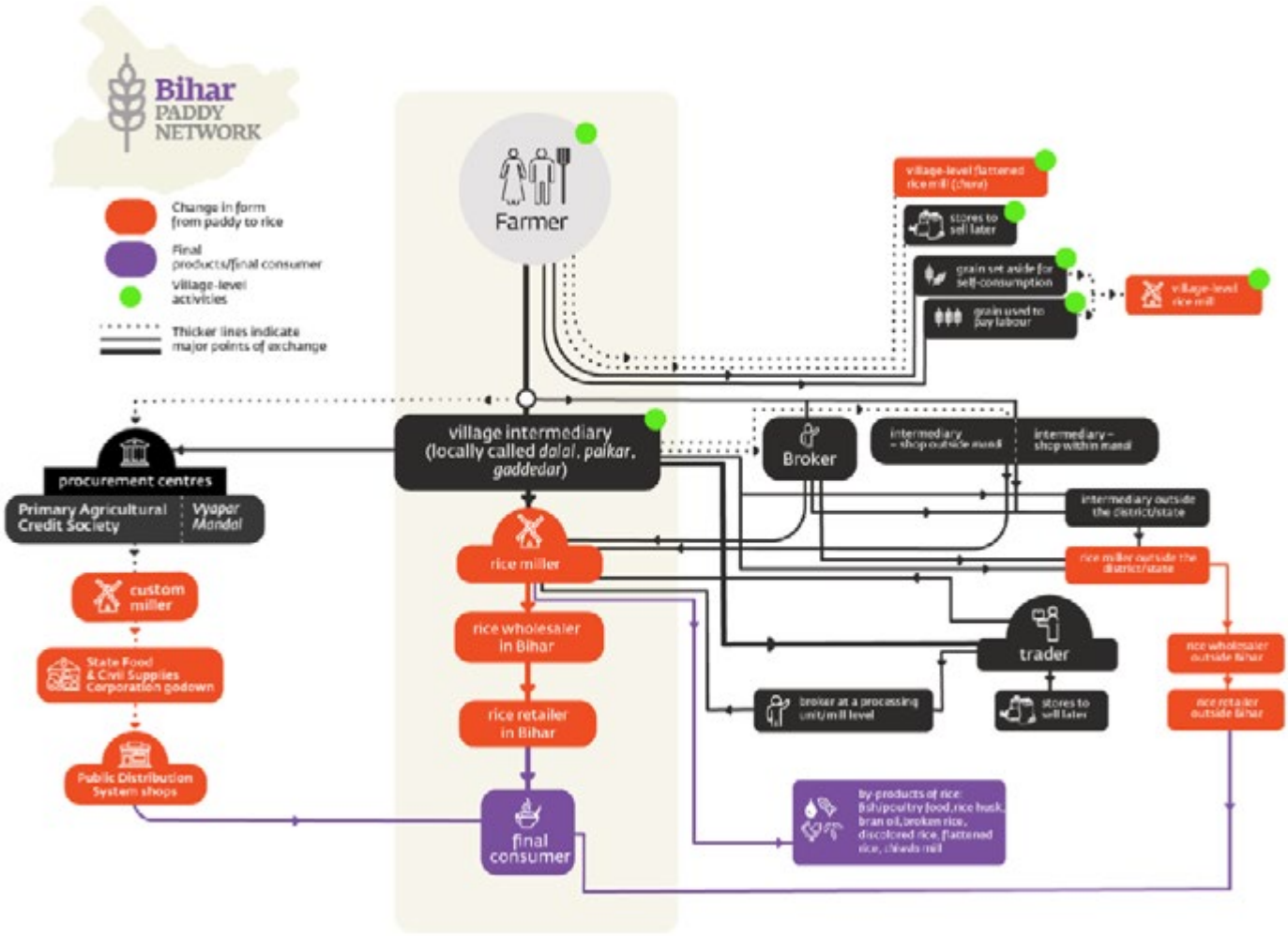


Figure 13.1 Paddy Network in Bihar

Paddy is the major ***kharif*** crop across the state of Bihar. The crop is typically sown between June and August and harvested and marketed between October and December.

As discussed in Chapters 3–5, farmers sell at the farmgate to local traders at prices lower than the Minimum Support Price (MSP). Only a few large farmers are able to access the state's procurement mechanism that is marred with inconsistencies. The village intermediaries who buy from the farmers are small traders and do not have the capacity to hold and sell almost immediately to the next (bigger) intermediary.

Mandis like Silao in Nalanda allow the farmers living in nearby villages to sell their produce to the mandi trader without the involvement of a village intermediary. Nonetheless, farmers overwhelmingly sell their produce at the village level to save on the logistical costs of transportation, loading, and unloading incurred in going to the mandi.

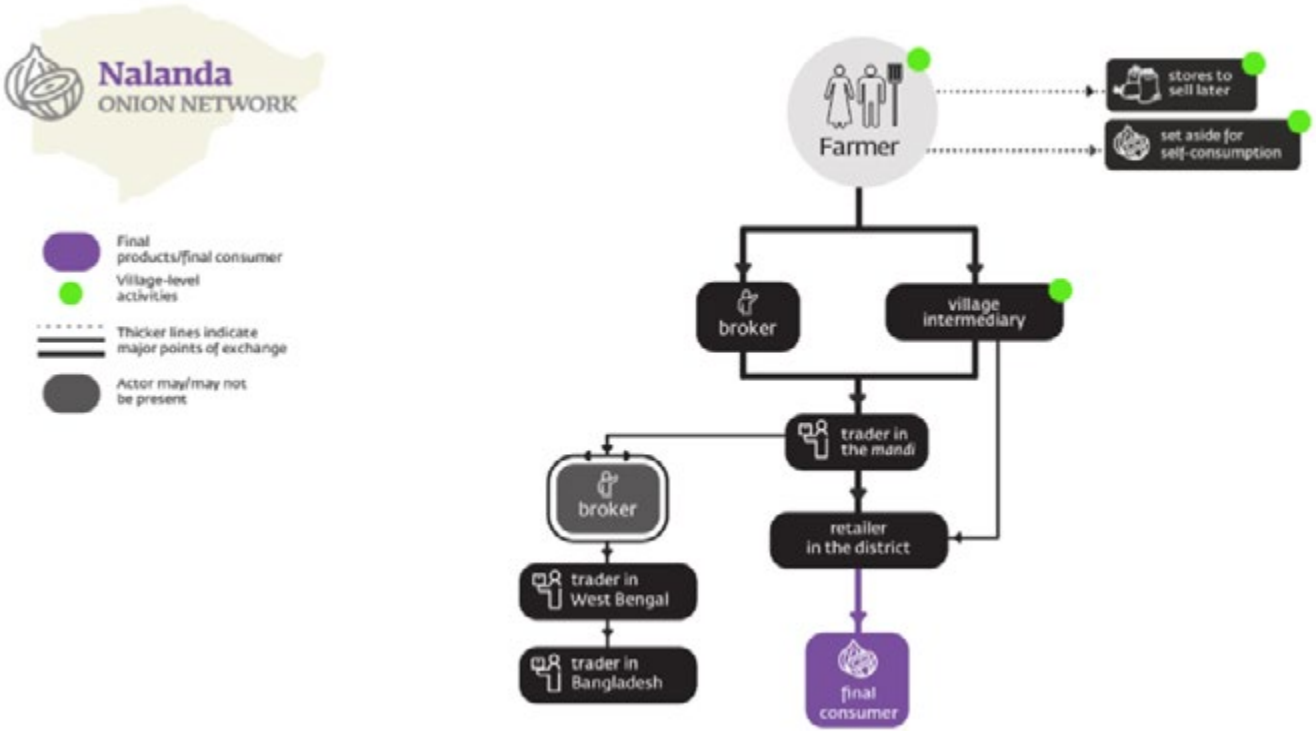


Figure 13.2 Onion Network in Nalanda

Onion, a historically significant ***rabi*** crop in Nalanda, has its major production center in the southern Rajgir block. It is sown in February and harvested in April, with most of the marketing wrapped up by June, although some may go on up till October.

The crop is typically sold to a village intermediary, who subsequently makes the sale to a larger trader in the mandi because a single farmer's produce is not enough to make up for the transportation costs involved. The village intermediaries aggregate the produce of multiple farmers to send a larger consignment to the mandi trader, who then further exports the commodity to other states. During our fieldwork, we found that the trade is primarily done on credit. The village trader receives his payment only after the mandi trader receives it from his outstation buyer. This translates either into a longer waiting period for the farmer or into a discounted price if the village traders pay the farmer earlier.

Onion traders are spread across multiple market sites in Nalanda. Over time, brokers have become important actors for the traders in the mandi while dealing with intermediaries in other states. They manage the counter-party risk involved in such trade due to instances of high rejections by the traders in the destination mandi in recent times.

The crop has seen a major decline in production over the last two decades due to new production centers that have come up, supplying cheaper produce to markets in Nalanda and Bihar.

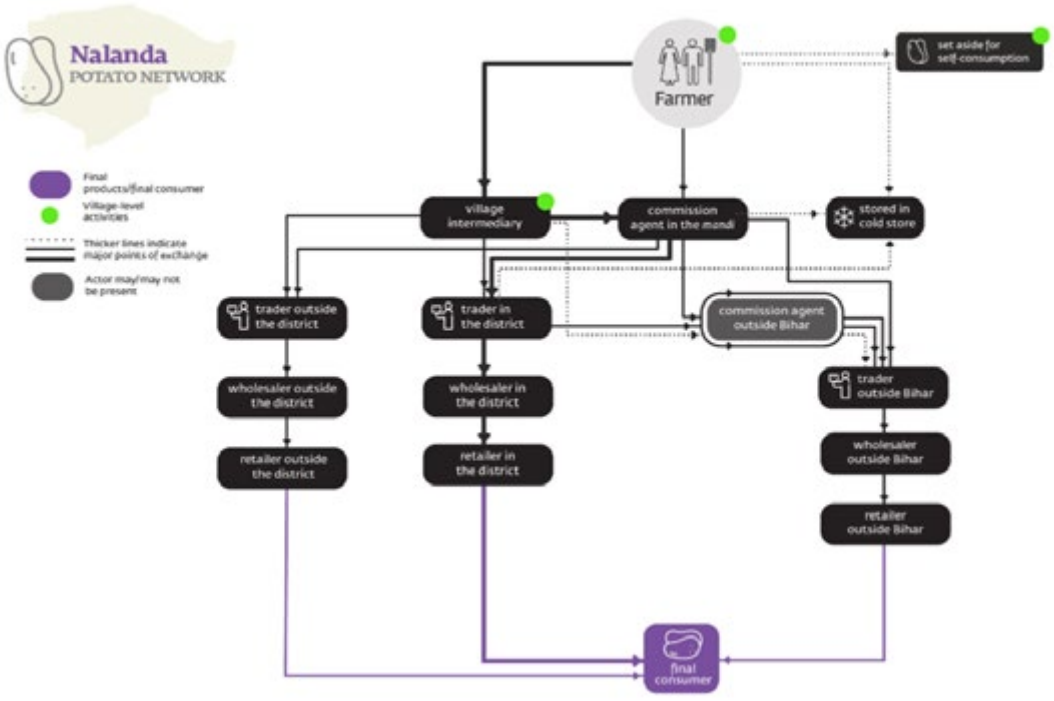


Figure 13.3 Potato Network in Nalanda

Potato production in Nalanda is concentrated in the central blocks of Noor Sarai, Rahui, and Silao, which surround important historic market sites—the Bihar Sharif and Soh Sarai mandis. The crop is mainly sown in October and harvested and marketed between December and February.

The harvested produce is picked up by the village intermediaries to supply to the mandi commission agent, who charges a 6% commission from the purchaser within or outside Bihar. Due to the growth of new production centers in the country, including the neighboring states of West Bengal and Uttar Pradesh, the majority of the sale and consumption of the crop has become local. Cold storages, where farmers would earlier store their produce when they grew potatoes twice in a single season, are now typically used by traders who hold on to the produce, waiting for the price to become favorable.

The Soh Sarai mandi in Nalanda is believed to be the oldest potato mandi in India, running its operations since 1952. Between 1960 and 1980, it was a major potato mandi, running even during the night to manage the large trading volumes of incoming crop. With the repeal of Bihar's Agriculture Produce Marketing Act, the produce is now sold off directly from the villages and not even brought into the mandis, drastically reducing the centrality of these mandis to the commodity's trade.

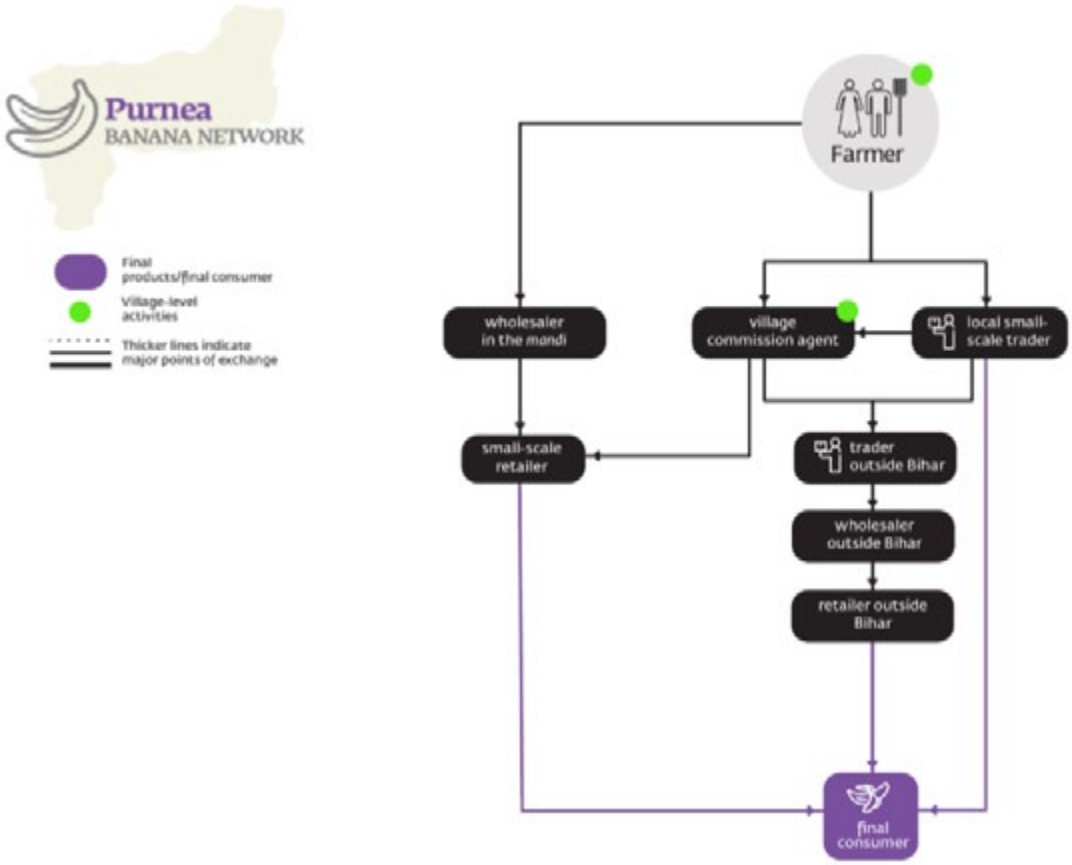


Figure 13.4 Banana Network in Purnea

The south-western blocks of Dhamdaha, Bhawanipur, and Rupauli are the major producers of banana in Purnea district of Bihar. The crop is typically sown in March and is ready in about 12 months. It is then harvested and marketed in a staggered form throughout the year.

The buyers of banana in Purnea usually constitute traders from north Indian states who buy the produce at the farmgate with the help of a village-level intermediary acting as a commission agent. These traders pick up the best-quality produce, which includes bananas of the largest size with no black spots. The commission agents perform the quality checks a day before the transaction. The trader comes equipped with the labor to cut and load the produce in the trucks.

Local banana traders of Purnea have also been selling to north Indian traders for years. They know several village-based intermediaries who instill a sense of security in handling transactions with farmers from multiple villages. Local traders purchase at the farmgate, picking up a small quantity of the best-quality produce and more of the lower-quality bananas, which is sold to local consumers.

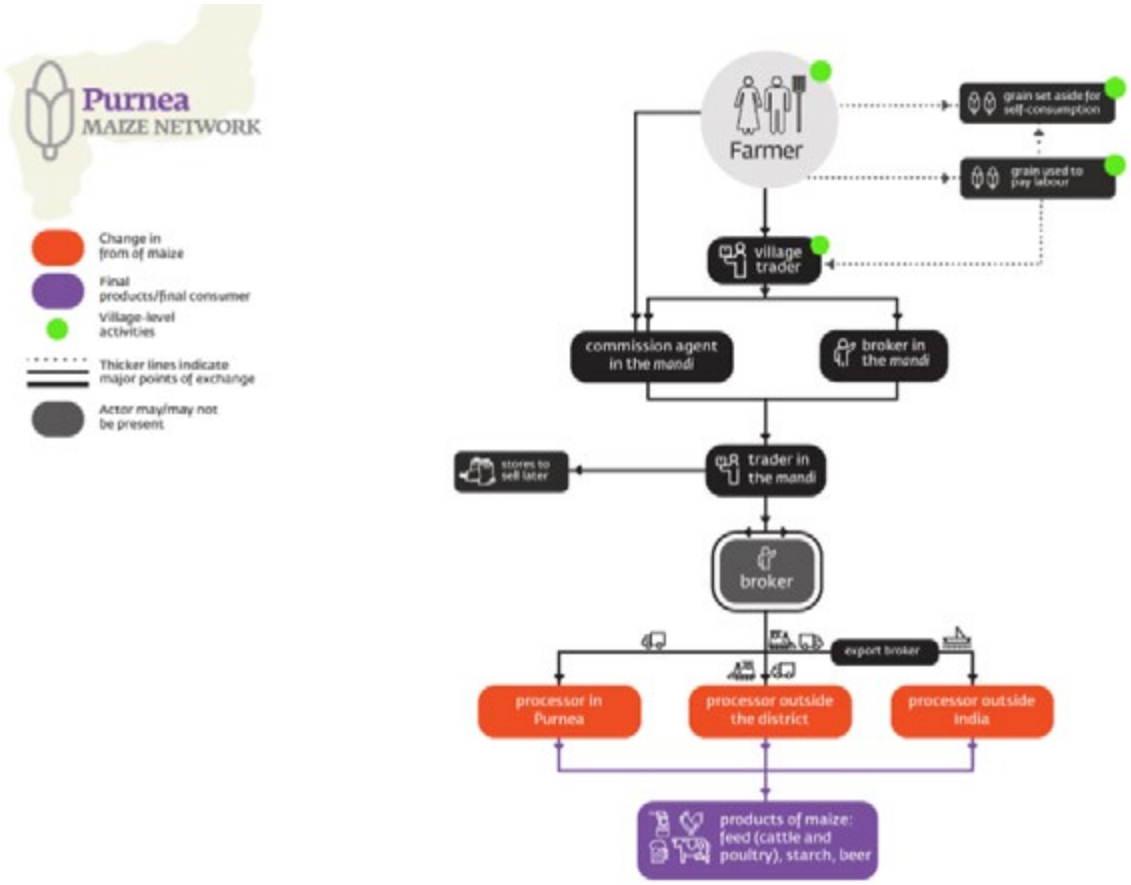


Figure 13.5 Maize Network in Purnea

Maize is a major crop produced during rabi in Purnea, unlike other parts of the country where maize is produced in kharif. The crop is sown between December and January. The harvest begins at the end of March and continues till May. The marketing continues in a staggered form by village intermediaries and traders who could hold the crop due to high moisture or in anticipation of favorable prices till September.

Due to their small quantities, limited bargaining power, and inability to undertake logistical costs, farmers usually sell their produce to an intermediary who further takes it to the trader in the famous Gulabbagh mandi.

A broker's position in Gulabbagh has gained importance with an expansion in their numbers from 30 in the early 2000s to 500 in recent years. The brokers are the solution to counter-party risks between village traders and the buyers in the mandi. The brokers ensure that the village traders are paid in a timely manner by the (usually unknown) buyers.

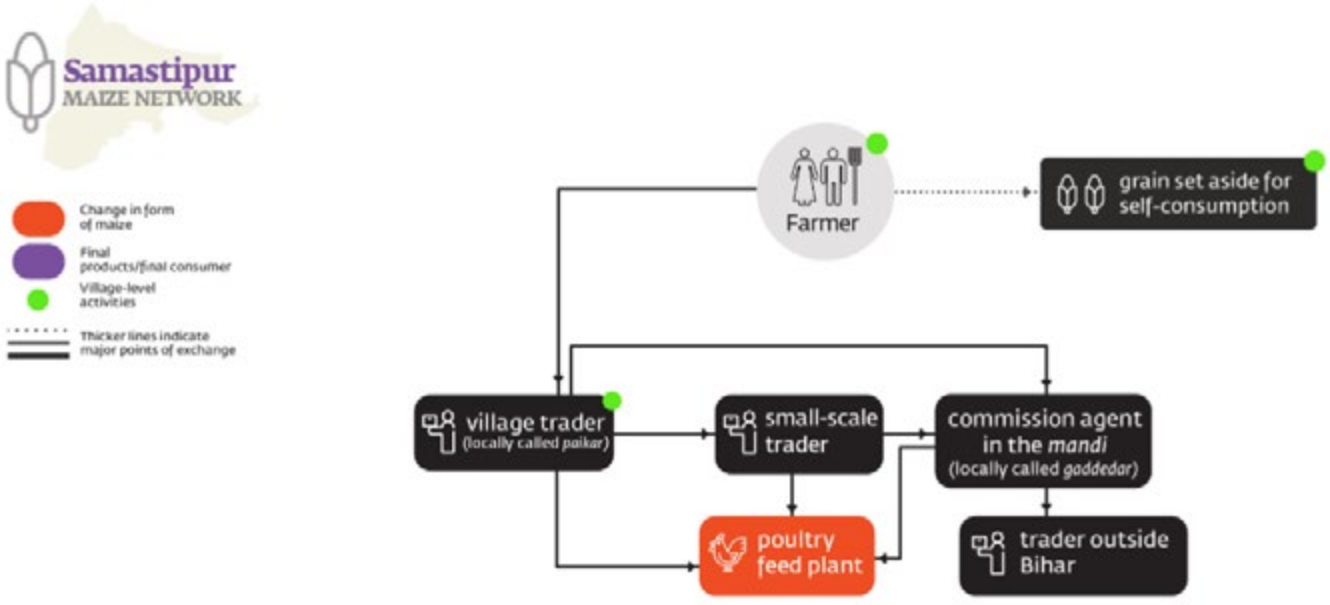


Figure 13.6 Maize Network in Samastipur

Samastipur's Khanpur and Bithan blocks are the major production sites of maize in the district. The major sowing season for maize is rabi and the short post-rabi season between rabi and kharif, with small amounts being grown during kharif. The harvesting and marketing of rabi and post-rabi maize are conducted during May and June, while the kharif-cultivated maize is marketed during September. Farmers also grow the white variety of maize, which is also used for home consumption.

Farmers sell the maize to village-level intermediaries who further sell it to larger traders or commission agents to send the produce outside the district. The village traders offer pre-sowing credit to farmers and have been connected to them for decades.

The presence of poultry-feed mills ensures a regular demand for maize, but the quality of Samastipur's maize is considered low in comparison to other maize-producing districts in Bihar. Large traders thus resort to buying from other districts, including mandis like Gulabbagh where the produce is better in quality and lower in price when there is a plentiful supply. They have the capacity to sell the maize to the mills on credit, which prefer to pay back over three months.

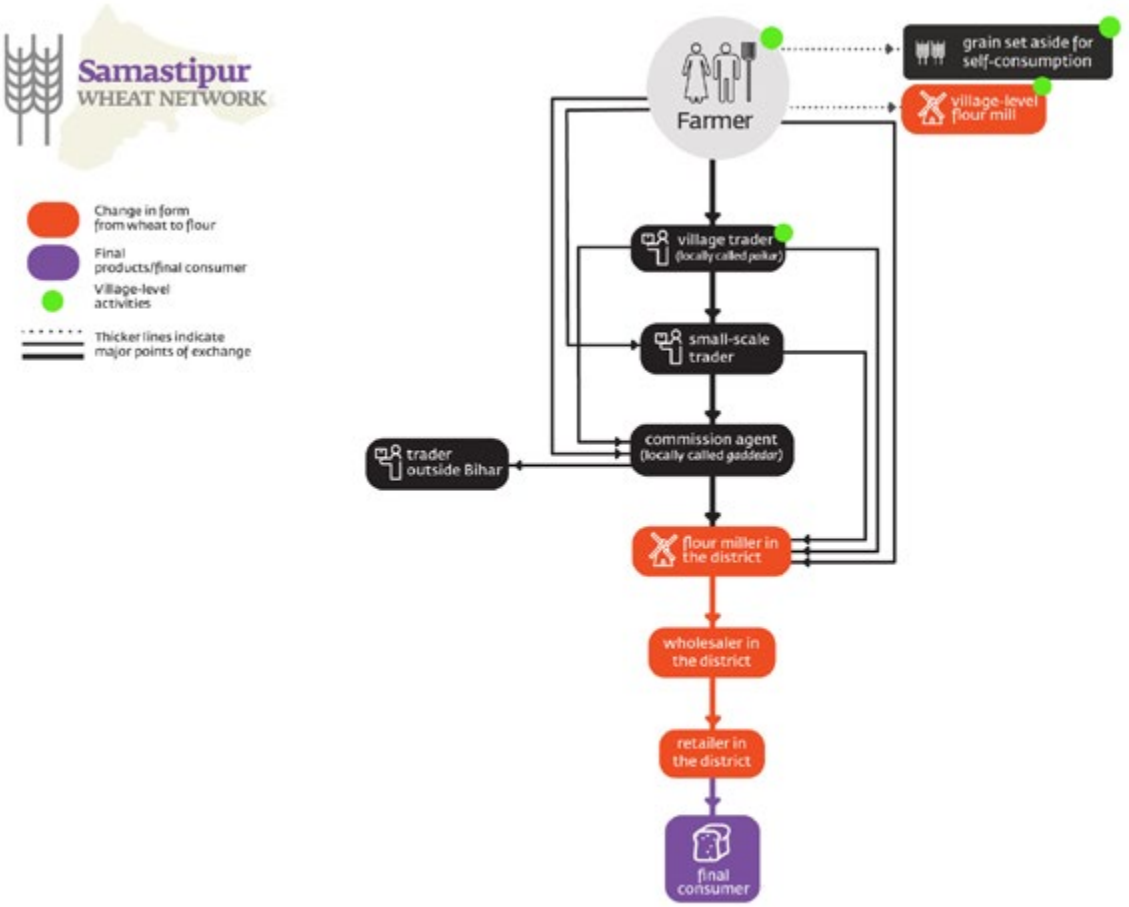


Figure 13.7 Wheat Network in Samastipur

The cultivation of the wheat crop in Samastipur is spread across the district as the local population consumes the crop. It is sown between October and December, with its harvesting and marketing being conducted in March and April.

As is the case for all grains in Samastipur, wheat is also sold by farmers to the village traders. A few large farmers are able to sell the crop to a commission agent or directly to the flour mills in the district. Farmers usually receive instant payments, irrespective of the buyer. They are also exposed to arbitrary price cuts on account of poor quality of the produce. A state procurement system exists for wheat, but its inactivity leads to sales being made below the MSP to private players.

Millers prefer to purchase from those who can extend credit lines and sell in large quantities. There are local flour brands in Samastipur, which are marketed by the millers of the district.

13.2 Odisha

13.2.1 Balasore

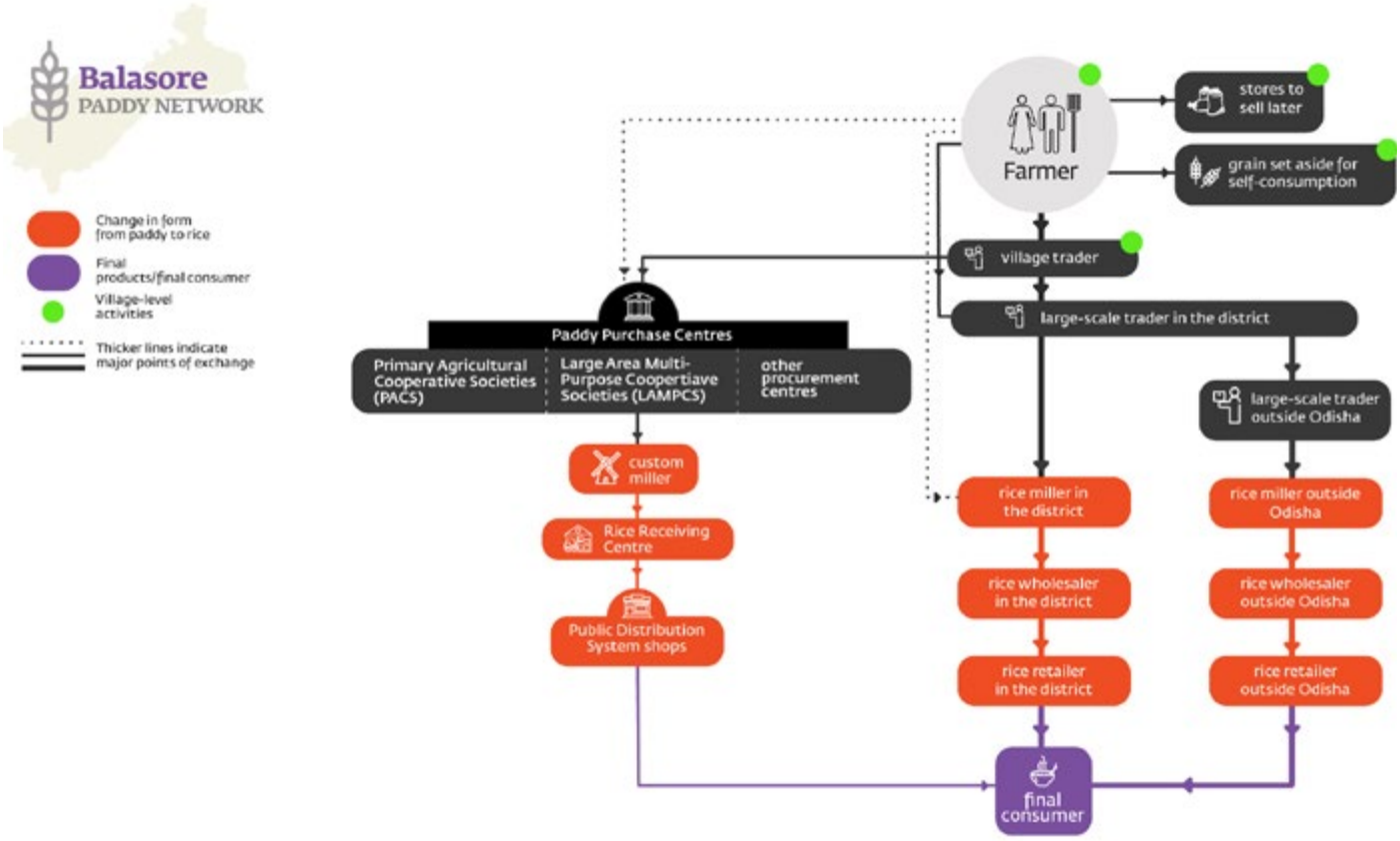


Figure 13.8 Paddy Network in Balasore

Balasore is a paddy-centric district, with the crop having the largest area under cultivation in both kharif and rabi seasons. While it is cultivated across the district in kharif, its production is more prominent in the northern blocks of Balasore in the rabi months.

The district portrays a clear picture of the state's inability to make its paddy procurement operation reach the small and marginal farmer. Delays in paddy procurement and payments keep them out of the system. Consequently, they are forced to sell their produce to the village intermediary. These intermediaries pay prices below the MSP while ensuring services like farmgate collection of the produce, credit, transportation, and timely payment. Most of these aggregators sell the produce to traders in the neighboring state of West Bengal in Sonakania, bordering Balasore's Jaleswar block, or Andhra Pradesh. The traders further supply paddy to millers in these states or through other intermediaries depending on their ability to extend credit to the buyers.

The traders outside Odisha are connected to village intermediaries in Balasore from whom they purchase paddy regularly. These intermediaries act as the agents of traders from other states and are often the large farmers of the village from where they aggregate. These intermediaries make instant cash payments, which make them preferred buyers compared to the alternative of selling to the state paddy purchase centers.

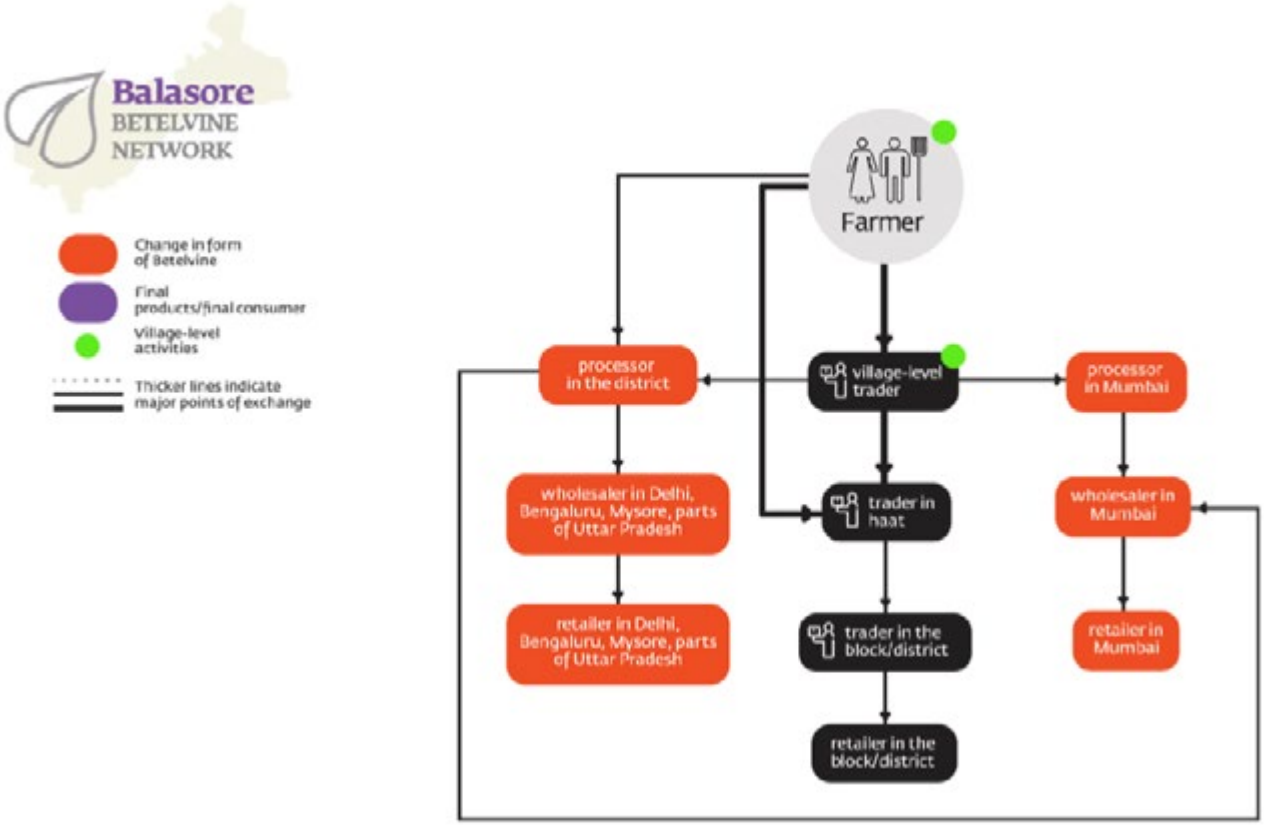


Figure 13.9 Betel vine Network in Balasore

Betel vine is grown in Balasore's northern blocks of Bhograi, Baliapal, and parts of Basta in sandy soils. Betel vine sowing is mainly done in the monsoon month of July, while harvesting and marketing are carried out by farmers throughout the year at gaps of 15 days. The production volume is relatively higher in the monsoon months in comparison to winter.

The main sites of exchange for betel vine are the farm gate and the haats. Traders often enter into contract- farming-like arrangements with the farmers where a rate is offered to the farmers for an entire piece of land where betel vine cultivation is being carried out. The trader himself becomes responsible for the harvesting and marketing of the crop and is sometimes also a processor of betel vine.

Some of the oldest betel vine haats in the district, dating back centuries, are located in Balasore's Baliapal block. Farmers directly sell to the traders in these ***haats*** and receive cash payment instantly. The transactions are settled in the market within two hours, after which the haat is cleared out for the day. One haat is available to farmers to sell the betel vine on six days of the week. These markets are either regulated by panchayats or upper-caste families who have rights over the land where these markets function.

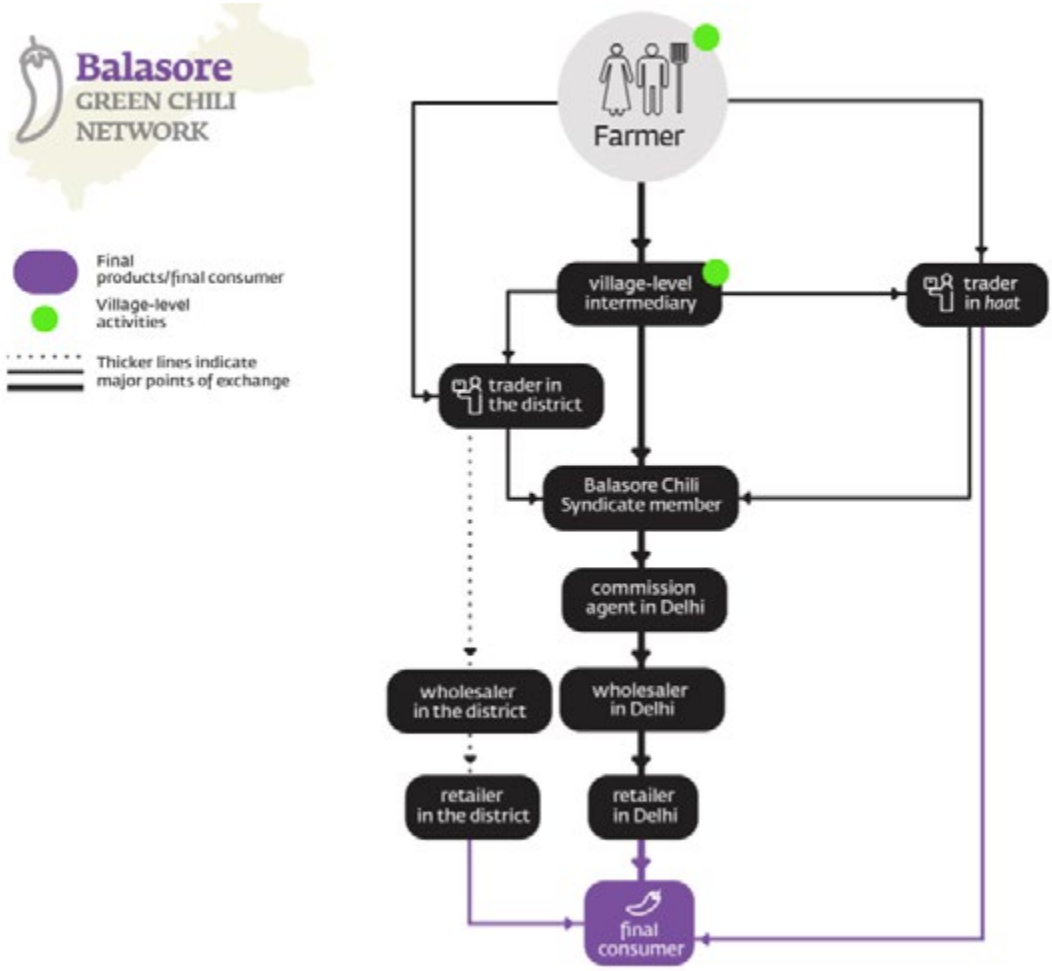


Figure 13.10 Green Chili Network in Balasore

Green chili cultivation is prevalent in Balasore's central blocks of Balasore Sadar and Remuna. The sowing is carried out between October and December, and the harvesting and marketing are done between January and March.

The majority of the sales occurs at the village level through over 100 intermediaries, connected to the members of the Balasore chili syndicate. The chili syndicate is essentially a group of 22 traders who have pooled in their resources to conduct the purchase operations at the village level through intermediaries. During the sowing season, they provide cash to the intermediaries, who use this to offer credit to farmers for inputs. The farmers are also reliant on these intermediaries to provide an assured sale outlet and price information, based on which they make their cultivation decisions. The price offered to the farmers at the time of harvest is decided collectively by the syndicate traders based on the prevailing prices in Azadpur, the major mandi in Delhi, to which they supply the green chili.

Farmers also sometimes take the produce for sale at haats or market sites at the district headquarters from where the traders further supply the produce to the syndicate traders.

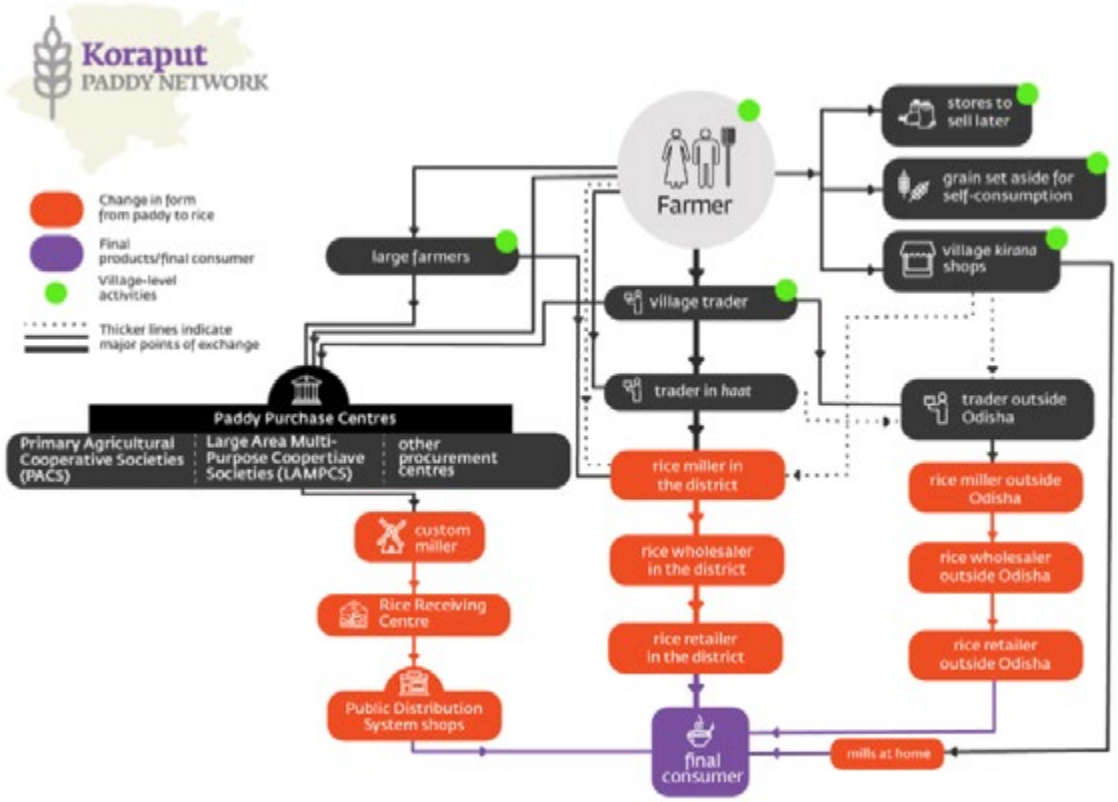


Figure 13.11 Paddy Network in Koraput

Paddy is cultivated across Koraput district as a consumption crop. Its cultivation is particularly high in the blocks of Jeypore subdivision, namely, Kotpad, Jeypore, Boriguma, and Kundura due to the flat terrain. It is cultivated in both kharif and rabi. The sowing months are July and January–February, respectively, in the two seasons. Paddy is harvested between October and December for the kharif crop and between May and June for the rabi crop. The marketing is higher during the peak harvest months, but farmers continue to sell the crop throughout the year in small batches when in need of money.

The majority of sales are made either at the village level or at the haat level. The large farmer or the haat trader acts as an aggregator to sell the farmers' produce to a mill. A common site of sale for the farmers of Koraput is the local provisions or kirana store where they sell their paddy in exchange for other grocery and household items. The ***kirana*** store owner then plays the role of the aggregator to supply to mills within or outside Odisha. Large quantities of paddy are sent to the neighboring state of Andhra Pradesh.

Farmers rarely engage with the state procurement mechanism themselves due to its absence, late payments, and deductions on account of quality. They allow an intermediary to sell their paddy to the procurement centers, take the immediate cash payment, and credit the amount to them once the state transfers it to their bank account.

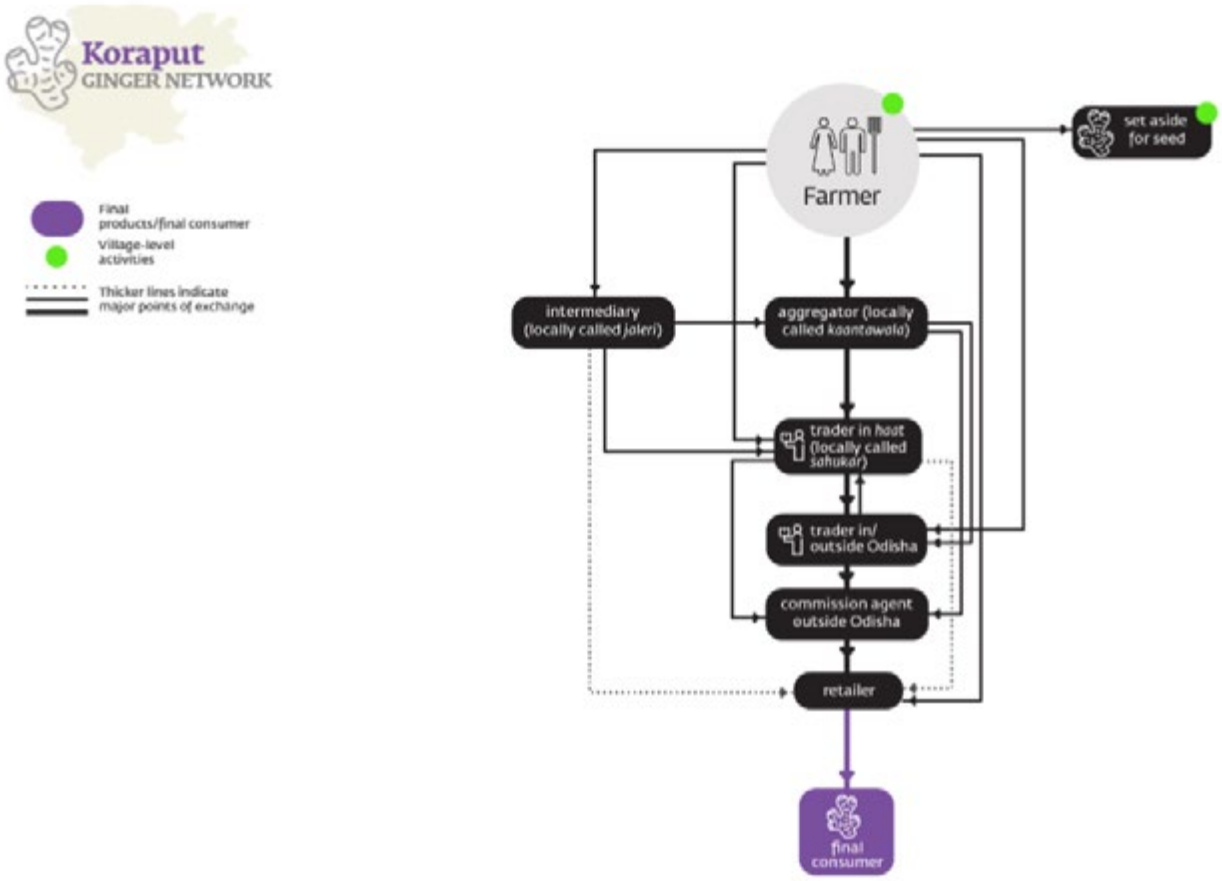


Figure 13.12 Ginger Network in Koraput

Ginger is a major cash crop grown primarily in the south-western blocks of Semiliguda, Pottangi, and Nandapur of Koraput district. It is sown between April and June and harvested and marketed between July and January.

The aggregator at the village level collects farmers' produce to sell in one of the haats of Koraput. Farmers also send the produce to a trader or a commission agent outside Odisha. The big traders in the Kunduli haat in the Pottangi block, located at the center of the ginger cultivation region, prefer to purchase ginger from intermediaries or aggregators (also called ***dalals***) instead of individual farmers with small quantities. The dalals are able to make instant cash payments to the farmers in case the traders are low on liquidity. At the same time, the farmers also prefer village-level transactions as the aggregator comes with his jute bags, labor, and weighing machine, taking care of any logistical cost the farmers would have to bear if they went directly to the haat.

It is also common for farmers to hedge risk and enter into contract-farming-like arrangements with the local intermediaries, including the ***kaantawalas*** and ***sahukars***. The intermediary is then responsible for the harvest and sale of the farmer's produce and pays him the price based on the area of land and estimated harvest quantity.

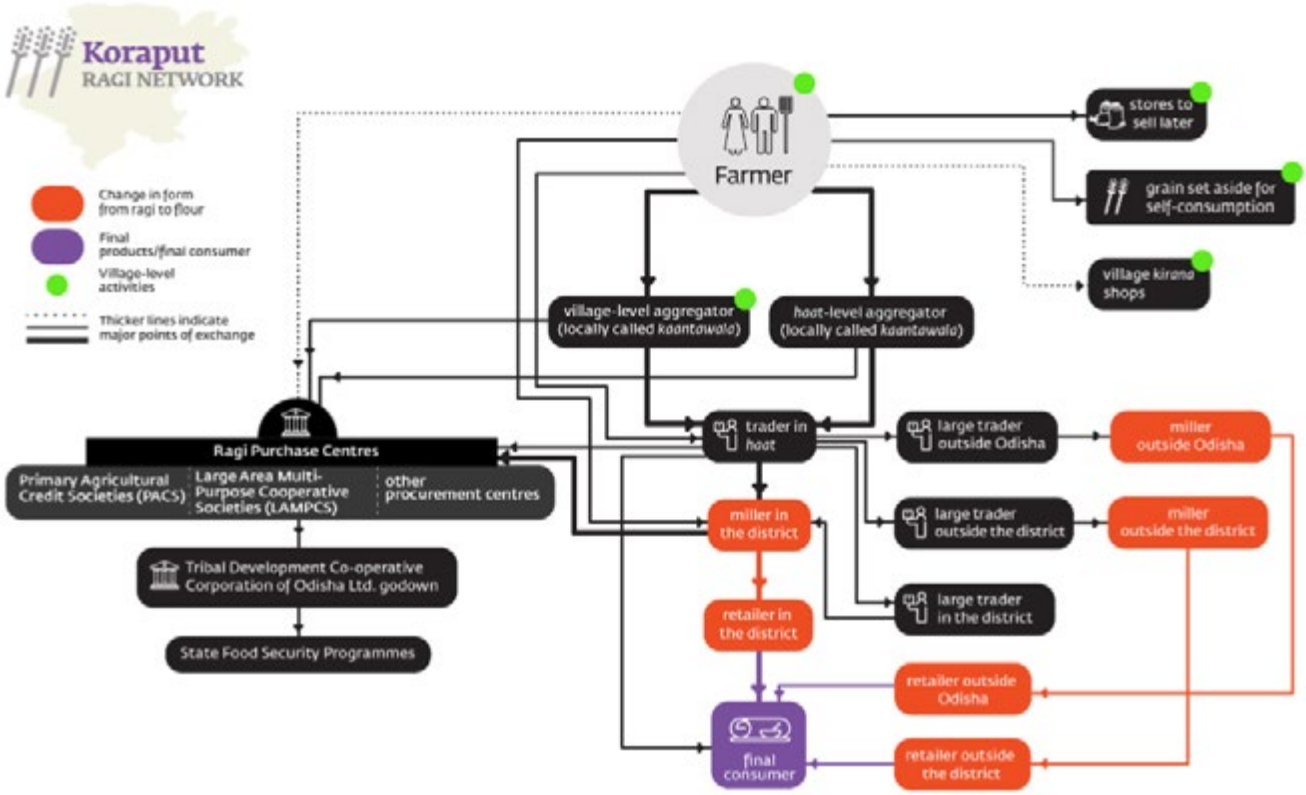


Figure 13.13 Ragi Network in Koraput

Ragi is grown across all blocks in Koraput district and is particularly prevalent in the tribal-dominated blocks of Narayanpatana, Nandapur, and Bandhugaon. The crop has been cultivated for generations using seeds preserved within the family and was grown largely for self-consumption. Like paddy, it is also sold in small quantities when farmers need cash. The crop is sown in July and harvested between October and December While most of the marketing takes place during the harvest months, smaller quantities are sold throughout the year.

The marketed ragi is aggregated at the village or sold to kaantawalas, who further sell it to traders to supply to the millers. Farmers are paid in cash at the time of sale. Some of these traders are owners of mills which clean the ragi. Traders from other states come to the haats to purchase ragi, and the produce is also sent by Koraput's ***haat*** traders to mills in other states, including Maharashtra and Andhra Pradesh.

State procurement of ragi was started in the 2018–19 Kharif Marketing Season. This was a pilot year for the Tribal Development Co-operative Corporation of Odisha, which was still in the process of learning how to run the procurement operations. They made quality cuts on the price of ragi paid to farmers and as a result farmers decided to sell to millers, who would then take the cleaned ragi to sell at the ragi purchase centers.

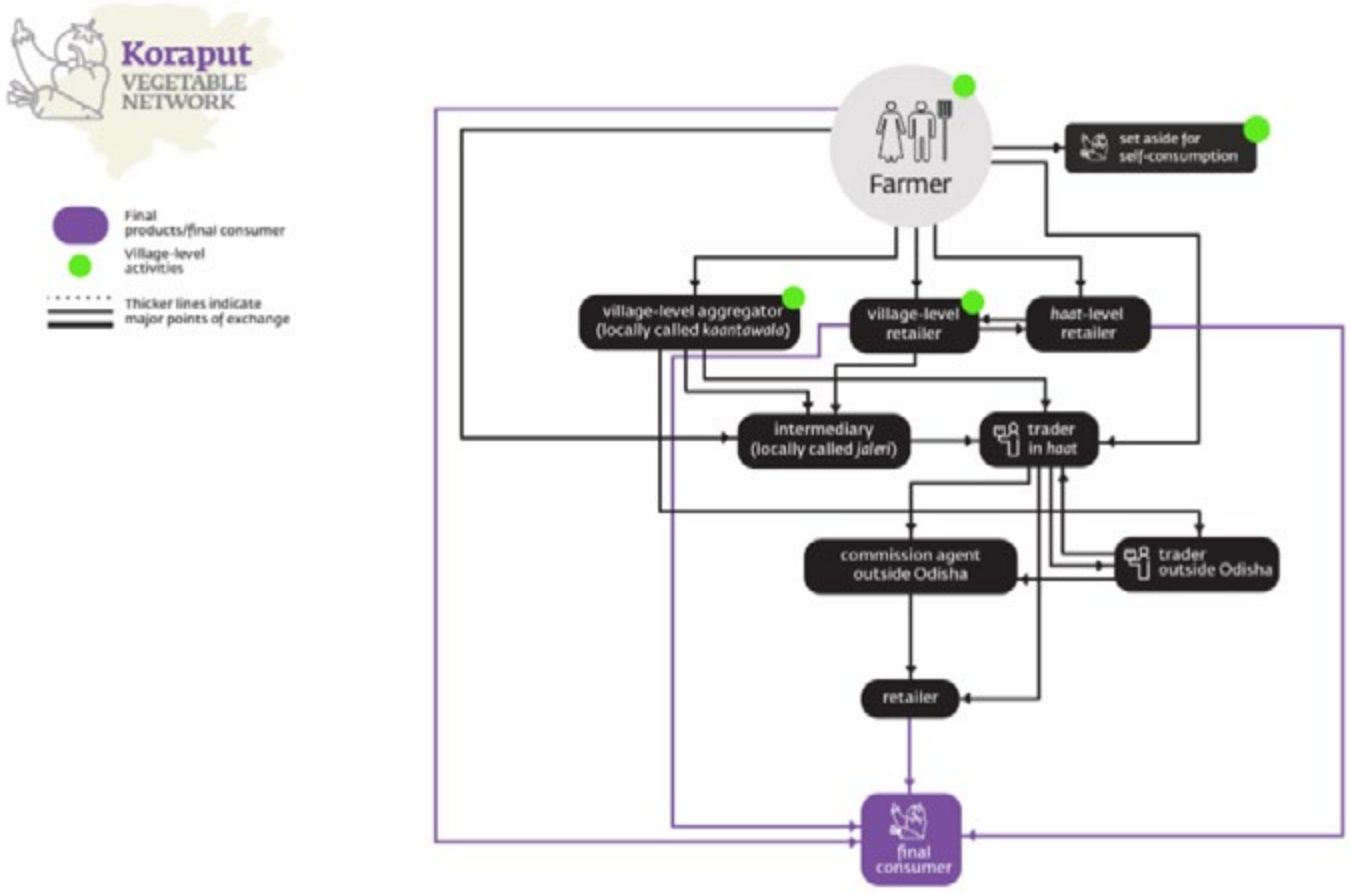


Figure 13.14 Vegetable Network in Koraput

A diversity of vegetables—including tomato, brinjal, cauliflower, potato, jackfruit, and cabbage—is grown across all blocks of Koraput throughout the year. Farmers harvest and sell small quantities every few days.

Some farmers prefer to sell the vegetables themselves as retailers. They go from haat to haat every day of the week to sell small quantities of vegetables to traders or intermediaries. They have at least one haat open to them every day of the week to sell their vegetables in the district. Much of the trade takes place between traders of Koraput and Andhra Pradesh. The proximity and alternating vegetable production cycles keep the vegetable trade going between the two locations. This has also impacted the traders' payment relations, leading them to often settle by supplying vegetables to each other, instead of paying cash.

Some of the village aggregators are from other blocks within Koraput or from the neighboring districts of Kalahandi and Malkangiri. They come to the villages with their pick-up trucks, having already connected with one farmer to aggregate the produce of a few more farmers in the village. They then send the produce to traders in other states via buses.

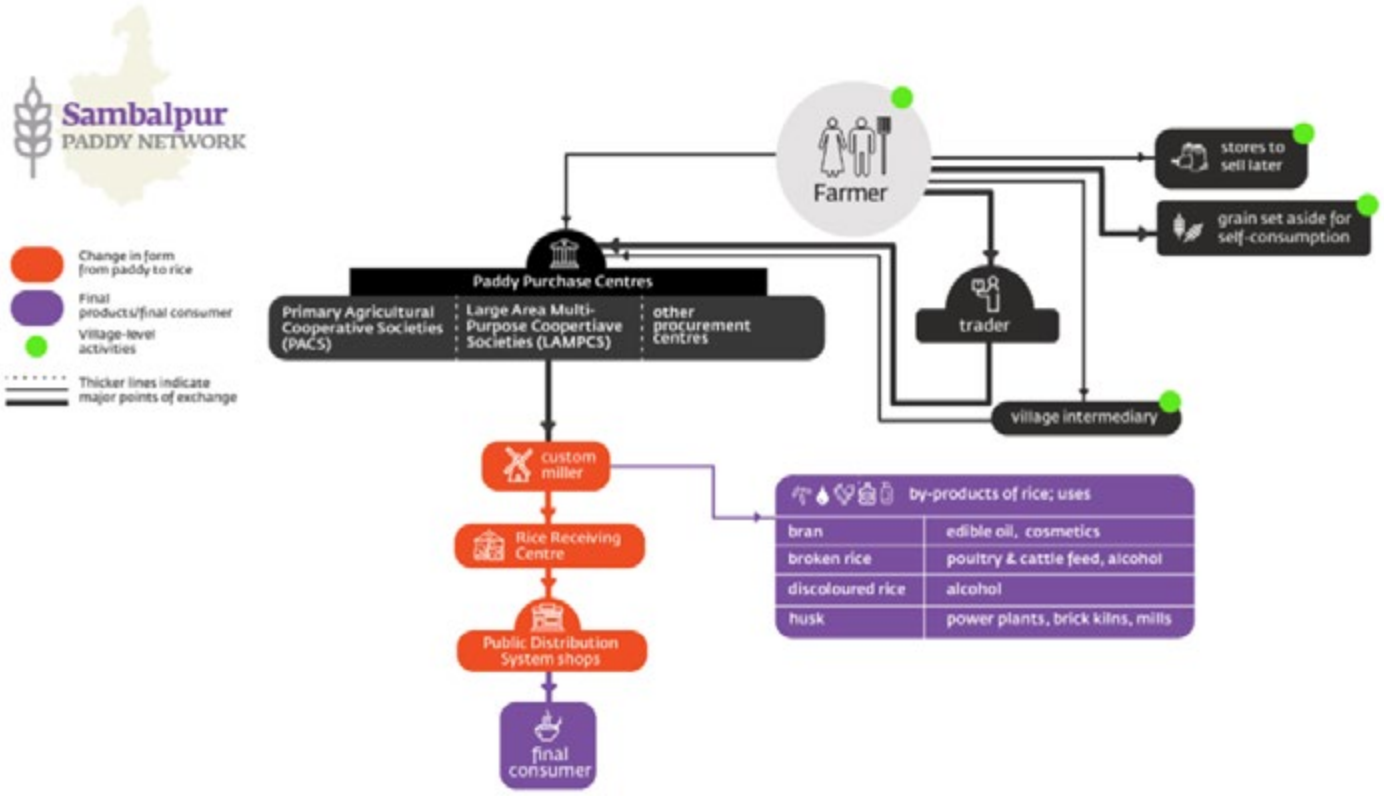


Figure 13.15 Paddy Network in Sambalpur

Paddy is cultivated across all blocks of Sambalpur districts in over 85% of the total cultivated area in kharif. The production in rabi is restricted to the western blocks of Dhankauda, Maneswar, Jujumura, and Rengali, which are covered by the canal irrigation system of the Hirakud Dam. Kharif sowing is done in July, while rabi sowing is completed by end January to mid-February. Kharif paddy is harvested and marketed in November and December, and rabi paddy is harvested in May and June. Paddy marketing often continues beyond these months, particularly in areas where the state procurement mechanism has not been actively implemented.

Sambalpur provides a functioning procurement system to farmers, particularly in the command area, where the influence of farmers' movements has forced the state to react by setting up procurement yards across the district. However, many of the district's yards are functional only on paper, and the procurement system is largely in the hands of rice millers, marketing committees and Primary Agricultural Cooperative Society (PACS) officials.

The millers and officials often do not perform proper quality checks and impose arbitrary cuts over the MSP. The delays associated with the procurement mechanism and the logistical costs continue to keep many farmers out of the process, who prefer to sell their produce to village traders. These traders aggregate the produce of multiple farmers and take it to the paddy purchase centers. The village traders are also often the agents of rice millers and are a source of input credit for the farmers.

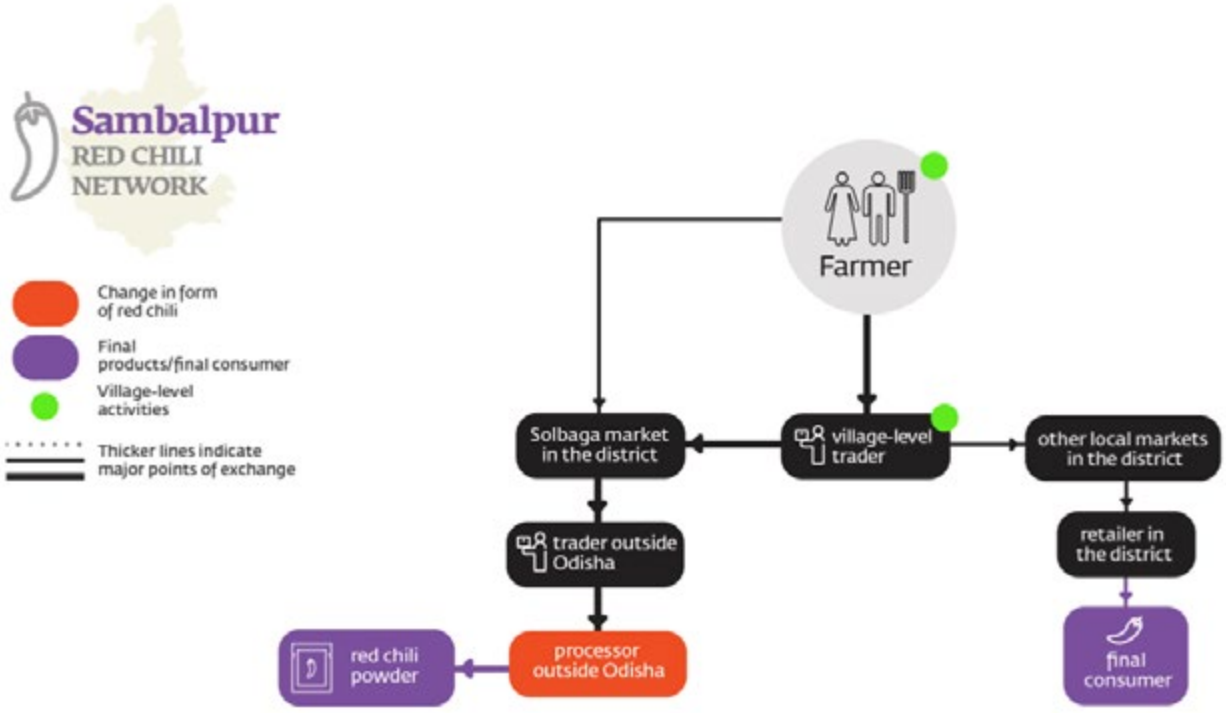


Figure 13.16 Red Chili Network in Sambalpur

Sambalpur's northern blocks of Kuchinda and Bamra are the historical cultivators of Sambalpur's famous red chili, known for its distinctive spiciness. The crop is sown in September and October and harvested primarily in February and March. Its marketing continues till September.

Farmers sell their produce to village traders. Depending on the remoteness of the village, the produce is exchanged between multiple intermediaries before reaching a trader in Bamra's Solbaga market. This trader aggregates the produce from the village traders or large farmers. He then sells it to traders from other districts of Odisha present in this market. These are the large traders responsible for transporting the chili to the other states, where it is processed. There are no processing units in Sambalpur's chili-producing blocks.

The village intermediaries make instant payments to farmers at the time of purchase, but the Solbaga traders hold off the payments, often asking the intermediaries to take the money from them the next time they come to the market to sell chili. This ensures that the intermediary remains tied to the same trader who is yet to pay his dues. Some of these traders are also tied to specific farmers and village intermediaries who regularly sell their chili produce to them.

Diligent efforts have been made by the Kuchinda Regulated Marketing Committee to operationalize the chili trade on the eNAM platform, but the powerful intermediary lobby has prevented this from happening. The associated bureaucratic hassles and low prices on the platform have also kept the farmers at bay.

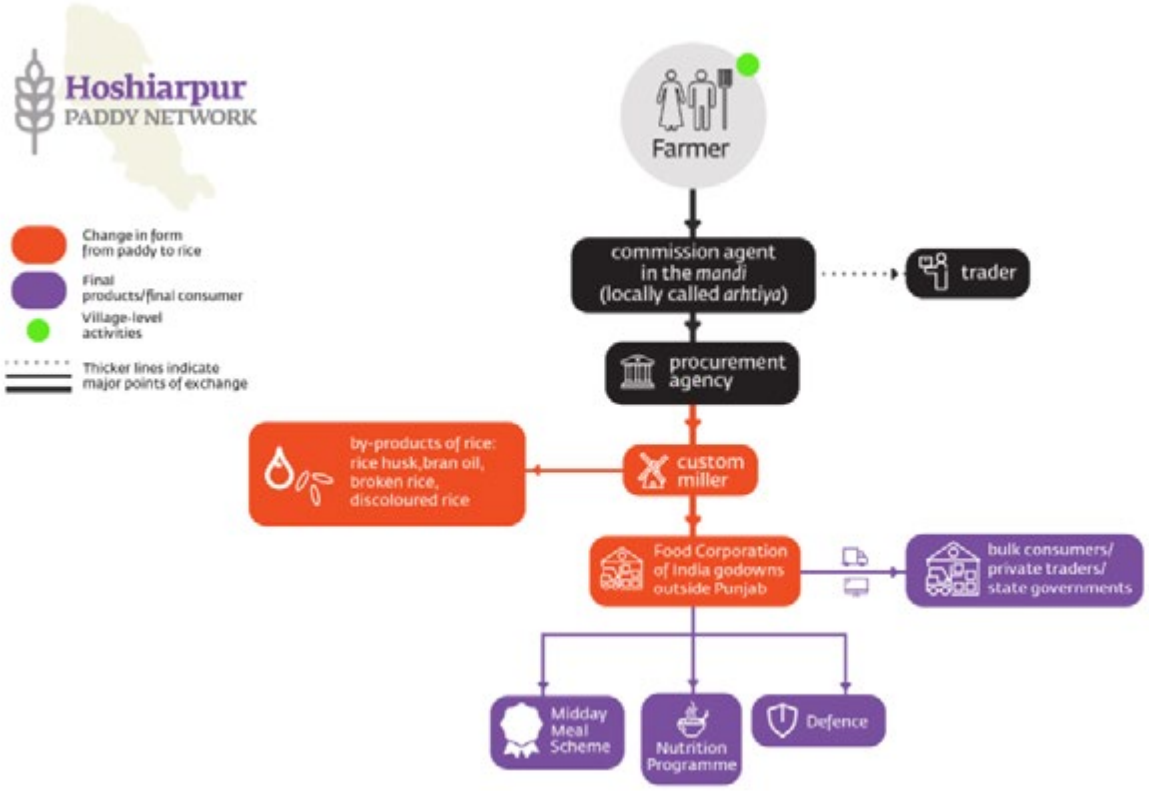


Figure 13.17 Paddy Network in Hoshiarpur

Paddy is grown across all blocks of the Hoshiarpur district, but the major production areas are concentrated in the flatlands of the northern blocks of Talwara, Dasuya, and Mukerian along the Beas river. The sowing is done in June and July, while the harvesting and marketing are completed in October and November.

A non-consumption crop for the local population, over 95% of the produced paddy was sold by the farmers at the state's regulated markets in Kharif Marketing Season 2018–19. In addition to the active year- round mandis, several seasonal focal points crop up across villages to provide an easily accessible market site to farmers. The responsibilities of purchase and lifting of produce across mandis are divided between the Food Corporation of India (FCI) and one of the five state agencies. The farmer's first point of contact in the mandi is the commission agent or ***arhatiya***, who cleans and dries the grain for the farmer with the help of mechanical cleaners and labor before bagging it to transfer to the custom millers. The responsibility for transportation lies with the agencies, which they often delegate to the arhatiyas.

After milling, FCI receives the custom-milled rice to meet the requirements of the Central Government's food security programs. FCI routinely transfers paddy from Hoshiarpur to the northern Indian states of Himachal Pradesh and Jammu & Kashmir.

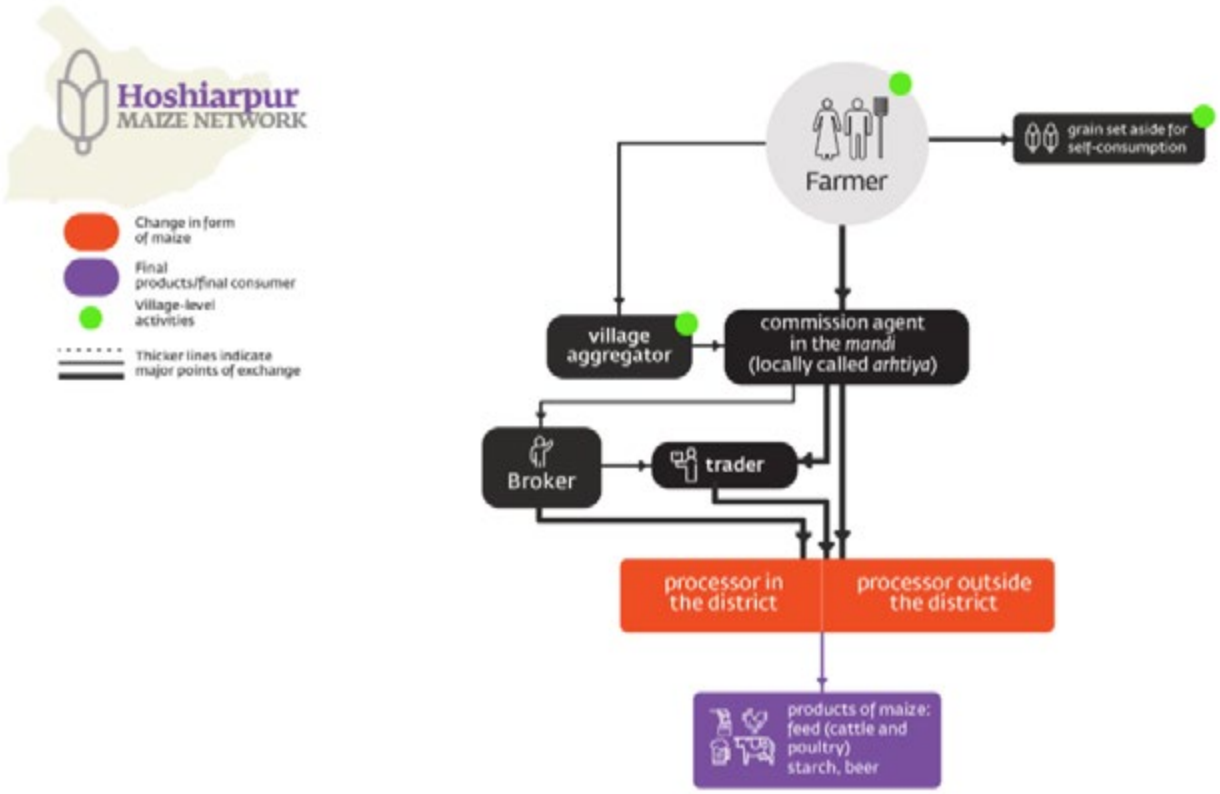


Figure 13.18 Maize Network in Hoshiarpur

Maize production in Hoshiarpur is concentrated in the central and southern blocks of Hoshiarpur-2 and Mahilpur. Hoshiarpur grows maize in three seasons, of which kharif maize is the most prominent. It is sown between May and July and harvested between August and October. Some farmers or village intermediaries have the storage capacity to continue to market the crop in the winter months when the prices rise.

Farmers market the crop themselves at the Hoshiarpur or Saila Khurd mandi, which are situated close to the crop production centers. Auctions are conducted every day in the Hoshiarpur mandi in the presence of traders, brokers, and processors, while in the Saila Khurd mandi, the arhatiyas buy the crop themselves at a fixed price, depending on the crop's moisture levels.

The crop is either purchased by a trader to later sell to the processor or routed via a broker. Some commission agents are in direct touch with processors, including poultry and cattle-feed processors, many of whom are located within the district and the state. A big buyer is the starch mill in the neighboring district of Kapurthala.

Farmers who live in the hilly terrain of Hoshiarpur market small quantities of indigenous varieties of maize. They prefer to sell it to a village aggregator who undertakes the journey to the Hoshiarpur mandi.

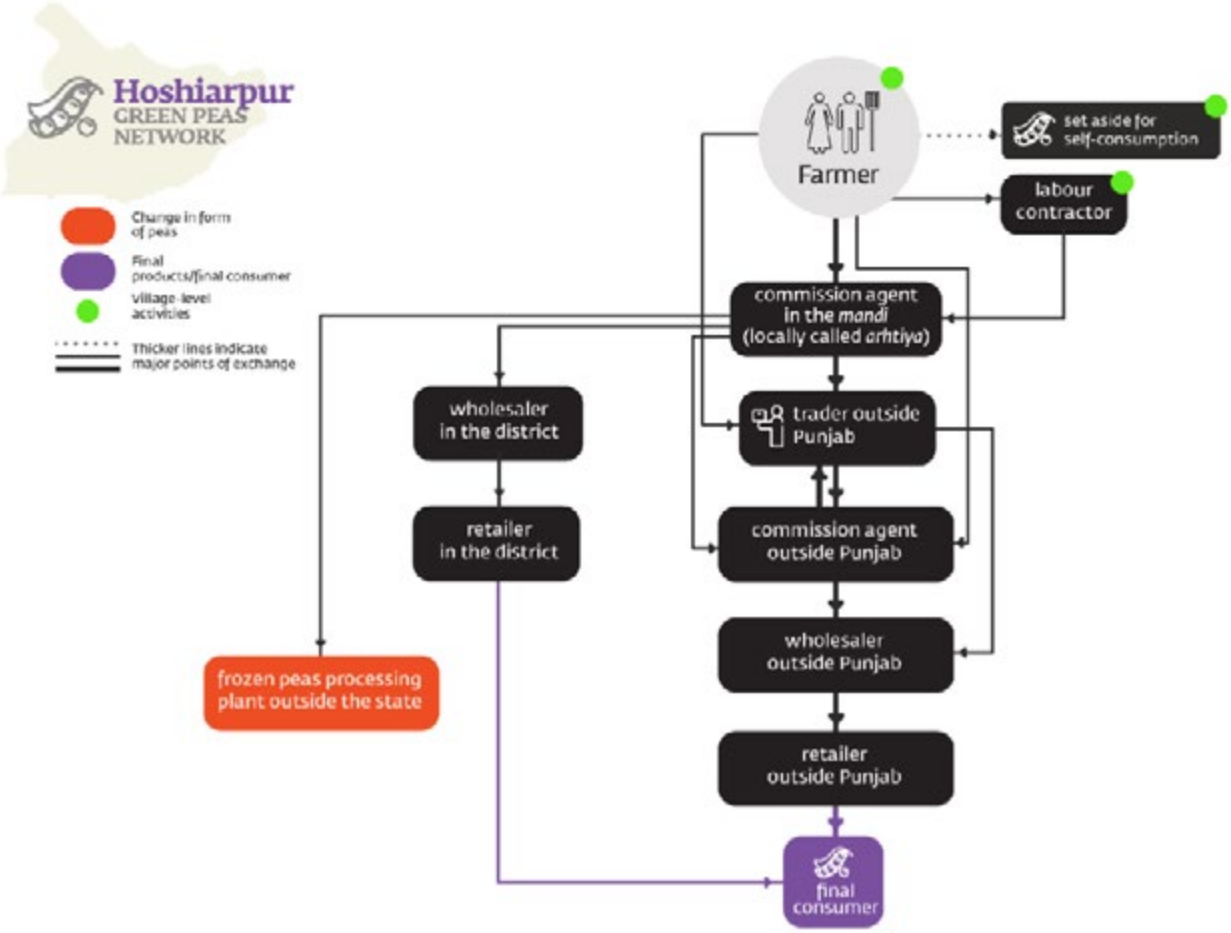


Figure 13.19 Green Peas Network in Hoshiarpur

Peas are cultivated at scale in Hoshiarpur's southern blocks of Mahilpur and Garhshankar. The sowing is completed between mid-September and early October, and the harvested crop enters the market in November. The volumes taper off by early January.

The crop is marketed by the farmers in the Chabbewal mandi, located in the Hoshiarpur-2 block. The mandi is believed to be the largest for peas in Asia and has new entrants in the form of traders and arhatiyas every year in the hope of making quick profits through the dynamic marketing season. Traders come from across the country and purchase the crop through an arhatiya to whom they pay a commission for the services offered in terms of extending credit to the traders, making timely payments to the farmers, weighment, and labor services. These traders have contacts with commission agents in mandis across the country. Produce is sent to the commission agents either on the trader's own account or on an order basis. The risks are higher if the trader takes ownership of the produce as he becomes the bearer of any losses that might occur during transportation to or sale in the destination mandi. The commission agents from other states are also present in the Chabbewal mandi, supplying not only to their mandis in other states but also to other commission agents in other mandis.

Some arhatiyas in the Chabbewal mandi are connected to frozen peas processors, who purchase peas at the end of the marketing season when the prices are at their lowest.

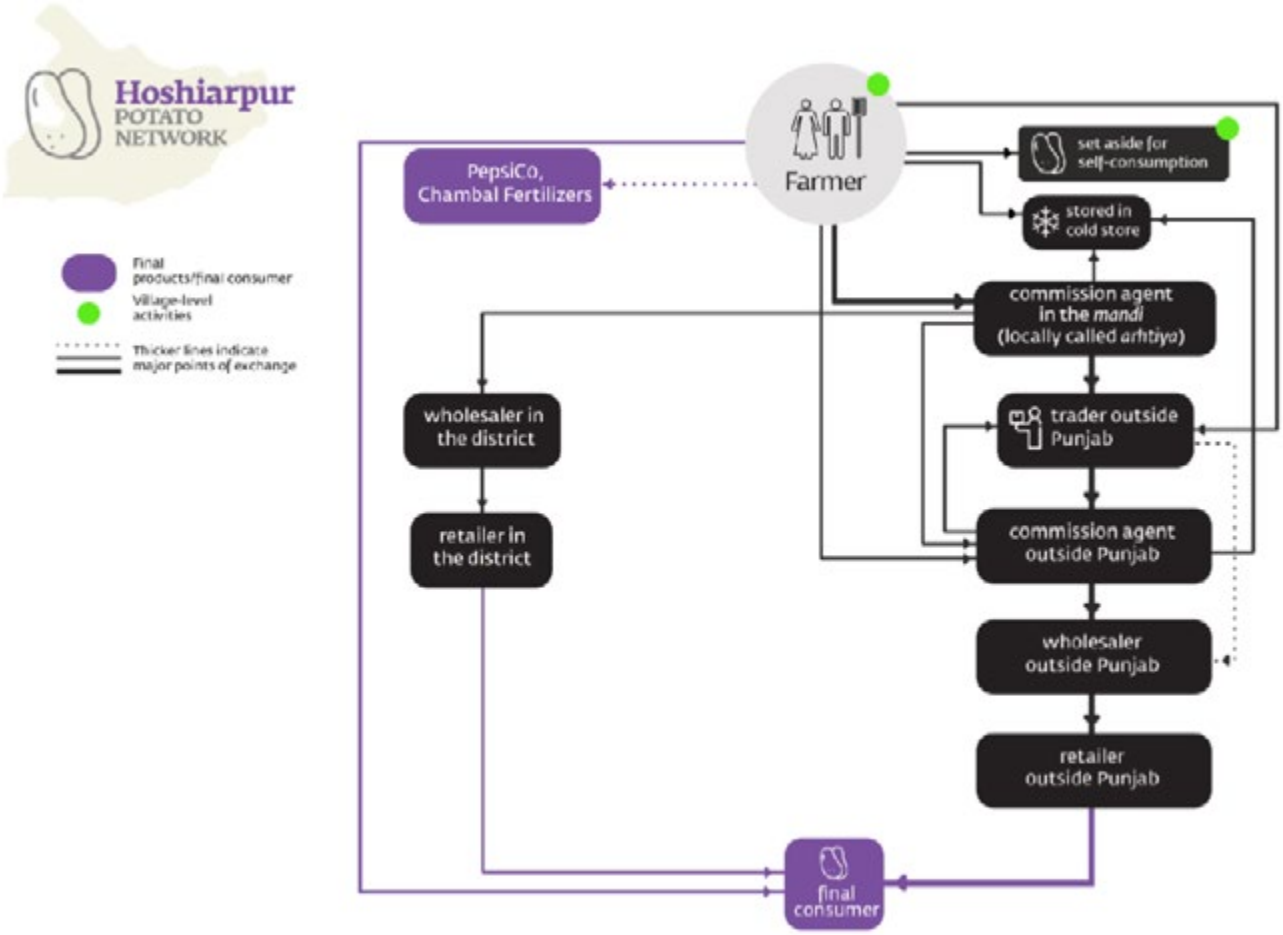


Figure 13.20 Potato Network in Hoshiarpur

The cultivation of potatoes is largely concentrated in the central blocks of Hoshiarpur-1 and Hoshiarpur-2. There are two sowing seasons for the crop, for a two-month harvest and a three-month harvest. The first crop is sown in August and September and is ready for harvesting and marketing in November. The next crop is sown immediately after the harvest of the first crop, and the sowing cycle may continue up till March. The marketing of fresh potato is completed by early June.

Potato is often picked up at the farmgate as it is a bulky commodity, and farmers are commonly able to produce enough to fill up a 9-ton truck, which transports it to consumption centers in Uttar Pradesh, Delhi, Rajasthan, and Himachal Pradesh. This helps save the costs of loading and unloading that would occur if the produce were brought to the mandi. It also reduces the transportation time to the final destination. The local arhatiyas connect traders and commission agents from other states to the farmers in the villages. The transportation cost, in this case, becomes the intermediary's responsibility.

Many farmers have had long trading relations with commission agents from Delhi's Azadpur mandi. Farmers receive credit from them at the time of sowing and send the produce via trucks to Delhi at their own cost. This practice has declined over the years as traders have begun coming to villages to buy the farmers' produce directly.

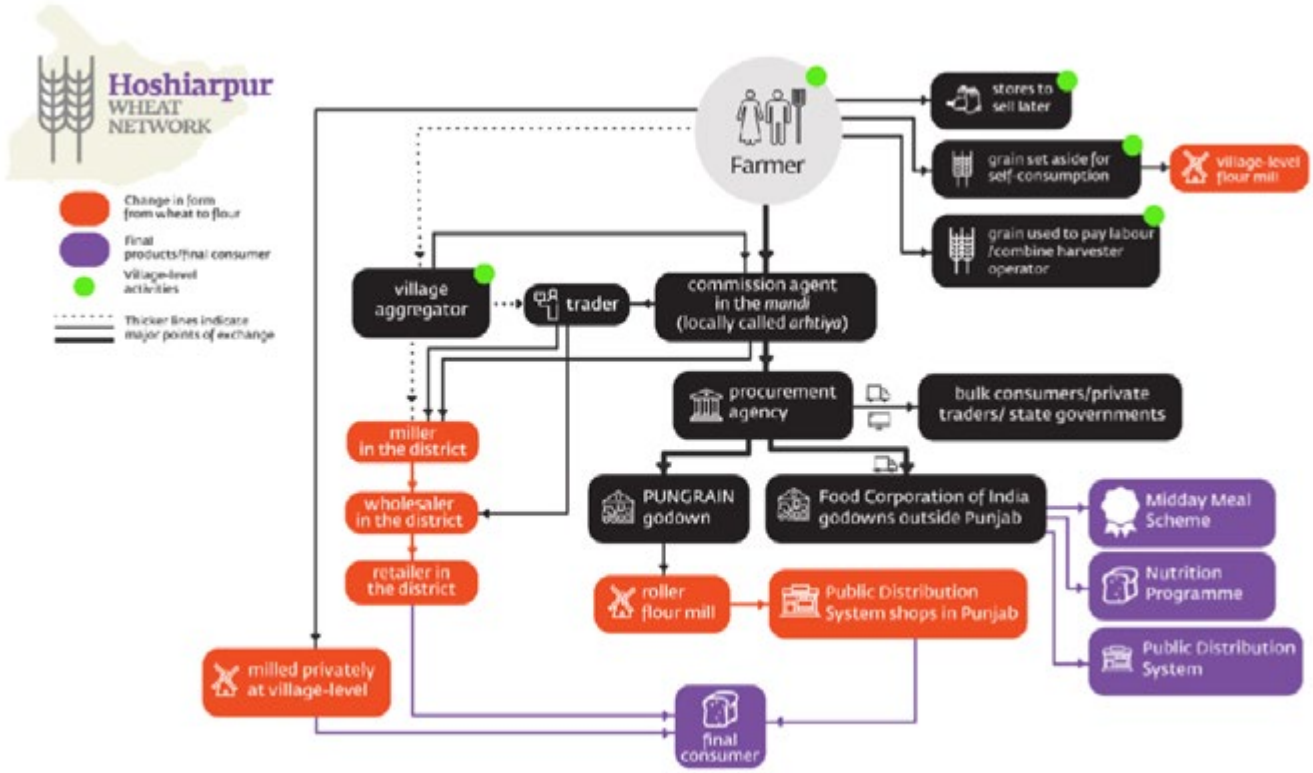


Figure 13.21 Wheat Network in Hoshiarpur

Wheat is cultivated across the Hoshiarpur district. The maximum area under wheat cultivation is in the northern blocks of Hazipur, Mukerian, and Dasuya. Wheat is sown in December and harvested in April and May. The marketing is also done in the harvest months when the state procurement mechanism is active, but some farmers store a small amount to market in off-season months when in need of money.

The major portion of the crop is sold to the state procurement agencies through the arhatiyas in the regulated mandis. Private participants, including traders and millers, are also present in the mandis during the marketing season. They purchase the crop from the commission agent once it has been cleaned and packed at rates slightly above the MSP.

The Punjab government uses wheat for its own food security programs. Punjab Grains Procurement Corporation Ltd. (PUNGRAIN) exclusively procures to fund the state's ***atta dal*** scheme, while other agencies transfer the procured produce to the FCI. The grain is then either used by the FCI for the Central Government's food security programs or sold to private or government buyers through the FCI's Open Market Sales Scheme via e-auctions. Farmers who live in the hilly areas of the district, have limited marketable surplus, and find it challenging to undertake the journey to the mandi. Instead, they sell small quantities to the village aggregators.