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Developing Agri Produce Logistics in Rural Areas

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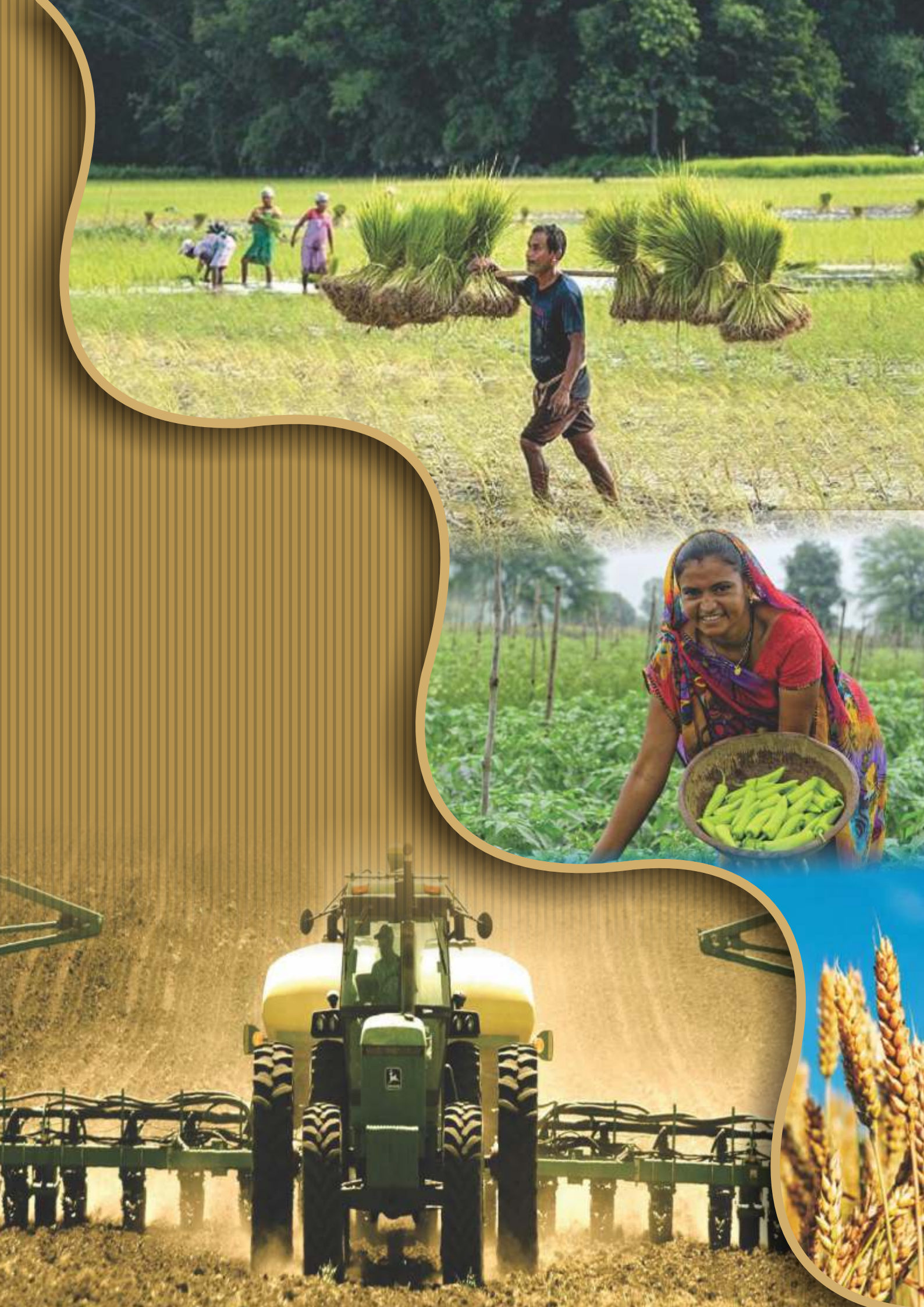

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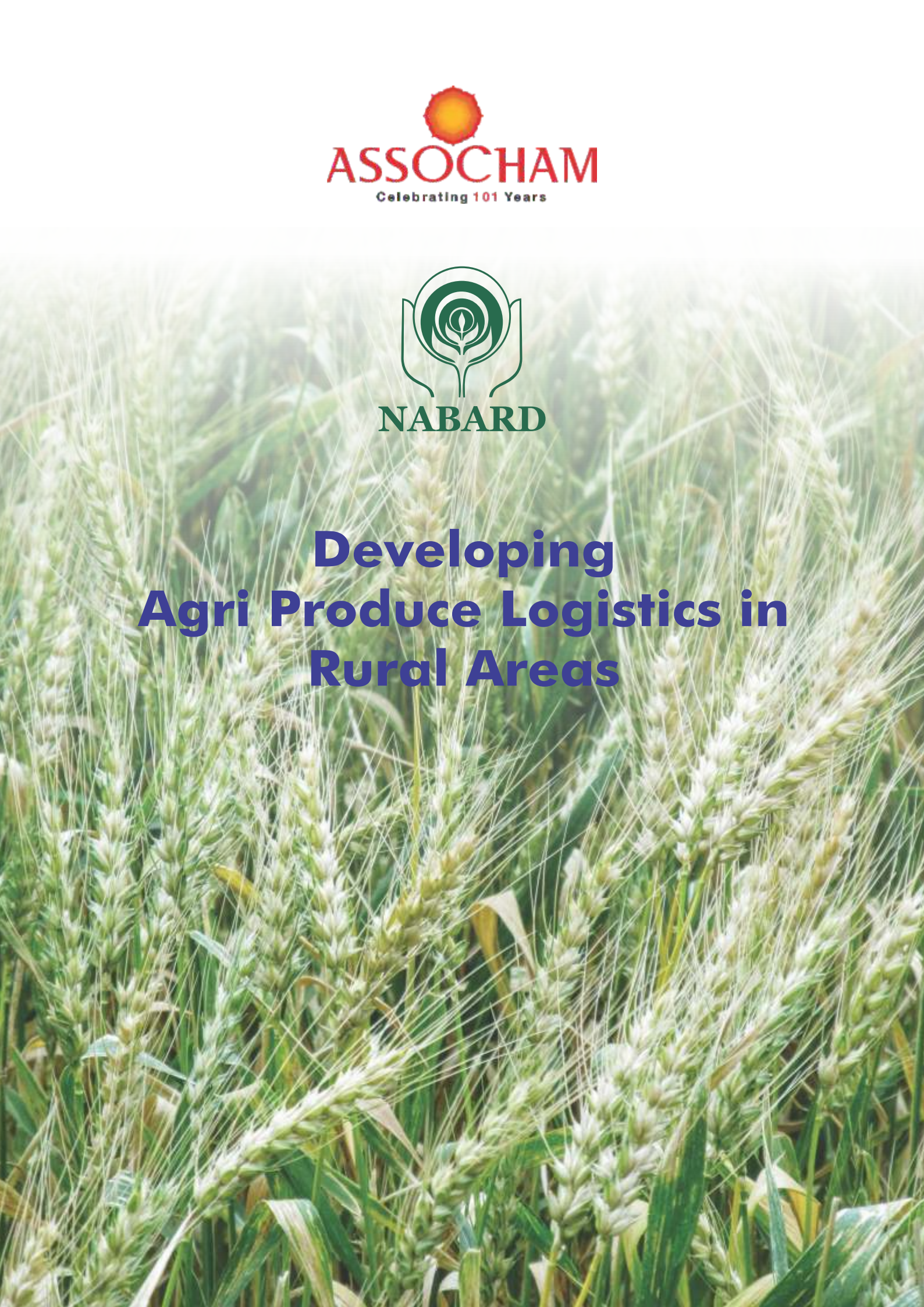

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Message from ASSOCHAM

We live in a widely interconnected world today, where information and adaptability are paramount. Odisha is surfacing as the manufacturing nucleus of the East through its industry-conducive environment and policy framework. Agri-logistics is an intrinsic part of Agribusiness of Orisha, which facilitates connectivity between construction and production on one side and consumption centers on the other.

This knowledge report encompasses the current scenario of Odisha's agro-logistics sector as well as the manifold business opportunities that this fast emerging state has to offer. It further delves into the commodity-wise supply-chain status in Odisha and the prospective investment projects for concerned investors. The report comprehends these value chains and renders translation of these opportunities by epitomizing benefits such as resilient food supply chains, food security, improved food-processing potential and greater e-commerce capabilities.

The government of Odisha plays a very proactive role in ushering in an all-inclusive and sustainable growth in the Agriculture Sector. It is commendable that given the prevailing pandemic situation, the State has been able to attract new investments across multiple sectors and has approved over Rs 1.20 lakh crore of investment proposals.

The knowledge report Agro-logistics in Odisha : challenges and solutions is an comprehensive study which lends visibility and focus on the emerging state of Odisha, which in turn is poised to becoming a significant contributor to the economic growth in India on an

Perminder Jeet Kaur
Director, East & North East
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Message from PwC

Odisha is known for its vast agro climatic diversity and has the potential to attract agribusiness investments, especially in the tribal districts. The state has ten agro climatic zones that are differentiated by soil types, humidity, elevation, topography, vegetation, rainfall and cropping pattern. These zones enable the state's farmer community to commercially cultivate a vast array of crops. These favourable agro climatic conditions are further synergised by the growing demand for Odisha's district-specific food commodities from bordering states as well as the state's own rising population. In addition, the Centre's Sagarmala project is expected to help Odisha emerge as one of India's agro-logistics hubs.

Strategic investments in agro-logistics, including warehousing, transportation and administration, are imperative to leverage the potential of agricultural productivity. The skewed distribution of warehousing and basic transportation facilities across the state is an opportunity for it to set up logistics facilities in some of the highly productive districts. Advancements in logistics facilities by incentivising multipurpose controlled-atmosphere (CA)cold storage facilities and cold-chain reefer-van networks and developing a traceability system may be some of the priority areas of intervention and agri-policy promotion.

This knowledge paper provides an overview of the present status of Odisha's agro-logistics segment and the business opportunities in the domain. It also provides insights into the commodity-wise supply-chain status in the state and the potential investment projects for interested sponsors. Understanding these value chains and capitalising on the opportunities could provide far-reaching benefits such as resilient food supply chains, food security, improved food-processing potential and greater e-commerce capabilities.

Ajay Kakra
Executive Director,
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Executive Summary

The COVID-19 pandemic has disrupted most businesses worldwide. However, despite facing its share of challenges, including supply chain interruptions and inadequate transportation, the logistics sector has managed to remain resilient and maintain a certain level of seamlessness in delivering commodities.

The term logistics today has a considerably broader meaning that encompasses all the elements of movement of products between their point of origin to point of consumption, as well as the supply chain. Agro-logistics is a continuous and dynamic supply chain that begins at the farm gate or production centres and extends to the end consumer. It lies at the core of agribusinesses, allowing the production and consumption centres to be linked over both geography and time with little loss in quality and quantity.

A well-established and effective agro-logistics framework not only aids in minimising post-harvest losses in terms of quantity and quality of food but also enhances the efficiency of food supply chains, thereby improving the penetration and reach ability of food items. An efficient logistics system also improves the transportation of seasonal items and their availability throughout the year. A well-established supply chain provides farmers with direct access to markets and customers and increases their capacity to monetise their produce. Agro-logistics also ensures that customer demands are fulfilled on time and farmed goods are valued to their full potential. Furthermore, it is critical to cut distribution costs, enhance agricultural product circulation, avoid needless losses and work towards building environmentally friendly and compliant logistics.

The state of Odisha is unique amongst Indian states and union territories for its rich and diverse population. The largely rural- and tribal-dominated population of Odisha is directly or indirectly dependent on agriculture and forests for its livelihood. Given the state's agro climatic diversity, a strong fisheries base, rich forest resources, and a huge population of agriculture and allied sector workers, Odisha is emerging as a food and agribusiness hub.

Focusing on post-production logistics connectivity is critical to enable the holistic growth of Odisha's agricultural sector. Increasing access to warehousing and logistics facilities, particularly for small and marginal farmers and farmers' groups, can help to reduce agricultural commodity wastage and curb the losses incurred by farmers due to distress selling. The agro-logistics sector would also benefit from creating an enabling infrastructure, strengthening the value chain through policy reforms, and leveraging digital platforms to bring markets closer to farmers. Food waste is a key issue in Odisha's efforts to end poverty and enhance food security. While stakeholders have emphasised boosting productivity, reducing losses incurred due to gaps in supply chains has been largely ignored. Odisha has the potential to become one of the leading states in terms of agricultural growth provided enough attention is given to developing agro-logistics across agriculture value chains.

Given this background, this report focuses on Odisha's agriculture industry and discusses the different elements of agro-logistics. The various issues in Odisha's agro-logistics framework and potential solutions have been examined and presented in this report.

Introduction

About Odisha

Odisha is located on India's eastern coast and the state is famous for its exquisite temples, religious fairs and festivals, handicrafts, hills and beaches. It has a population of 4.20 crore and a population density of 270 persons per sq. km. nearly 83.3% of people inhabit the state's rural areas. It is also known for its rich tribal culture and heritage, and the total scheduled tribe (ST) population accounts for 22.8%of the state's total population. The state's GDP grew at a rate of 6.16% in 2019-20 and its per-capita income increased to INR 101,587. The largest contributor to Odisha's gross value added (GVA) is the services sector with a share of 40.51%, followed by industries (39.60%) and agriculture and allied services (19.90%).The state is rich in numerous mineral resources such as iron ore, manganese, coal, bauxite, dolomite and tin, resulting in the industrial sector playing an important role in its economic development. The state government's proactive initiatives have also adequately boosted the industries sector.

Odisha's agricultural sector grew positively at a rate of 11.92% in2019-20. However, the pandemic affected the sector significantly, resulting in negative growth in 2020-21. Farmers' income in Odisha has grown significantly from INR 19,524 per annum in 2002-03 to INR 92,772 per annum in 2016-17.The rate of growth is higher compared to the national average.

Odisha has favourable and varied agro climatic conditions, abundant water bodies, and a 480-kmlong coastline, making it suitable for diverse agricultural, horticultural, livestock and aquaculture practices. It is an agrarian state where approximately 60% of its population is directly or indirectly dependent on agriculture for its livelihood. Two out of three women in the state are engaged in agricultural activities either as a cultivator or a labourer.

Parameters	Odisha
Capital	Bhubaneswar
Geographical area (in lakh sq. km)	1.56
Number of administrative districts	30
Population density (persons per sq. km)	270
Total population (in million)	41.97
Rural population (in million)	34.97
Urban population (in million)	7.00
Sex ratio (females per 1,000 males)	979
Literacy rate (%)	72.9%
Male literacy rate (%)	81.6%
Female literacy rate (%)	64.0%
Unemployment rate (2020–21)	7.6%

Source: Odisha Economic Survey 2020-21

Odisha has realised the importance of producing high-value crops and the area of cultivation under vegetables, fruits, oilseeds and pulses increased to 43.79% in 2018-19 compared to 42.37%in 2014-15.The state's milk output increased from around 17.8lakhtonnes in 2012-13 to over 23.7lakhtonnes in 2019-20. Similarly, other livestock products like eggs and meat have also increased remarkably. Therefore, the state government is focusing on developing the agriculture and allied sector through various conducive interventions that pay attention to the nutritional and food security of people, diversification of crops, avenues for food processing, development of agricultural infrastructure, improvements in logistics, transportation and storage infrastructure, etc.

Rural and tribal profile

Odisha is unique amongst Indian states and union territories for its rich and diverse population. It is inhabited by a variety of ethnic tribes, rural communities and urban dwellers. As per Census 2011, 83.32% of the state's population lives in rural areas while the rest resides in urban areas. The majority of Odisha's STs live in the state's hilly and forested regions. They have their own distinctive cultural milieu and a thriving, well-preserved traditional heritage despite being economically backward and lacking formal education. Odisha is home to 62 out of India's 635 tribal communities, 13 of which are particularly vulnerable tribal groups (PVTGs). Therefore, the state's tribal areas have an extremely diverse socioeconomic landscape.

Odisha has the third-highest concentration of tribal population in the country after Madhya Pradesh and Maharashtra. The scheduled area, which makes up for about 44.7% of the state's geographical area, is spread over 119 of 314 blocks in 12districts of the state. The tribal population in Odisha is around9,590,700, accounting for 22.85% of the state's total population.

The largely rural- and tribal-dominated population of Odisha is dependent on agriculture and forests for its livelihood and subsistence. Animal husbandry is another important economic activity in the state's rural areas, second only to agriculture. Owning livestock ensures both revenue and nourishment for tribal farmers. Forests have been subjected to degradation due to various biotic and a biotic factors, and the tribal communities are forced to undertake distress migration in search of odd jobs during the non-agricultural season.

Odisha is the second-largest state producing non-timber forest products (NTFPs) and a significant section of its rural and tribal population is dependent on NTFPs for livelihood purposes. NTFP production plays an integral part in the socioeconomic lives of the state's tribal communities. Seasonally, the tribal communities collect various NTFPs to address food, fodder, and medicinal requirements. The Odisha Forest Development Corporation (OFDC) and Tribal Development Co-operative Cooperation (TDCC) channelize the sale and purchase of NTFPs and other agricultural surplus from tribal gatherers so that they are able to earn regularly. Trading NTFPs aids in improving the socioeconomic status of tribal communities. However, the lack of institutional and financial support prevents them from exploring the full potential of NTFPs. Thus, such natural resources originating from Odisha's forests remain underutilised despite their rich heritage.

The agricultural sector in Odisha

Agriculture is the mainstay of Odisha's economy and accounted for a sectoral share of 21.27% in the total gross state domestic product (GSDP) of the state in 2020-21.The sector provides employment and sustenance directly or indirectly to about 60% of the state's total workforce. Odisha has a geographic coverage of 155.7 lakh hectares (ha), out of which the total cultivated land in the state is 61.80 lakh ha (41% upland, 34% medium land and 25% low land) and the gross cropped area (GCA)is 83.15 lakh ha with 156% cropping intensity.

The presence often agro climatic zones in the state results in a range of soil types which help in practising varied cropping patterns and the cultivation of various agricultural produce. The 10 agro climatic zones of Odisha are mentioned below:

Agro climatic zones of Odisha

S.No.	Name of the Agroclimatic zone	Region of the state	Name of the districts	Soil type
1.	North – Western Plateau	Highland regions	Sundargarh, Deogarh	Red, Brown forest, Red & Yellow, Mixed Red & Black
2.	North Central Plateau		Mayurbhanj, Keonjhar	Lateritic, Red & Yellow, Mixed Red & Black
3.	North Eastern Ghat		Ganjam, Gajapati, Rayagada, Kandhamal	Brown forest, Lateritic Alluvial, Red, Mixed Red & Black
4.	Eastern Ghat High Land		Koraput, Nabarangapur	Red, Mixed Red & Black, Mixed Red & Yellow
5.	South Eastern Ghat		Malkangiri	Red, Lateritic, Black
6.	Western Undulating Zone		Kalahandi, Nuapada	Red, Mixed Red & Black and Black
7.	Western Central Table Land		Bolangir, Sonepur, Boudh, Sambalpur, Bargarh, Jharsuguda	Red & Yellow, Red & Black, Black, Brown forest, Lateritic
8.	Mid Central Table Land		Dhenkanal, Angul	Alluvial, Red, Lateritic, Mixed Red & Black
9.	North Eastern Coastal Plain	Lowland/ Coastal regions	Balasore, Bhadrak, Jajpur	Red, Lateritic, Deltaic alluvial, Coastal alluvial & Saline
10.	East and South Eastern Coastal Plain		Cuttack, Jagatsinghpur, Kendrapara, Puri, Khordha, Nayagarh	Saline, Lateritic, Alluvial, Red & Mixed red & Black

Source: Odisha Economic Survey 2020-21 and PwC Analysis

There are 8 agro climatic zones known as highland regions which comprise of 80% of the total area of the state whereas the remaining 2 agro climatic zones are known as lowland/ coastal regions.

21 Districts fall under Highland region and the remaining 9 Districts fall under Lowland region.

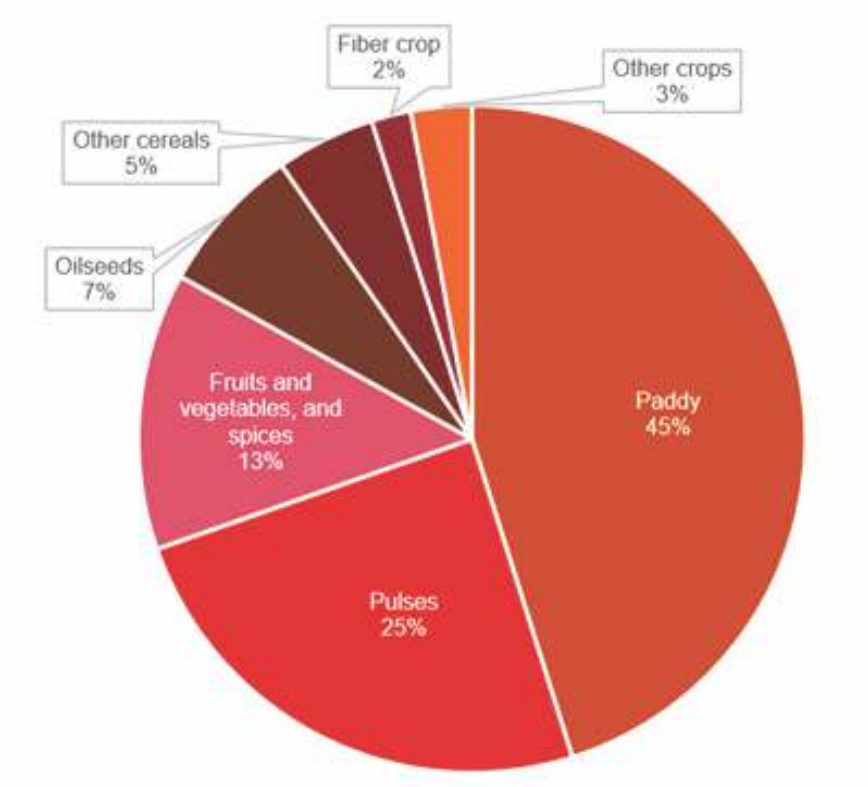
Landholdings

The average operational land holdings in Odisha reduced from 1.25ha in 2000-01 to 0.95ha in 2015-16. Odisha had about 3.22% of the operational holdings of all India. The number of large, medium and semi-medium land holdings in Odisha has decreased while the number of marginal land holdings has increased significantly. The number of marginal land holdings has increased from 59.62% to 74.74% between 2005-06 and 2015-16. As per the state's recent agricultural census, about 93% of operating land holdings fall into the marginal or small category. Small and marginal farmers cultivate their land in three cropping seasons depending on the availability of water resources. In the kharif season, paddy is cultivated in 67% of the land whereas pulses are cultivated in 52% of the land in the rabi season. Almost 50% of the land is cultivated twice a year in Odisha. Farmers diversify their crops for practical reasons like consumption, risk mitigation and crop failure.

Cropping Pattern

Odisha's cropping pattern is food grain centric. Around 75% of the state's GCA is used for cultivating food grains such as cereals and pulses. Paddy is cultivated in nearly 45% of the gross cropped land. Paddy is mostly cultivated in lowlands and medium lands in the state, though a few highland areas are also used. Maize and ragi are the major cereals grown in the state. Oilseeds are cultivated in 7% of the cropped land only and groundnut accounts for the highest percentage of the area coverage under oilseed cultivation. Only 2% of the land is used for cultivating fibre crop, mostly cotton. A large number of farmers in Odisha's southern districts cultivate cotton in the kharif season as a cash crop.

The figure below shows that crop diversity is comparatively less in Odisha. Diversifying crops and enhancing the cultivation of cash crops could result in increased incomes for the state's farmers.



Commodity Movement

Agricultural and horticultural produce passes through multiple channels while moving from farm to fork. A few of the produced commodities are commonly consumed within the neighbouring areas and intra- and inter-district movements are predominant. Odisha also sends several commodities to other parts of the country as well.

Outward movement of major agricultural and horticultural produces from Odisha:

- Odisha sells rice to other states and countries through private players and the Food Corporation of India (FCI).
- Around 70-80% of the maize produced in Odisha is traded with other states like Andhra Pradesh, Telangana and Chhattisgarh.
- Around 15-20% of the raw cotton produced in Odisha is sent to other states for ginning and pressing.
- Almost all processed cotton bales are sent to western and northern states for further value addition.
- Turmeric from Kandhamal is sent to all major spice mandis of the country and processed turmeric is exported abroad.
- Ginger is mostly sent to Andhra Pradesh, Telangana, Chhattisgarh and West Bengal.
- Betel leaf is mostly sent to West Bengal and Maharashtra.
- A very small quantity of mango, litchi and watermelon is sent outside the state during the peak harvesting season.

Inward movement of major agricultural and horticultural produces to Odisha:

- Odisha imports wheat from other states as its own wheat production is insufficient to fulfil internal demand.
- It has a high deficit of oilseeds and imports oilseeds and edible oil from other states.
- Vegetable production in the state is not sufficient compared to the demand. It imports vegetables from other states throughout the year. The import quantity of vegetables reduces in the winter months as the state's own production increases.
- It imports potato from West Bengal and onion from Maharashtra.
- It imports cashew kernel from Andhra Pradesh to meet the demands of the state's processing units.
- It is also highly dependent on other states for the supply of fruits.

Post-Harvest Scenario

Odisha has built post-harvest storage infrastructure and implemented several management activities in recent years. Mandis, regulated multi-commodity cold stores, food processing plants, warehouses, pack houses and e-NAM mandis are part of the state's post-harvest infrastructure.

The agricultural marketing sector plays a major role in improving the financial situation of the state's farmers. It emphasises equally on private investment, contract farming and direct marketing, rather than on a strict control regime of a regulated marketing mechanism.

As of 2020-21, there are 66 regulated market committees (RMCs)in 30 districts across Odisha. These RMCs operate under the supervision of the Odisha State Agricultural Produce Marketing Board(OSAMB) which is administered by the Department of Cooperation Government of Odisha.

Additionally, the state government has granted licence to NCDEX-e-Market Ltd. (NeML) for establishing a private market for the sale and purchase of agricultural products in the state. A total of 41 RMCs are linked to the e-NAM portal, and these are now functioning as e-NAM hubs to create a unified national market for agricultural commodities across India. Nearly 330, 400 quintals of different agricultural commodities and over 1.42 crore coconuts have been traded via the e-NAM platform in2019-20. The quantity of online trading of agriculture commodities and coconuts grew by about178% and 443% respectively between 2018-19 and 2019-20.

Procurement of non-paddy crops from 2017-19 (in quintals and in bales for cotton)

Crops	2017–18	2018–19	2019–20	Procuring agency
Cotton	16.05 lakh	17.21 lakh	19.13 lakh	Cotton Corporation of India andprivate traders
Ragi	-	18,000	94,745	Tribal Development Co-operative Corporation (TDDC) of Odisha Ltd.
Pulses andoilseeds	94,340	75,932	92,384	National Agricultural Cooperative Marketing Federation (NAFED) though Marketing federation (MARKFED)
Jute	787	667	624	Jute Corporation of India

Source: Directorate of Agriculture (DA) and Food Production(FP), Odisha, and Cooperation Department, Odisha

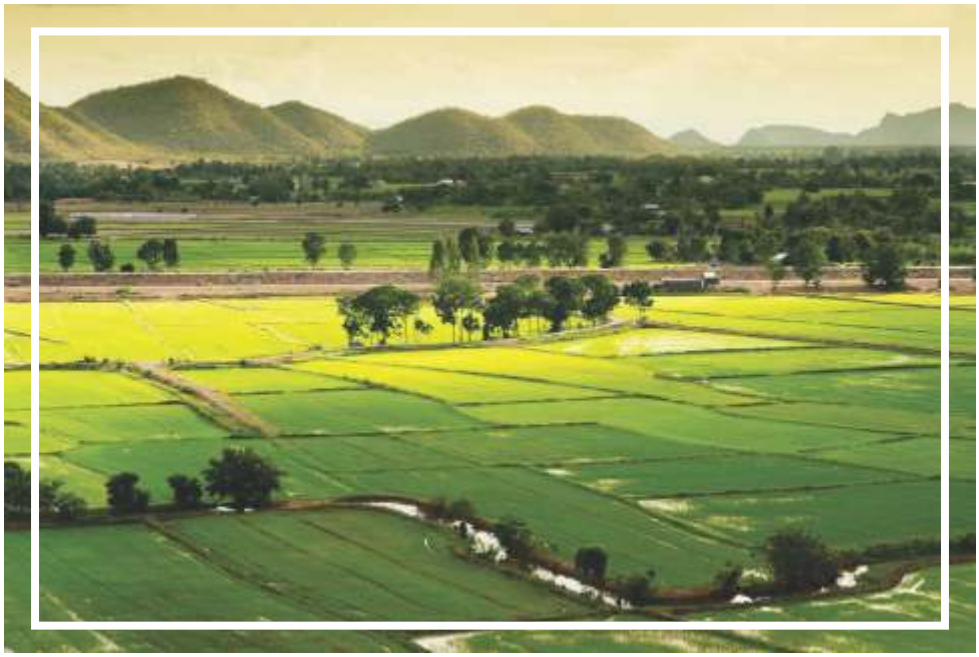
Out of the 18 cold storage units controlled by the Rector of Cooperative Societies (RCS) of Odisha, five are operating with a capacity of 18,500 metric tonnes (MT) compared to13,500 MT for the previous year, an inclined trend of 37%. Under the Mission for Integrated Development of Horticulture (MIDH) and Pradhan Mantri Kisan SAMPADA Yojana (PMKSY) schemes, a total of 179 cold storage units have been established in the state and have a combined capacity of 572,966 MT.

The state government is focusing on improving Odisha's agro-logistics capabilities and has taken initiatives to reduce the gap between the requirement of warehouse space and availability of warehouses with the RMCs and other state government departments to store agricultural produce and fertilisers. The following table shows the improvement in storage capacity of warehouses under different government establishments in2019□20 compared to 2015-16. There has been a 32.5% and 10.7% increase in the storage capacity of food grain and fertiliser warehouses.

Available capacity of warehouses in Odisha (in MT)

Government establishments	Foodgrain warehouse capacity			Fertiliser warehouse capacity		
	2015-16	2019-20	% increase	2015-16	2019-20	% increase
Primary Agricultural Cooperative Society **(PACS)**	136,715	278,275	103.5	141,855	141,855	-
Marketing federation **(MARKFED)**	14,000	22,000	57.1	86,000	107,500	25.0
Odisha State Warehousing Cooperation **(OSWC)**	472,550	494,900	4.7	20,000	25,000	25.0
Regulated Marketing Committee **(RMC)**	190,895	305,595	60.1	-	-	-
Odisha State Civil Supplies Corporation Limited **(OSCSC)**	331,800	417,800	25.9	-	-	-
Total	11,45,960	15,18,570	32.5	247,855	274,355	10.7

Source: Odisha Economic Survey 2020-21



Agro-Logistics in Odisha

A brief sectoral analysis of agro-logistics

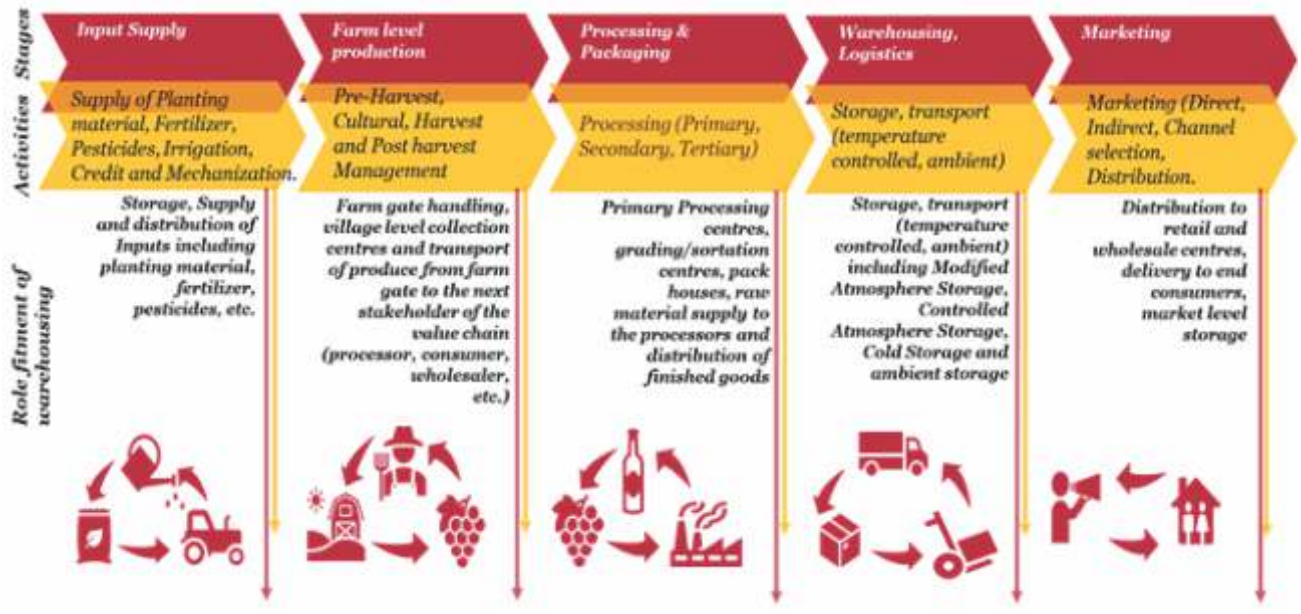
Logistics plays a crucial role in nurturing economic growth and is the mainstay of social development in any geography. The recent increase in global trade and its related freight distribution systems now require the development of logistics and warehousing capabilities, which are governed by both physical infrastructure and managerial assets.

Odisha is a primarily rural agrarian economy and approximately three quarters of the state's working population earn their livelihoods through agriculture and allied activities. The presence of varied agro climatic regions in the state favours the cultivation of a wide range of crops.

Odisha is an emerging hub for food and agribusiness industries given the state's agro climatic diversity and vast availability of agricultural labour. The demand for logistics facilities inclusive of warehousing, transportation and administration is also set to rise with the growth of agribusinesses. Thus, it becomes imperative for the state to invest in parallel research and development (R&D) capabilities and infrastructure to leverage its full agricultural growth potential.

Logistics management forms an integral part of any agricultural supply-chain management. Logistics plays a significant role by transporting, storing and handling of goods at each stage of farm-level production, processing, packaging and marketing, as depicted in the figure below.

Role of logistics management in agricultural supply-chain management



Source: PwC analysis

Supporting infrastructure for agro-logistics in the state

The state government of Odisha envisages integrating agro-logistics at every stage of agri value chains in a structured system for catering to district-wise commodities. For example, the major milk producing districts of Bolangir, Cuttack, Dhenkanal, Jagatsinghapur and Kendrapara are also becoming major processing centres and the development of cold-chain infrastructure is also being planned parallelly. Currently, the skewed distribution of logistics facilities in coastal districts provides opportunities for new private investments, especially in the eight districts in Kalahandi Balangir Koraput (KBK) region.

Odisha also has the strategic advantage of a well-developed water transportation system due to its 480-km long coastline, and a strong potential for inland waterways. The Central Government is further assisting Odisha to develop its port cities under the Sagarmala project and helping the state in becoming a major logistics destination. Six of the state's waterways have been declared as national waterways in 2019 by the Inland Waterways Authority of India.

Leveraging logistics for linking farms to markets

Spotlight commodity-fisheries

The robust water-transport potential of Odisha becomes even more suitable for capitalising on the state's fishery resources. The state has 6.85 lakh ha of freshwater resources and 4.18 lakh ha of brackish water resources. The total fish production in Odisha during 2018-19 was 7.59 lakh MT. However, due to the lack of appropriate post-harvest facilities, more than a quarter of the produce gets wasted before reaching consumers.

This wastage further intensified in 2020-21 during the COVID-19 pandemic. The lockdown prevented fishermen from venturing into the sea and the simultaneous fishing ban resulted in them being unable to fish for about 75 days in the east coast. March-June is the peak season for fish and shrimp farming and the period was affected last year due to the non-availability of workers, shortage of fish seed, fertilisers and other inputs, hampering the desired production levels for the year. The export of marine products was also seriously affected as most of the export markets like Japan and the US were buying selectively, and the European market was totally closed off.

The major challenge that surfaced during the crisis was the insufficient capacity of coastal states to process and store their stock of already captured fish. The inadequacies in post-harvest infrastructure had impacted the share of final retail prices, resulting in fishermen and fish farmers resorting to distress sale in wholesale markets. The lack of options of exporting high value fish and processed products was also facing a glut in the domestic market along with other key high value items like shrimp and crab due to lack of availability of storage facilities. Thus, district-wise infrastructure at different levels of agri value chains needs to be developed after conducting detailed value-chain analyses and technical/financial feasibility studies of logistics infrastructure projects.

Current policy and regulatory support in the sector

The above-mentioned supply-chain management practices can be implemented by incentivising the establishment of requisite transportation via reefer vans as well as aggregation/chilling points (like village aggregation points, milk pooling points and bulk milk chillers) enroute the processing plant. The National Dairy Development Board (NDDB) is setting up a state-of-the-art automated milk processing plant in Arilo Govindpur in Cuttack district, with a capacity of processing five lakh litres per day. The NDDB has already built a cattle-feed plant for this purpose with an installed capacity of 150 MT per day in Khurda district, neighbouring Cuttack, Puri, Jagatsinghapur and Kendrapara.

Case study: Odisha Millets Mission

The Government of Odisha launched a special programme for the promotion of millets in the state's tribal areas in2017.The Odisha Millets Mission (OMM) envisioned reviving the cultivation of millets and ensuring that they reached the consumers. Millets have been traditionally cultivated in rain fed regions of southern Odisha that are habituated by tribal communities. OMM focuses on improving the production of nutria cereals, increasing local consumption, enabling procurement at minimum support price (MSP) and providing logistics support via the Public Distribution System (PDS). OMM follows a decentralised approach in which the selected districts are managed by project management units.

Major objectives of the OMM are:

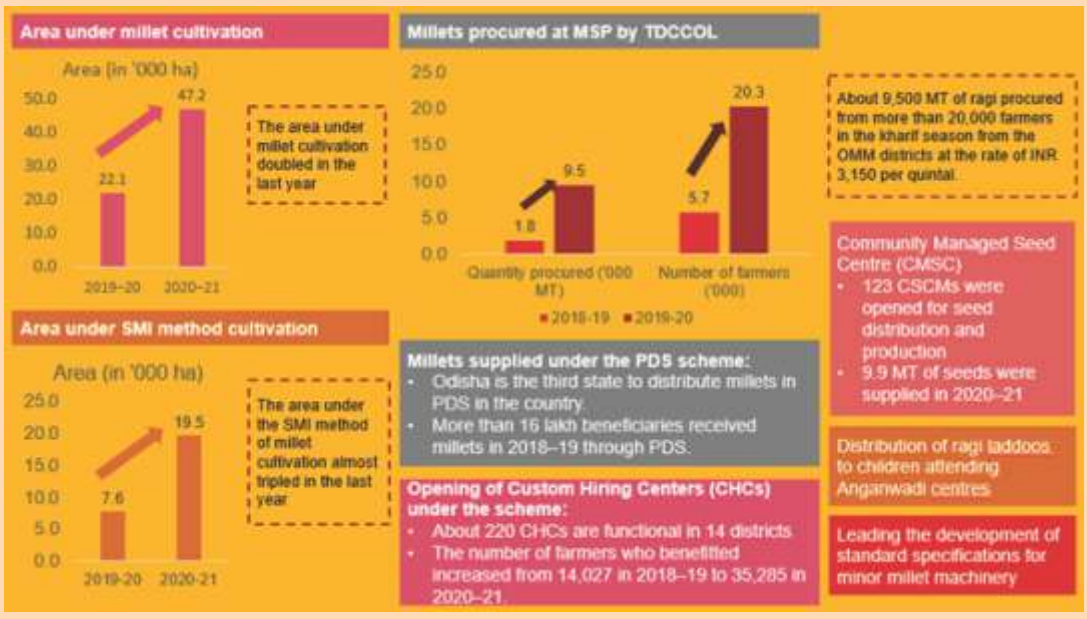
- Improving the productivity of millet crops
- Increasing household-level consumption
- Setting up decentralised processing facilities
- Promoting farmer collectives for marketing
- Including millets in state nutrition programmes, mid-day meals (MDMs) and PDS.

The Government of Odisha has decided to integrate locally produced millets in public food systems (such as integrated child development services [ICDS], PDS and MDMs) for popularisation of production, better nutritional gains and increased local consumption. This would not only ensure logistical support to millet produced in the districts but also enable economies of scale for different modes of transport used for aggregation and distribution of other agricultural commodities.

The mission focuses on an integrated value-chain approach by linking the farm gate to the end consumer. The scheme's scope of work starts right from building climate resilience and promoting agro ecological farming to complete demand-driven marketing and distribution of nutritional meals in various government schemes. The state government incentivised stakeholders at each stage of the value chain to build necessary infrastructure, especially at the farm gate.

The OMM's success in increasing the production and productivity of millets and crops, and including them in government meal schemes as well as reducing the infrastructure gaps in machinery and processing technology is an example of successful revival of millet production in the state.

Overview of millet crop under OMM in Odisha



Source: Odisha Millet Mission, Department of Agriculture and Food Production, Govt. of Odisha

The role of agro-logistics in Odisha

Post-harvest losses and the role of agro-logistics

At a time when the retail inflation rate is still above the acceptable range of 4±2% (as of May 2021), Odisha continues to face huge losses of over 1.45 lakh tonnes of fruits every year. This loss results in many latent consequences such as farmers not earning profitably, states losing out on huge revenue, consumers facing price hikes and processors losing out on raw materials and economies of scale. Thus, the importance of post-harvest infrastructure cannot be belittled, specifically for perishable produce like fruits, vegetables, fish and milk. Odisha has cold storage capacity to the tune of only about 2.1 MT per sq. km (less than one-third of the targeted capacity of 10.1 MT by 2025-26).

The state also faces the problem of skewed district-wise storage capacity. As many as 15districts in the state don't have the adequate cold storage facilities. For example, Keonjhar, Bhadrak, Jharsuguda, Jajpur, Boudh and Kandhamal have cold storage facilities exclusively for storing potatoes. Also, most of the existing cold storage facilities in the state are privately owned. Thus, integrating with schemes like ICDS, MDM and PDS becomes another challenge for an assured market for the produce. Private-public partnership (PPP) models could resolve such challenges.

Role of sectoral modernisation

Primary processing: The Government of Odisha has recently set up a corpus fund of INR100 crore with a budgetary provision of INR555 crore for nurturing and promoting farmer bodies. The state has launched the three-year Promotion and Stabilization of Farmer Producer Organizations (PSFPO) project that aims to increase the profitability and sustainability of FPOs and market-facing companies (MFCs). The Government of India (GoI), under the Aatmanirbhar Bharat stimulus package, launched the Agri Infrastructure Development Fund with a corpus of INR1 lakh crore. The fund will be utilised for focusing on farm gate infrastructural facilities like grading/sorting/packaging houses, cold storage facilities, and low-cost cooling chambers.

Cold storage facilities and multi-commodity cold chambers: Out of 30 districts in Odisha, currently only Sundergarh, Sambalpur, Raigoda, Puri, Mayurbhanj, Koraput, Dhenkenel, Balasore, Cuttack and Bargarh have multipurpose cold storage facilities. Other cold storage facilities are used for storing either only potatoes or marine products. Thus, the cold storage market for fruits and vegetables is still untapped, and the state government plans to fulfil this gap by setting up about 150 cold storage facilities across the entire state. The state government should conduct a detailed catchment analysis of the commodities to be stored for ensuring that the infrastructure follows a demand-driven and pull-based approach rather than an unplanned, push-based and supply-driven approach. The government could also consider incentivising private players to enter into PPP contracts at strategic locations for establishing multi commodity-controlled atmosphere chambers rather than the traditional cold storage facilities for achieving full functionality in all seasons, price stabilisation and reduced post-harvest losses.

Traceability and e-commerce: Information fragmentation across agro-commodity value chains hinders the product trust among businesses, consumers and communities. As brands are increasingly trying to become transparent and accountable, especially in the e-commerce sector, they need a solution to integrate supply-chain data in a trusted and transparent manner for business partners and societal stakeholders. As per PwC's Global iTrust Survey, 2017, 68% of the consumers

are willing to pay a premium price for traced products with a demonstrated origin and journey. Thus, the need for traceability arises for enabling:

- leveraging e-commerce capabilities
- resource planning and allocation
- data-driven decision making
- yield and damage estimation
- real-time decision support system
- efficient pre-farm, on-farm and post-farm operations
- traceability
- market development
- brand development
- risk management and quality assurance
- limiting market rejections
- improvement based on customer feedback.

Mapping the current status with special focus on tribal districts

Odisha has diversified topography and accessing storage facilities and markets becomes difficult for the farmers in several remote pockets of the state. Moreover, nearly 93% percent of them are small and marginal farmers and farm mechanisation (usage of tractor, etc.) is less. Hence, the first-mile delivery of produce to markets and storage units is a major challenge, especially in peak seasons. Hired tractors and goods-carrier vehicles are often used by farmers as modes of first-mile transport. Two- and three-wheelers are also often used for transporting smaller quantities of marketable produce. There is a lack of operation by organised logistics agencies in the state.

Agricultural warehousing facilities in Odisha are mostly provided by government agencies like the Odisha State Warehousing Corporation (OSWC), Central Warehousing Corporation (CWC), Food Corporation of India (FCI) and OSAMB. The overall warehousing capacity in the state is around 15 lakh MT. A large percentage of these storage facilities are often used for storing paddy, cotton and other crops. Increasing access to warehousing and logistics facilities, especially for small and marginal farmers and farmers' groups, can contribute to reducing the spoilage of agricultural commodities and curbing the loss incurred by farmers due to distress selling.

GI tag of Kandhamal turmeric

Kandhamal is a southern district in Odisha with a total population of 7.33 lakh of which 53% people belong to tribal communities. Households in this forest-rich district are commonly dependent on agriculture and NTFPs for their livelihoods. However, the district is famous for its spices, especially aromatic turmeric, which has special medicinal values and is significantly in demand across India. The farmers of Kandhamal usually adhere to natural farming practices to cultivate turmeric. The agro climatic condition of the North-Eastern Ghat zone also benefits the farmers and enables them to grow large volumes of premium-quality turmeric. Around 32,000 MT of turmeric is produced from Kandhamal every year.

A process was initiated for registering Kandhamal turmeric under the Geographical Indications of Goods (Registration and Protection) Act, 1999. The proposal was accepted by the authorities and Kandhamal turmeric eventually received the geographical indication (GI) tag in April 2019. The GI tag primarily recognises the unique identity of products corresponding to different geographical locations. Hence, a GI-tagged product has a unique quality and characteristic which is attributable to its geographic origin.

A large part of Kandhamal is remotely located, and transportation is a challenge in these hilly and forest-covered areas. Hence, aggregation, value addition and market linkage are critical factors for the turmeric farmers of the district. It is estimated that a minor percentage of the total produce is processed within the district, although storage, polishing and processing units have been developed in the production areas. The rest of this premium-quality, GI-tagged turmeric is purchased from the farmers at non-remunerative prices and sent to other states through unorganised marketing channels. Processors, exporters and other value-chain players can create a win-win situation for turmeric farmers of Kandhamal and the buyers with the support of efficient logistics services.

Diversified cropping practices in southern districts

Odisha has predominantly been a paddy producing state and ranks eighth in terms of national paddy production. More than 45% of the GCA in the state is used for cultivating paddy. Around 10% of the paddy cultivated is produced in the rabi season and the rest is produced in the kharif season. Although farmers from all the 30 districts are largely into paddy cultivation, a few of the districts stand out due to diversified cropping practices. The southern districts of Odisha have significant crop diversity and are remotely located with a large tribal population. The table below shows the contribution of these districts in the total production non-paddy crops in the state. These districts have diversified cropping practices and farmers have taken up cash-crop cultivation.

District	Maize	Ragi	Arhar	Turmeric	Ginger	Cotton	Onion
Kalahandi	7%		20%			37%	
Kandhamal	6%			59%	21%		
Koraput	10%	41%		12%	29%		
Nabarangpur	27%						
Rayagada	8%	12%	15%			25%	
Bolangir						26%	31%

Source: Director of Agriculture and Food Production, Odisha

Large parts of Kalahandi, Kandhamal, Koraput, Nabrangpur, Rayagada and Bolangir districts have forest covers and hilly terrain. Hence, first-mile transport and logistics support are greater challenges for the farmers in these districts. Crops like cotton and onion are produced in large volumes across small pockets and require specific warehouses. Crops like turmeric, ginger, ragi and maize have high potential for value addition and industrial use. Cotton is auctioned and traded in the mandis by the Cotton Corporation of India (CCI) and private millers in these districts. But the rest of the crops are often sold through middlemen or traders without value addition and at non-remunerative prices. As these districts are located near the borders of Chhattisgarh and Andhra Pradesh produces like turmeric, ginger, onion, ragi, sugarcane and maize are traded to other states through traders for further value addition and marketing. Organised market channels and efficient logistics facilities in these remote and tribal districts can support farmers and create business opportunities for value-chain players.

Challenges and way forward

Challenges in the Agro - Logistics Sector

Agro-logistics refers to procedures such as climate-controlled warehousing and temperature-controlled transportation facilities which are instrumental in maintaining the physiological and inherent properties of agricultural produce and food products through processes such as controlled and/or modified atmosphere, humidity regulation and modified inert gas packaging. An efficient and well-established agro-logistics framework not only aids in reducing post-harvest losses in terms of quantity and quality of food, but also improves the efficiency of food supply chains, thus increasing the penetration and reach ability of food.

Agro-logistics in Odisha is still in its nascent phase and faces several challenges. These challenges affect all the stakeholders of the value chain simultaneously. A few major challenges related to agro-logistics in Odisha are analysed below:

- **Small marketable surplus**

The total number of cultivators in Odisha has decreased with increasing fragmentation of land. The number of people who own land decreased by 4.5% between 2001 and 2011.The percentage of agricultural labourers increased by 15.36% during the same period. The proportion of large, medium and semi-medium land holdings has decreased, while the number of marginal and small land holdings has increased. Small and marginal farmers with land holdings of less than 2 ha make up for 92.97% of the state's farmers. They are more susceptible to crop failures and frequently diversify their crops to reduce risk and increase self-sufficiency. Farmers cultivate a number of crops, except paddy, in smaller pieces of land and such low output leads to lesser chances of the produce reaching the markets.

- **Disproportionate intra-state agricultural scenario**

Several areas of the districts like Koraput, Malkangiri, Nabarangpur, Rayagada, Subarnapur, Kalahandi etc. are underdeveloped in terms of connectivity and infrastructure development. The region is also home to a large proportion of the state's tribal population. Most of the tribal dwellers in the region engage in subsistence farming and depend on forests for their livelihoods. Factors such as difficult terrain, lack of adequate transportation facilities, and distance markets make agriculture less remunerative in these districts. Whereas agriculture is more prominent and boosted by high cropping intensity in the coastal districts of Puri, Jagatsinghpur, Cuttack and Khurdha. Farmers in the state's 17 districts earn lower incomes compared to the state's average. Thus, better agriculture extension services are required to make agriculture more remunerative across the state.

- **Post-production challenges**

The development of roads has hada huge impact on market linkages and made it easier for farmers to transport their produce to nearby marketplaces. But many remote villages continue to lack proper transportation facilities and are poorly connected to the main markets.

Several remote districts of Odisha face many constraints in terms of rural connectivity. Missing routes and roads pose several challenges to the rural and tribal dwellers, and prevent them from accessing market facilities. Hiring vehicles becomes expensive for farmers due to their small scales of production. The availability of transportation facilities during the peak season becomes another challenge for many districts in Odisha.

Furthermore, the density of coverage by railway routes is poor and disproportionate in Odisha. While the coastal districts are well covered, central Odisha remains largely uncovered by rail connectivity. Thus, the state should focus on building better transport connectivity to bridge the gap between potential markets and farmers.

- **Distance of regulated markets from farmlands**

There are 66 RMCs in 30 districts operating under the supervision and control of OSAMB. The average coverage area of a regulated market in Odisha is 103-gram panchayats. An average distance of 16 kms needs to be covered to reach these regulated marketplaces. The farmers receive little to no incentives to cover this distance to sell their modest produce. Thus, they prefer selling their produce in the village markets which are located nearby though they offer non-remunerative prices. The time and effort required to sell produce in RMCs discourages the farmers and negatively impacts the price realisation.

- **Non-remunerative price realisation by farmers**

Farmers are often compelled to sell their produce at non-remunerative prices in village markets as they need to repay consumption loans. The aggregation of produce is difficult to achieve due to the lack of storage capacities/aggregation facilities near farm and block levels. Small and marginal farmers are frequently forced to sell their produce at low prices to avoid spoilage. They face price uncertainty due to limited market surplus. Thus, higher impetus should be given to the aggregation of crops under a collaborative group of farmers.

- **Lack of access to market intelligence**

The Department of Telecommunications, GoI, undertook a study in 2016-17 to determine the number of villages without telecommunication connectivity. Around 11,000 out of 51,311 villages in Odisha did not have mobile connectivity. Digital connectivity is a precursor to ensuring financial inclusivity and accessing market information. Farmers receive information about MSP and purchasing processes from government agencies. But they don't have any access to information about market price, price fluctuation, forecasting, etc. Their decisions about buyer selection, selling place and time are completely dependent upon unauthorised sources and other factors like cash requirements and sowing of other crops.

- **Inadequate infrastructure for inventory management**

The primary benefit of establishing agro-logistics is in creating a direct connectivity between the farm gate and the larger markets/consumers. Transport connectivity facilitates farmers in accessing markets beyond their proximities. Most of agricultural produce is temperature sensitive and requires individual assistance in terms of storage and transportation. The workforce in India, and especially Odisha is still not well versed with the standards and protocols that are required to be maintained for quality delivery of agricultural produce. Hence, proper training should be provided, and skills ought to be developed for the establishment of agri-logistics supply chains.

Furthermore, several challenges limit the establishment of agro-logistics in Odisha. Food grain warehouses in the state are poorly maintained and lack sufficient capacity. Under the Registrar of Cooperative Societies (RCS) of Odisha, only 18 cold storage units are present in the state, of which only five were operational in2019-20. Further, as mentioned previously the cold storage capacity in the state is less than one-third of the targeted capacity of 2025-26.The lack of basic infrastructural requirements leads to high price fluctuations as produce cannot be aggregated.

- **Impact of COVID-19**

Lockdowns have affected the food supply chain because of the increased demand for domestic health-boosting products and temperature-sensitive drugs. As a result, well-established cold chains have become necessities and their demand has surged.

The food supply chain in India is dominated by the unorganised sector. Such a fragmented supply chain needs to be structured with adequate focus on specific categories ranging from perishable food products to pharmaceuticals and others.

Way forward

Creating an enabling infrastructure and strengthening the value chain through an effective policy environment would be required for the overall sectoral growth of agro-logistics. Adopting the following strategies could boost the sector significantly.

- **Policy-level interventions**

The Government of Odisha has launched and adopted various policies and programmes for encouraging the effective implementation of agro-logistics in the state. The state envisions capturing greater profitability across the agricultural value chain, guided by the principles of 5T□technology, teamwork, time limit, transformation and transparency. The state government plans to engage in modern and scientific studying of agricultural value chains by leveraging the research and database of the Odisha University of Agriculture and Technology (OUAT). It also plans on promoting various interventions to train farmers on post-harvest management, inclusive of grading, sorting, packing and transporting, to reduce post-harvest losses. The state also launched its agricultural policy Samrudhi in 2020.The policy supports the creation of a conducive and stable policy environment for establishing new marketing models that would support infrastructure development. The state government should establish and adhere to logistics policies for a holistic development of the state's overall agricultural sector. It would also be imperative to combine policy interventions with supporting capacity building measures to enable successful implementation benefitting the stakeholders across the value chain.

- **Role of the private sector**

The agricultural policy, Samrudhi focuses on providing access to fair and remunerative markets, and supports infrastructure development through private participation, wherever feasible. The state government is undertaking initiatives to setup private markets and encouraging private players to participate in agriculture value chain for which the state government has passed “Odisha Agriculture Produce and Livestock Marketing (Promotion and Facilitation) Ordinance” and “The Odisha Agriculture Produce and Livestock Contract Farming and Services Ordinance” in 2020. It is planning to establish a new warehousing and logistics policy to encourage private-sector engagement in the state. It has also extended its support in developing private storage warehouses. It is confident that the launch of the electronic negotiable warehouse receipt (e-NWR) would bring markets closer to farmers through increased private-sector investment in cold chains and logistics. The state government envisions boosting private-sector participation under the new agricultural policy through diversifying wholesale markets and creating capital infrastructure for the development of cold-chain infrastructure and agro-logistics.It would also be important to ascertain the impact of private sector involvement on the small and medium farmers to streamline the efforts without disrupting the remunerative flow.

- **Upgradation and restructuring**

As per the 68th National Sample Survey Office (NSSO) survey, Odisha's rural household expenditure on food accounted for 51.98% of the total household expenditure, 0.30% more than the national rural household expenditure on food. Similarly, food expenditure by urban households in Odisha accounted for 39.26% of their total household expenditure, 2% more than the national average.

There has been a steady shift towards consuming high-value crops in Odisha. The procurement of ragi (millet) has grown significantly, increasing by 426.36% in 2019-20 compared to the previous year. Similarly, per-capita fish consumption increased by 5.19% to 16.4 kg during the same period. Wheat and maize cultivation have also grown positively at a compound annual growth rate (CAGR) of 19.14% and 22.53% respectively during 2019-20 compared to2014-15.

However, Odisha also faces significant crop losses. As per the Odisha Agriculture Statistics 2017□18, crop losses were reported from 233 blocks during the kharif season of 2015, up from 40 blocks in 2004-05.

Marketing policies and infrastructure and logistics requirements need to be established and strengthened for avoiding crop losses. Integrated cold-chain systems inclusive of refrigerated trucks, reefer vans and modified atmosphere packaging (MAP) are needed for capturing a larger share of customers and reducing post-harvest losses. For food grains and allied products which have longer shelf lives, adequate warehousing facilities help farmers in storing their produce for a longer time.

The state should focus on developing policies that focus on proper agri-logistics planning. The deepest pockets of the rural districts must be connected through effective agro-logistics strategy which will improve geographical reach for farmers and allow them to reach inter- and intra-state customers, thereby increasing their revenue. Farmers can boost their selling volumes and allow more produce to securely reach the desired markets by turning crop loss into revenue through timely engagement with post-production activities.

- **Strengthening the agri supply chain**

The GoI's target of doubling farmers' incomes is a welcome move to improve the agriculture and allied industry. There is potential for local agricultural value chains to successfully transform and modernise their journey to enhance farmers' incomes and expand their geographical base. The agriculture and allied sector accounted for21.27%of Odisha's GVA in 2020-21. With 83.3% of the state's population living in rural areas, focusing on strengthening the agricultural supply chain could enhance the incomes o farmers through further employment generation in processing, distribution, logistics, warehousing and retail. This is further expected to enhance the forward linkage of food produced in Odisha to larger markets. It is imperative to invest in integrated agro-logistics to bring the markets closer to the farmers. Integrating small and marginal farmers into village-level aggregators / FPOs can aid in collaborative cultivation. Such integration would also increase the incomes of farmers and enable them to reach a higher level of operational efficiency across the value chain.

- **Leveraging the online e-NAM platform**

The National Agriculture Market (eNAM) platform was launched by the Small Farmers' Agribusiness Consortium (SFAC) to expand the geographical reach of producers from their local levels to unified markets. This platform provides and promotes uniformity in the marketing of agricultural produce by streamlining pan-India trade in agricultural commodities and enabling both buyers and sellers to discover better prices and establish stronger connectivity.

The digital trading platform allows both buyers and sellers to understand demand through real-time price discovery, thereby enabling them to make uniformed decisions. The eNAM platform is a one-

stop solution for all Agricultural Produce Marketing Committee (APMC) related queries. It also provides access to those who transport agricultural produce across India. At present, 1,000 APMCs are linked to the eNAM platform and 41 of the mare from Odisha.

It is critical to change soft agricultural infrastructure if the target of doubling farmers' income is to be met. Farmers can reach more customers and enhance their revenue if they have access to a unified national market.

- **Investment opportunities in Odisha**

Odisha is self-sufficient in producing paddy, which is the state's staple food, and maize, which is the second most important cereal cultivated in terms of area coverage and production. Wheat is imported from other states as the state's production is lower than its total requirement. The average capacity of cold storage facilities in Odisha is just 2.1 MT per sq. km. This is insufficient to meet the current demand and results in around 35-40% of the food wastage in the state. The state government is addressing this issue by launching PPP projects in building new cold storage facilities with a capacity of 10.1 lakh MT per sq. km by 2025-26. As a result, agro-logistics must be strengthened to improve its access and reach into the deeper pockets of Odisha. The ability to directly link farm gates with markets could be promoted through rail/road/multimodal logistics facilities. Providing access to such logistics facilities would aid in holistic post-production management and geographical flow of produce, thereby highlighting Odisha's contribution to India's agriculture and allied sector.

Conclusion

Odisha's rich resources, strategic location and the presence of varied agro climatic conditions provide ample opportunities for improvement in the state's agriculture and allied sector. The state boasts of varied crop varieties, a strong fisheries base and rich forest resources, thereby creating a plethora of opportunities for domestic and international trade. Thus, it is imperative to develop a strong agricultural infrastructure and logistics base to harness these advantages. Currently, the state's marketing infrastructure is supported by 66 RMCs, cold storage units with around 591,000 MT capacity and food grain warehouses with a capacity of around 1,146,000 MT. The state government is focusing on improving the policy ecosystem to develop and sustain the agriculture sector. However, challenges such as fragmented value chains, lack of aggregation and awareness, insufficient supporting infrastructure and inadequate services across value chains continue to behind ranches to sectoral growth. Macro- and micro-level initiatives need to be taken up to address the same, including developing policy-level interventions, promoting private sector investments, supporting farmers through ancillary services, building capacity and strengthening the bargaining power of farmers. Odisha can emerge as one of the leading states in terms of agricultural growth if there is adequate focus on strengthening agro-logistics across value chains.

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