

EXPORT ORIENTED VALUE CHAIN STUDY

Ginger - Koraput, Odisha

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Executive Summary

Commodity Profile

Ginger (botanically known as *Zingiber Officinale*) belongs to the family Zingiberaceae. Ginger's generic name, Zingiber, is derived from the Greek zingiberis, which comes from the Sanskrit name of the spice, singabera. Ginger is an important commercial spice in tropical and subtropical countries, particularly in South Asia. It is highly valued for its medicinal components which are extractable oleoresins, fats, carbohydrates, vitamins, minerals and medicinal compounds such as antioxidants, flavonoids and many minor phytochemical components which are considered as anticancer agents. Ginger is commercialized for its aromatic rhizomes, which are also used as a spice as well as an essential ingredient for many medicines.

Global Ginger Production and Trade Scenario

India is the largest producer of contributing slightly more than 40% of the global production in 2020. It is followed by Nigeria and China which compete closely for the second spot with about 17% and 14% of global production in 2020. Nepal (~7%), Indonesia (~4.5%) and Thailand (~4%) are other major producers of ginger.

China is the leading exporter of ginger with a share of 69.14 percent in world exports. While Thailand ranks second, its share is far lower at 9.57 percent. The share of India is 3.72 percent and although the country ranks 3rd along with Peru, its share in world exports of ginger is considerably low.

The share of USA in global imports of ginger in 2019-20 was highest at 13.13 percent, followed by Japan which had a share of 10.32 percent. Netherlands ranked third, but it is important to note here that Netherlands imports ginger and then exports it to other European countries after processing and packaging.

Indian Ginger Production Scenario

Though Madhya Pradesh figures at the largest producer of ginger in India, it is Karnataka which is recognised as the leading production state of India not only due to the large size of its ginger crop (which actually exceeded Madhya Pradesh ginger production in 2020-21) but also for its physical quality and dense concentration of production areas around the Malnad region of Karnataka. Hassan and Shimoga districts in Karnataka are major producers of ginger and these two districts together occupy 63 percent of the area under ginger in Karnataka. Assam is also an important ginger growing state with significant production volumes but more importantly the low fibre and largely organic character of the ginger produce. Ginger production is gaining popularity in the eastern belt of the country with considerable increase in area under ginger in West Bengal, Odisha, Sikkim, Meghalaya and other eastern states.

Odisha and Koraput Ginger Production Scenario

Odisha is among the Top 5 states for production of ginger in India. The two districts in South-West Odisha namely Koraput and Kandhamal contribute more than 50% of the total production of ginger in Odisha which is about 1.28 lakh MT.

Koraput is the leading district for production of ginger in Odisha state. With more than 9500 acres under ginger, the district produced nearly 50,000 MT of ginger in 2020-21. Three blocks namely Semiliguda, Pottangi and Nandapur - each have a ginger production exceeding 10,000 MT. These three blocks contribute 77% of the total ginger production for Koraput district. Several varieties of ginger are cultivated in Koraput. Major ones reported by the Regional Research and Technology Transfer Station (RRTTS) Semiliguda are Suprabha, Suruchi, Suravi, Nadia, Koraput local bold and Kalimpong. The ginger varieties developed and notified by High Altitude Research Station located in Pottangi block of Koraput include Suprabha, Suravi and Suruchi.

There are two primary products of the harvested ginger rhizome –fresh and dry. Fresh ginger is consumed as a vegetable. The dry form is mainly for value addition into other products.

Ginger is propagated by portions of the rhizomes, known as seed rhizomes. The crop is normally sown in the months of April-May and harvested from 150 days up to 270 days. Ginger attains full maturity in 210-240 days after planting. However, harvesting of ginger for vegetable purposes starts after 150-180 days depending on the demand for the produce. At an early maturity, they are fit for fresh consumption as the rhizomes are less fibrous and tender. This rhizome gradually becomes more fibrous and strong flavoured after 210 days or so and hence not used as fresh but mainly dry.

The farmers harvest the crop before full maturity, if the price is favourable. Also, at the time of harvest, if the price is not satisfactory, then perennated crop is practised when the matured rhizome is left in the field without harvesting, in the hope of higher market prices.

Value Chain Analysis of Koraput Ginger

The analysis of Ginger value chains in Koraput has brought out the following key observations which are relevant for development of business plans revolving around ginger.

1. There is a higher demand for split / sliced ginger after drying as it becomes easier to control quality in such form than in ground material.
2. During grinding of ginger, there could be a many food safety issues especially the control of contamination (mycotoxins, salmonella etc.), pesticide residue levels (MRLs), detergent residue, additives
3. Due to the high water content of fresh ginger, exports of fresh ginger to other international markets are limited. The cost of transportation of fresh ginger is high as the product has low resistance to spoilage (because of its high perishability) due to effect of heat and humidity.
4. EU buyers are reported to be facing challenges in finding supplier-processors with good cutting equipment that would help in supplying ginger as thin slices.
5. For supply of dry ginger based products for table consumption, Indian companies often blend Nigerian and Indian ginger which helps to reduce pungency of Nigerian ginger while taking benefit of lower prices and superior essential oil / oleoresin content of Nigerian ginger.
6. It emerged that some Indian varieties for high quality ginger (e.g. Cochin ginger preferred for its low fibre content, pleasant flavour and acceptable pungency; Ellakalan from Idukki district preferred for its high oil content; Karbi Anglong from Assam preferred for its low fibre content) have over time given way to varieties from Nigeria which were cheaply available in

international markets. Hence cheap imports have gradually led to the disappearance or limited supply of quality varieties in India.

7. In fact, India imports dry ginger from Nigeria for manufacture of value added products such as ginger oil and oleoresins. India is importing dry ginger at very competitive prices. Further, there are very limited varieties of ginger which give a good yield of oil whereas those imported from countries like Nigeria give good oil yield.
8. The major components of the cultivation costs for ginger are the cost of seeds, plant protection chemicals, fertilizers and most importantly, the labours involved in farm operations such as bed preparation, seed sowing, weeding / cleaning, mounting of soil and harvesting. Labour costs clearly comprise the largest share (45%-60%) of the cultivation costs of ginger.
9. Most smallholder, tribal farming households cultivate ginger in relatively small area ranging from 0.2 acre to 0.5 acre, with only 15%-20% of smallholders, tribal households growing ginger in an area exceeding 0.5 acre. The limited availability of household-level labour coupled with financial constraints in hiring external labour usually determine the upper limit (for a smallholder, tribal household) of the cultivation area under ginger.

Gaps in the Ginger Value Chain of Odisha

From an economic development perspective, there are five main issues in the ginger value chain needing higher degree of attention. These issues pertain to: (i) traditional v/s recommended practices during production and post-harvest management; (ii) increasing adoption of synthetic chemical based agri-inputs; (iii) persistent low levels of post-harvest management and value addition by producers; (iv) limited equity or bargaining power of producer organisations in value chains; (v) social and occupational conditions esp. with regards to women, children and youth participation

Potential Interventions to Access EU Markets

I. Infrastructure Support

- A. Provision of Critical Infrastructure for Postharvest Management, Value Addition and Processing of Ginger
 - A1. Cleaning and Washing Stations for Ginger at Suitable Aggregation Points in Koraput (preferably at FPO Collection Centres)
 - A2. Cold Storage for Ginger in Koraput (preferably close to road / railway transportation hubs)
 - A3. Common Facility Centre for Production of Dried Ginger Powder

II. Institutional Development

- B. Promoting institutional structures for effective governance of ginger value chain development programme in Koraput

- C. Addressing market failures and gaps in service delivery to ginger growers and producer organisations
- D. Facilitating access to markets, finance and risk mitigation services

Proposed Export Oriented Value Chain for Ginger in Koraput

The AMD project envisions connecting producer organisations (FPOs) in Koraput directly with the markets in EU for various ginger products. The intended objective of the project could be viewed as a multi-stage or multi-level initiative which has to systematically build the capacities of selected FPOs for catering to the demands or opportunities of more challenging buyers which would in turn enable these FPOs to realize more remunerative prices for ginger products supplied by them. It becomes important to recognise here that the goal of supplying ginger products to a challenging buyer (oleoresin manufacturer) or market (EU or Japan) could be relatively simpler than the goal of developing or nurturing the selected FPOs to become an influential actor in the value chains of ginger products which serve remunerative markets such as EU. By enabling the FPO to become an influential or dominant actor in some of the targeted value chains will ensure long-term benefits not only for the associated ginger producers but also for the underlying ecosystem for ginger in Koraput. In pursuit of this goal, the focus should therefore be on building the organisational (or entrepreneurial) capacities of the selected FPO(s) especially for achieving critical scale, profitability and sophistication in its business operations especially on the postharvest and marketing side. Till the time the selected FPO reaches the critical scale, profitability and sophistication, it would be useful for it to be nurtured or supported by a private sector partner (primarily for business development support services for product distribution, market outreach, financing mobilization, stakeholder management, systems development etc.).

1. Commodity Profile – Ginger

1.1 Market Overview

It is widely believed that ginger has originated from the Indian sub-continent because a large number of varieties of ginger, as well as their wild relatives, are available in this area. Its use in India and China has been known from ancient times. It was then brought into the Mediterranean region by the first century traders. Ginger is an important commercial spice in tropical and subtropical countries, particularly in South Asia. It is highly valued for its medicinal components which are extractable oleoresins, fats, carbohydrates, vitamins, minerals and medicinal compounds such as antioxidants, flavonoids and many minor phytochemical components which are considered as anticancer agents. Ginger is commercialized for its aromatic rhizomes, which are also used as a spice as well as an essential ingredient for many medicines.

Ginger (botanically known as *Zingiber Officinale*) belongs to the family Zingiberaceae. Ginger's generic name, Zingiber, is derived from the Greek *zingiberis*, which comes from the Sanskrit name of the spice, *singabera*.

1.1.1 Global Production of Ginger

	2015	2016	2017	2018	2019	2020
GLOBAL PRODUCTION	2.76M	3.63M	3.51M	4.10M	4.09M	4.32M
India	760.00K	1.11M	1.07M	1.76M	1.79M	1.84M
Nigeria	413.38K	774.89K	834.63K	700.00K	647.04K	734.30K
China	495.92K	550.00K	557.78K	577.45K	600.00K	618.90K
Nepal	242.55K	271.86K	279.50K	284.00K	297.51K	298.95K
Indonesia	313.06K	340.34K	216.59K	207.41K	174.38K	183.52K
Thailand	162.40K	166.43K	163.41K	168.28K	169.37K	167.02K

According to FAOSTAT 2020 data, based on estimated global production shares, India, Nigeria and China are the top three ginger producing countries in the world. In terms of regional production shares, Asia and Africa dominate global ginger production.

In 2020, the top exporters of Ginger were China (\$758M), Netherlands (\$127M), Peru (\$111M), India (\$94.2M), and Thailand (\$64.1M). In 2020, the top importers of Ginger were Netherlands (\$174M), United States (\$170M), Pakistan (\$94.6M), Japan (\$87.5M), and Bangladesh (\$84.7M).

In 2020, the countries that had the largest value of net exports for Ginger were China (\$752M), Peru (\$110M), India (\$75M), Nigeria (\$56.1M), and Thailand (\$55.6M). In 2020, the countries that

had a largest value of net imports were United States (\$161M), Pakistan (\$93.2M), Japan (\$87M), Bangladesh (\$84.7M), and United Kingdom (\$54.7M).

China is a leading exporter of ginger with a share of 69.14 percent in world exports. While Thailand ranks second, its share is far lower at 9.57 percent. The share of India is 3.72 percent and although the country ranks 3rd, along with Peru, it has a very small share in world exports of ginger.

The share of USA in global imports of ginger in 2019-20 was highest at 13.13 percent, followed by Japan which had a share of 10.32 percent. Netherlands ranks third, but as noted earlier, Netherlands imports ginger, and after processing and packaging exports it to other European countries.

1.1.2 Indian Production of Ginger

PRODUCTION (IN MT)	2016-17	2017-18	2018-19	2019-20	2020-21
Madhya Pradesh	372.6K	377.5K	414.3K	438.4K	477.6K
Karnataka	271.5K	249.9K	244.1K	234.2K	532.1K
Assam	156.6K	161.6K	166.3K	183.2K	186K
West Bengal	130.4K	133.8K	135.6K	136.6K	139K
Odisha	128K	128K	128K	128K	128K
Gujarat	102.9K	102.9K	110.4K	113.2K	110.9K

Source: indianspices.com (Spice Board of India)

Ginger production is gaining popularity in the eastern belt of the country with considerable increase in area under ginger in Assam, Odisha, West Bengal, Sikkim, Meghalaya and other eastern states.

As per data for 2019-20 from Indianspices.com, Karnataka contributes 15 percent of the total ginger production in India. Hassan and Shimoga districts in Karnataka are major producers of ginger and these two districts together occupy 63 percent of the area under ginger in Karnataka.

Assam is an important ginger growing state and has a share of 10 percent of the total Indian production of the crop. The produce is however sold mainly in fresh form by farmers. The traders from local as well as distant markets are the main buyers of the produce. The climate in Assam is humid and hence even if the produce is dried, it still has high moisture content which leads to rejection of lots. Hence the produce is mainly sold in fresh form. The produce is largely organic but farmers often did not get premium price for their product. It is however important to note that an important variety of ginger cultivated by tribals in Assam, namely, Karbi Anglong, has been accorded Geographical Indication tag. The ginger produced has low fibre content and considered to be one of the best organic ginger varieties in the world. The yield of ginger has not shown much

improvement over the years and the North Eastern states experience even lower yields as they practise organic farming.

The major production centres and markets of ginger across India are listed in the following table.

State	Major Production Centres and Markets of Ginger
Kerala	Cochin, Alleppey, Calicut, Wayanad
Karnataka	Hasan, Coorg-Madikeri, Shimoga, Mysore
Madhya Pradesh	Tikamgarh, Chhindwara, Sagar, Katni, Dhar, Chhatarpur, Anuppur
Maharashtra	Nagpur, Satara, Aurangabad
West Bengal	Siliguri, Kolkata
Odisha	Koraput, Kandhamal
Gujarat	Dahod, Mahisagar, Panchamahar, Anand (Boriavi)
Sikkim	Gangtok
Assam	Guwahati, Tinsukia, Silchar
Meghalaya	Bhoi, Rymbong, Rongram
Nagaland	Dimapur

1.1.3 Ginger Export Scenario

Ginger Export Statistics

Year	Export Qty in MT	Export Value in INR Lakh	Top 5 Export Markets	Share Top 5 Markets (by Value)
2021-22 (Est.)	147614	83734	Bangladesh, Morocco, USA, UAE, UK	72.4%
2020-21	145974	84982	Bangladesh, Morocco, USA, UAE, UK	74.9%
2019-20	60410	52905	Morocco, Bangladesh, USA, UAE, Saudi Arabia	70.6%
2018-19	18150	19602	USA, Morocco, Bangladesh, UK, UAE	69.6%
2017-18	22605	21607	Morocco, USA, Bangladesh, UK, UAE	63.0%

India is the largest producer of ginger in the world but also the largest consumer. Hence most of the produce is consumed in the domestic economy and barely 5 percent of produce is exported. The produce that is exported is not only of fresh and dry ginger but also that of value added products such as ginger powder, ginger oil and oleoresin and other forms either crushed or non-crushed.

India exports fresh ginger mainly to Bangladesh and over the eleven year period from 2007-08 to 2017-18, about 50 percent of Indian exports of fresh ginger were to Bangladesh. This is possibly due to its close proximity to the North Eastern and Eastern states of India (Assam, Sikkim, West Bengal, Odisha, Meghalaya, Nagaland etc.) which are also important ginger growing regions. Exports

of fresh ginger to Nepal and Pakistan also take place due to the same reason. Small quantities of fresh ginger are exported to farther destinations such as UAE, Saudi Arabia, Morocco, Egypt etc.

Dry ginger is mainly exported to Spain, Morocco, Saudi Arabia, USA and UAE.

USA and UK are major countries to which ginger powder is exported. In fact, many western countries import ginger powder from India.

The major countries to which exports of ginger oil take place are, U.K, USA and South Africa. However, ginger oil is exported to several other countries such as Netherlands, France and Germany.

The main countries to which ginger oleoresins are exported is USA, UK, and South Africa. However other countries which have a lower share of oleoresins exports from India are Australia, Germany and South Korea.

High domestic consumption and lack of price competitiveness in international markets act as a major constraint on exports of ginger from India. Hence the export potential of Indian ginger is not realized and other exporters such as China, Nigeria and Peru are able to increasingly tap remunerative markets in Europe, North America and Asia Pacific. In fact, India imports dry ginger from Nigeria for manufacture of value added products such as ginger oil and oleoresins. Data on imports of dry ginger reveals that India is importing dry ginger at very competitive prices. Further, there are very limited varieties of ginger which give a good yield of oil whereas those imported from countries like Nigeria give good oil yield.

It emerged that some Indian varieties for high quality ginger (e.g. Cochin ginger preferred for its low fibre content, pleasant flavour and acceptable pungency; Ellakalan from Idukki district preferred for its high oil content; Karbi Anglong from Assam preferred for its low fibre content) have over time given way to varieties from Nigeria which were cheaply available in international markets. Hence cheap imports have gradually led to the disappearance or limited supply of quality varieties in India.

Ginger Exports to European Union (EU)¹

The worldwide consumption of ginger is forecast to continue to grow in the next 3-5 years. This is triggered by the increasing popularity of dishes, drinks, snacks and food supplements having ginger as a key ingredient. European consumers buy ginger mainly during the winter to relieve sore throat or flu symptoms. COVID19 helped to further boost the demand for natural remedies prepared from ingredients such as ginger, turmeric etc. A specific trend in the EU from which Indian ginger producers can benefit especially is the fact that European demand peaks in wintertime, when supply from other sourcing geographies is low and this creates scope to realise better prices.

In 2020, direct imports of dried ginger from developing countries to Europe totalled 152 thousand tonnes. Since 2016, the import volume has increased by 8.5% annually. In that same period, the (direct) import values increased by more than 16% annually, totalling €310 million in 2020. In

2020, more than 70% of total imports to Europe were sourced directly from developing countries. Re-exports to Europe accounted for almost 30% of total imports in 2020.

Together, the Netherlands, the United Kingdom and Germany form the top three (of a total of six) markets considered to be most interesting for dried ginger in Europe. The Netherlands ranks first only because the country is an important European trade hub for spices, while the UK and Germany are actually the two largest consumer markets in Europe for dried ginger. The UK is traditionally the largest market in Europe because of the large Asian diaspora living in the country; they typically consume a lot of ginger.

In Germany, but also in Italy, the Netherlands, Spain, and France, the market has grown considerably in recent years because of the increasing popularity of ginger as a healthy ingredient in dishes and other foods or drinks, such as fruit and nut bars and tea. Although mentioned last, tea is certainly not the smallest market for ginger. On the contrary, in recent years ginger tea has become very popular across Europe. While the fresh ginger market benefited from this trend tremendously, also the dried ginger market growth can be partly attributed to the growing use of ginger tea.

In Europe, Netherlands is the not only the largest importer but also trader of ginger. And the country is a trade hub for intra-European trade. Netherlands imports ginger and then re-exports it by adding value to imported dried ginger by further processing and packaging it. The main destinations for Dutch exports are all European countries with Germany ranking first (over 14 thousand tonnes and a share of 23%), followed by Poland (7.3 thousand tonnes), France (5 thousand tonnes), Belgium (3.5 thousand tonnes), Sweden (3.2 thousand tonnes), and Austria, Switzerland, and the United Kingdom (between 2.3 and 2.4 thousand tonnes each).

The Netherlands has a particular high share of imports coming from Peru. In 2019, the Netherlands imported 7.5 thousand tonnes of ginger from Peru, and in 2020, this volume more than doubled to almost 16.5 thousand tonnes. This is roughly 50% of Peru's total ginger exports and more than 75% of Peruvian ginger exports to Europe. In 2020, imports from China dominated with 61 thousand tonnes. Imports from Brazil stabilised (10.4 thousand tonnes), as did imports from Nigeria (2.3 thousand tonnes). Imports from Thailand actually decreased from 1.4 to 0.7 thousand tonnes. The Netherlands imports only small amounts of ginger from other European countries: 1.2 thousand tons from Belgium and approximately 400 tonnes each from Germany and Italy.

United Kingdom is the second largest importer of ginger in Europe and this could possibly be due to the fact that there is a large Indian population residing in Europe. Germany and other European countries also import ginger although their share is small. While some of these countries import from Netherland, many of them also source it from India.

1.2 Ginger Production in Odisha

As per data from the Spice Board of India, Odisha is among the Top 5 production states for ginger in India. The two districts in South-West Odisha namely Koraput and Kandhamal contribute more than 50% of the total production of ginger in Odisha which is about 1,28,020 MT. Other important

districts for ginger production in Odisha are Keonjhar, Mayubhanj and Rayagada, which cumulatively contribute about 16% of the total ginger production of Odisha

The ginger production from Odisha caters to local demand from within the state, from neighbouring states such as Andhra Pradesh (Visakhapatnam markets) and to the demand of fresh ginger from Bangladesh.

1.2.1 Ginger Production Regions (Koraput)

Koraput is the leading district for production of ginger in Odisha state. With more than 9500 acres under ginger, the district produced nearly 50,000 MT of ginger in 2020-21. Three blocks namely Semiliguda, Pottangi and Nandapur - each have a ginger production exceeding 10,000 MT. These three blocks contribute 77% of the total ginger production for Koraput district.

1.2.2 Ginger Varieties and Key Characteristics

Several varieties of ginger are cultivated in Koraput. Major ones reported by the Regional Research and Technology Transfer Station (RRTTS) Semiliguda are Suprabha, Suruchi, Suravi, Nadia, Koraput local bold and Kalimpong. The ginger varieties developed and notified by High Altitude Research Station located in Pottangi block of Koraput include Suprabha, Suravi and Suruchi.

Each variety has its own characteristics in terms of pungency, flavour, aroma, colour, yield, maturity, dry recovery and oil extraction (FAO, 2002). The key characteristics of ginger cultivars grown in Koraput are compared in the following table:

Cultivar	Fresh Yield	Maturity (Days)	Oleoresin (%)	Essential Oil (%)	Crude Fiber (%)	Dry Recovery (%)
Suprabha	16.6	229	8.9	1.9	4.4	20.5
Suruchi	11.6	218	10	2	3.8	23.5
Suravi	17.5	225	10.2	2.1	4.0	23.5

1.2.3 Ginger Crop Seasonality

Calendar of Key Activities

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Harvest of Rhizome for Seed & Dry Ginger			Planting			Harvest of Mother Rhizome			Harvest for Fresh Vegetable Use		

There are two primary products of the harvested ginger rhizome –fresh and dry. Fresh ginger is consumed as a vegetable. The dry form is mainly for value addition into other products.

It is important to note that ginger is propagated by portions of the rhizomes, known as seed rhizomes. The crop is normally sown in the months of April-May and harvested from 150 days up to 270 days. Ginger attains full maturity in 210-240 days after planting. However, harvesting of ginger for vegetable purposes starts after 150-180 days depending on the demand for the produce. At an early maturity, they are fit for fresh consumption as the rhizomes are less fibrous and tender. This

rhizome gradually becomes more fibrous and strong flavoured after 210 days or so and hence not used as fresh but mainly dry.

The farmers harvest the crop before full maturity, if the price is favourable. Also, at the time of harvest, if the price is not satisfactory, then perennated crop is practised when the matured rhizome is left in the field without harvesting, in the hope of higher market prices.

1.3 Value Chain Analysis

It can be roughly estimated that in the ginger economy of the country, the farmers retain about 20 percent as seed and 20 percent is processed into dry ginger. Out of the remaining 60 percent, about 10 percent is converted into ginger paste and the remaining 50 percent is consumed as fresh in vegetable form for culinary purposes. Ginger flakes and ginger powder are made from dry ginger.

Ginger powder is normally a by-product while processing dry ginger. Further, dry ginger is also purchased by manufacturers of oil and oleoresin units, who also depend upon imports for their raw material. About 5 percent of total ginger produced in India is exported.

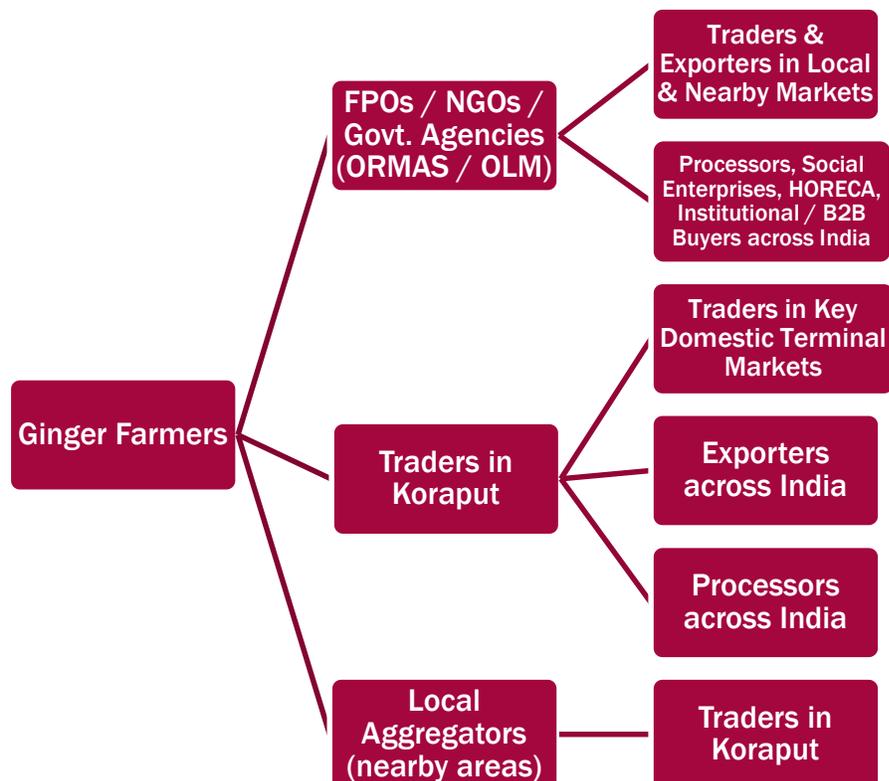
1.3.1 Major Actors in Value Chain

- Major Actors in Value Chain of Ginger in Koraput

Activity	Agent / Actor	Output
Input Supply	Agri-Input Shops, Fellow Farmers	Seeds, Nutrients, Protection Chemicals, Agri-Machinery, FYM, Bio/Organic Inputs
Training and Subsidies	Dept. of Horticulture, KVK, Research Station (RRTTS Semiliguda & HARS Pottangi)	Package of Practices, Frontline Demonstrations, Soil Testing, Subsidies etc.
Crop Production	Farmers	Ginger produce
Post-Harvest Management	Farmers, FPOs, NGOs, Govt. Agencies (ORMAS / OLM)	Washing, Rinsing, Splitting etc.
Transportation	Local Aggregators, Agents (of Traders) FPOs, NGOs	Logistic Assistance, Packing, Quality Assessment
Primary Processing	Local Aggregators, Agents (of Traders) FPOs, NGOs, Govt. Agencies (ORMAS / OLM)	Slicing, Bleaching, Drying etc. resulting in dried ginger
Secondary and Tertiary Processing	Specialized Processing Units for Ginger Oil, Oleoresins and other Complex Products	Essential oils, oleoresins and other value-added products of ginger such as ginger-infused tea, ginger lozenges etc.
Distribution and Retail (Domestic Market)	Traders, FPOs and NGOs in Koraput, Bhubaneswar, Visakhapatnam, Raipur etc.	Marketing and sales of fresh ginger in domestic and neighboring export markets
Exports	Specialized Processors mainly in South India; Exporters in Kerala, Nagpur, Kolkata etc.	Marketing of complex products made from dried ginger in distant markets
Certifications -Phytosanitary Certification, GLOBAL GAP, Health Certificate)	SGS, Eurofins, TuV etc.	Certified consignments of ginger products for domestic / export markets
Organic certification	APEDA approved Certification agencies including Orissa State Organic Certification Agency for NPOP; USDA approved Certification agencies for NOP	NPOP / NOP certified organic ginger products for domestic / export markets

1.3.2 Commodity Flow Analysis

Trade Channels for Koraput Ginger



Indian Exports of Ginger

India is the largest producer of ginger in the world but also the largest consumer. Hence most of the produce is consumed in the domestic economy and barely 5 percent of produce is exported. The produce that is exported is not only of fresh and dry ginger but also that of value added products such as ginger powder, ginger oil and oleoresin and other forms either crushed or non-crushed.

The total quantity of ginger and ginger products exported was 1.48 lakh MT in 2021-22 (est.) valued at Rs 837 crore and 1.46 lakh MT in 2020-21 valued at Rs 850 crore. The quantity of ginger exports in the two most recent years have almost increased by 140 percent vis-à-vis the exported quantity of 60 thousand MT in 2019-20. The increase in ginger exports during 2021-22 and 2020-21 seems more spectacular from the average exported quantity of 20 thousand MT in 2018-19 and 2017-18. While the exported quantity in the two most recent years has increased by almost 140 percent, the corresponding increase in price / value realization has been around 60 percent signifying higher share of lower-priced fresh ginger in the increased export quantity.

India exports fresh ginger mainly to Bangladesh and over the eleven year period from 2007-08 to 2017-18, about 50 percent of exports of fresh ginger were to Bangladesh. This is possibly due to its close proximity to the North Eastern and Eastern states of India (Assam, West Bengal, Odisha, Sikkim, Meghalaya, Nagaland etc.) which are also important ginger growing regions. Exports to

Nepal and Pakistan also take place due to the same reason. Due to the high water content of fresh ginger, exports of fresh ginger to other international markets are limited. The cost of transportation of fresh ginger is high as the product has low resistance to spoilage (because of its high perishability) due to effect of heat and humidity.

Dry ginger is mainly exported to Spain, Morocco, Saudi Arabia, USA and UAE. USA and UK are major countries to which ginger powder is exported. In fact, many western countries import ginger powder from India. The export volumes of dry ginger and ginger powder from India are relatively modest when compared to China and Nigeria - India's major competitors in international markets for dry ginger. Chinese and Nigerian ginger is available in the international markets at lower rates. The ginger from Nigeria is renowned for its pungency and oleoresin extraction from it is also higher.

The major countries to which exports of ginger oil take place are, U.K, USA and South Africa. However, ginger oil is exported to several other countries such as Netherlands, France and Germany. The main countries to which ginger oleoresin are exported is USA, UK, and South Africa. However other countries which have a lower share to which oleoresin is exported are Australia, Germany and South Korea.

There is a higher demand for split / sliced ginger after drying as it becomes easier to control quality in such form than in ground material. During grinding of ginger, there could be a many food safety issues especially the control of contamination (mycotoxins, salmonella etc.), pesticide residue levels (MRLs), detergent residue, additives. EU buyers are reported to be facing challenges in finding supplier-processors with good cutting equipment that would help in supplying ginger as thin slices. For supply of dry ginger based products for table consumption, Indian companies often blend Nigerian and Indian ginger which helps to reduce the pungency of Nigerian ginger while taking benefit of lower prices and superior essential oil / oleoresin content of Nigerian ginger.

1.4 Farm-Level Economics of Ginger Cultivation

The major components of the cultivation costs for ginger are the cost of seeds, plant protection chemicals, fertilizers and most importantly, the labours involved in farm operations such as bed preparation, seed sowing, weeding / cleaning, mounting of soil and harvesting. Labour costs clearly comprise the largest share (45%-60%) of the cultivation costs of ginger. Owing to the availability and frequent use of household / family labour, the cost of ginger cultivation can be reduced significantly by smallholder, tribal farming households. Most smallholder, tribal farming households cultivate ginger in relatively small area ranging from 0.2 acre to 0.5 acre, with only 15%-20% of smallholders, tribal households growing ginger in an area exceeding 0.5 acre. The limited availability of household-level labour coupled with financial constraints in hiring external labour usually determine the upper limit (for a smallholder, tribal household) of the cultivation area under ginger.

Key Activities	Time Required (Person Days)	Nature	Cost (in INR)
Land Preparation – 6 times		Critical	7000
Organic Manure		Desirable	5500
Bed Preparation	20 person days	Important	5000
Seeds Arrangement – 7 Quintals (Seed is replaced every 3-5 years)		Desirable	21000
Fertilizers (DAP – 100 kg, Potash - 50 kg)		Critical	5000
Seed Sowing	25 person days	Critical	6250

Mulching (Leaf, Paddy Straw)		Desirable	1500
Irrigation (Rain-fed)			
Weeding / Cleaning	30 person days	Critical	7500
Sprays	9 person days	Important	2250
Application of Plant Protection Chemicals & DAP		Important	13500
Mounting of Soil	40 person days	Desirable	10000
Harvesting (Digging, Cleaning)	50 person days	Critical	12500
Total Cost of Cultivation (per acre in INR)		Critical + Important + Desirable	97,000
Cost of Cultivation (per acre in INR)		Critical + Important	59,000

1.4.1 Price Build-up Analysis: Production, Marketing Functions, and Key Supply Chain Activities

Production Cost (per acre) ~ INR 60,000 per Kg (for smallholder, tribal households)

Yield (per acre) ~ 4000 Kg

Particulars	Amount (in INR per Kg)		Price Markup (INR per Kg)
Production Cost	15		
Fresh Ginger Sale Price (Month-wise for reference)	Jan-Feb	10-20	
	Mar-April	20-30	
	May-Jun-Jul	30-50	
	Aug-Sep-Oct	25-40	
	Nov-Dec	15-25	
Fresh Ginger Sale Price in Feb-Mar (Estimated Average)	25		
Average Selling Price for Farmers	20		
Farmgate-level Handling Costs (Cleaning, Packaging, Loading & Transportation)	3	23	
Aggregator / Local Middlemen Charges	2.5	25.5	
Handling & Transaction Costs in Nearby Market / RMC (Loading, Unloading, Quality Sampling, Market Fee)	1.5	27	
Local Trader's Margin (5-6%)	1.5	28.5	
Transport to Nearby Terminal Market (Bhubaneswar / Visakhapatnam)	1.25	29.75	
Cost of Wastage / Dump (2.5%) (At wholesaler's level)	0.75	30.5	
Wholesaler's Margin (7-8%)	2.5	33	
Cost of Wastage / Dump (7.5%) (At retailer's level)	2.75	35.75	
Retailer's Margin (25-30%)	9.25	45	

1.5 Gaps in the Value Chain

From an economic development perspective, there are five main issues in the ginger value chain needing higher degree of attention. These issues pertain to: (i) traditional v/s recommended practices during production and post-harvest management; (ii) increasing adoption of synthetic chemical based agri-inputs; (iii) persistent low levels of post-harvest management and value addition by producers; (iv) limited equity or bargaining power of producer organisations in value

chains; (v) social and occupational conditions esp. with regards to women, children and youth participation

(i) Traditional v/s recommended (scientific) production practices

Smallholders have limited or no access or no access to improved inputs (quality/disease-free planting material, mulching material, seed treatment chemicals and manure/compost). Production of ginger by smallholder, tribal farmers in Odisha suffers from low yields. Plants are often stressed and vulnerable to disease, provoking excessive use of pesticides and chemical fertilisers. Smallholders follow poor agronomic practices (land rotation, companion cropping, mulching practices, time of input application).

Because ginger can be replanted and harvested again the following year, some producers choose to replant old rhizomes, hoping for a better price the following season. While the practice of mother rhizome retrieval (during off season) before harvesting of ginger can be good practice and economical for farmers (up to 90% of seed rhizome can be retrieved), it makes the standing ginger crop susceptible to rhizome rot infestation (due to bacterial infection of rhizome from the point of rhizome separation as the mother seed is cut out during the rainy season). The farmers tend to sell the mother seed in August as they get a much higher price then as compared to selling the end produce in December (without taking the mother seed).

Despite the development of high-yielding varieties by the local research station affiliated with the Indian Institute of Spices Research, the majority of tribal and smallholder growers especially in a few blocks of Koraput continue to prefer cultivation of the local ginger variety. It has been reported that the local Koraput local ginger variety can be stored in ambient conditions for a long time after harvest. This obviates the need for cold storage for longer holding of crop by farmers or for conversion into dried ginger to enable shelf-life without use of cold storage facilities.

Likewise, very few tribal and smallholder growers follow the practice of seed treatment which could help reduce the losses due to soil-borne diseases. This becomes important when most grower use stored seeds for ginger cultivation.

There is a clear gap between the research institutions and the local growers (along with their support organisations) in striking the right balance between traditional and recommended practices during production and post-harvest management stages of ginger crop cycle.

(ii) Increasing adoption of synthetic-chemical based agri-inputs

Although most ginger farmers in the region claim that they cultivate organic ginger, the usage of synthetic chemicals (nutrients, protection chemicals) especially synthetic fertilizers / urea is fast catching up with the high levels of synthetic chemical inputs used in Malnad region of Karnataka which is the preferred source of quality fresh ginger for domestic and international markets. Though ginger growers in the North-East states (Assam, Sikkim, Meghalaya etc.) are reported to grow ginger organically, Koraput is losing its identity as a ginger production district with minimal usage of chemical inputs.

During primary research, most ginger growers in Koraput reported greater cost-efficacy and other associated advantages such as better shelf life of harvest and soil health with usage of biological /

organic inputs. However the convenient availability, reduced drudgery and easy application of synthetic chemical based inputs act as strong pull factors for tribal and smallholder ginger growers.

The Indian Institute of Spices Research (IISR) has launched bio-capsules – a technology which involves collection and compression of micro-organisms in a capsule which can be used as substitute for fertilisers in agriculture. Bio-capsules have the potential to improve the quality of soil as well as environmental standards, besides reducing the use of chemical fertilisers and pesticides. In the absence of suitable integration with the existing production systems of tribal and smallholder ginger growers, these sustainability-oriented innovations such as bio-capsules and other alternative biological / organic inputs continue to face a major barrier for trial and adoption (if found suitable).

(iii) Persistent low levels of post-harvest management and value addition by producers

Tribal and smallholder growers of ginger in Koraput are primarily restricted to production and sale of fresh ginger (for table consumption) and their active involvement in other aspects of the value chain is extremely limited. Their inability to store ginger and sell in bulk immediately after harvest or to convert it to dried ginger limits the opportunity to realise higher value from their ginger cultivation. At the same time, the tribal and smallholder ginger growers still have high dependence on local aggregators and agents (of local wholesale traders of fresh ginger) for sale of fresh ginger. About 20%-30% growers usually look up to these middlemen to help them in offloading their produce right from their ginger farms, thus minimising efforts in cleaning, packaging, loading and transporting of fresh ginger for sale in nearby markets. In the absence of alternatives to stock their fresh ginger produce (in cold storage or alternative storage facility) after harvest for sale at a later time or to convert it later into dried ginger products, a high percentage (80%-90%) of smallholder ginger growers in Koraput dispose their ginger produce (in fresh form) right after harvest.

(iv) Limited equity or bargaining power of producer organisations in value chains

The recent impetus by state agencies and socio-economic development organisations on developing producer organisations as institutional vehicles to help smallholders navigate the value chain and bargain effectively with the market players has seen emergence of a large number of producer organisations in Koraput. A high percentage of these new producer organisations in Koraput have ginger as a key or a focal commodity. There is high degree of competition among the producer organisations for capturing the centrestage as the flagbearer of the tribal and smallholder ginger community. There is limited synergy or alignment among the producer organisations promoted by different development organisations. The suboptimal alignment and collaboration among key stakeholders of the ginger ecosystem is likely to not only delay the process of mainstreaming tribal and smallholder growers in the value chain but would also lead to wastage of resources and efforts due to underlying redundancies, duplication and unaddressed gaps. As a result, middlemen (local aggregators or traders) are still the dominant actors with producer organisations and their promoting development organisations not able to find a way around to bypass the middlemen for improving the price realisation of growers.

Except at a minuscule level, producer organisations in Koraput have not been able to help their member-growers stock their fresh ginger produce (in cold storage or alternative storage facility) after harvest or convert it into dried ginger products for higher returns. Since tribal and smallholder ginger growers pay less attention to quality, hygiene and food safety requirements, the lack of

quality assured and consistent supply of fresh ginger, dried ginger or value-added ginger products remains a major constraint for collective marketing by producer organisations.

Furthermore, almost all the producer organisations in Koraput have low financial net worth (generally taken as the sum of share capital and reserves & surplus) and limited business experience. This makes it difficult for them to obtain loans of suitable size which could be used as working capital for procuring and stocking ginger. Though there are existing credit guarantee facilities set up for FPOs by the state government besides other financial enablement measures, lending institutions especially banks do not still extend loans exceeding Rs 20 lakh (2 million Indian rupees) to these FPOs.

(v) Social and occupational conditions (esp. with regards to participation of women, children and youth)

Women play an instrumental role in the ginger crop of Koraput. Though the women have limited decision making or decision influencing powers in matters related to land preparation, agri-inputs, financing, marketing and hiring of paid labour, they contribute bulk of the household labour required during planting, weeding and harvest operations. The children (including the school-going ones) from tribal, smallholder households that cultivate ginger also contribute labour for key operations in ginger production. Sometimes, they may have to also

Occupational Conditions: The cultivation and processing of ginger in Koraput continues to be done largely with hand tools and using manual approaches. Hardly any smallholder ginger grower uses personal protective gear during sprays of protection chemicals or adheres to protocols for safe handling of hazardous chemicals used in ginger cultivation. Most of the operations especially during the post-harvest stages especially aggregation, transportation, drying etc. are done in unhygienic or unsanitary conditions which could potentially compromise food safety.

1.6 Potential Interventions to Access EU Markets

1.6.1 EU market requirements

Requirements for ginger for the European market can be broken down in two broad categories:

- a. Food safety requirements (traceability, hygiene and control): HACCP (for processed ginger) and GLOBALG.A.P. (for fresh ginger) are obligatory. There are some optional requirements demanded by specific European buyers. In addition, ginger has to meet EU standards on maximum levels of contamination (mycotoxins, salmonella etc.), pesticide residue levels (MRLs), detergent residue, additives, etc.
- b. Non-obligatory requirements: demanded by specific buyers, such as BRC, Rainforest Alliance, organic and fair-trade certification.

Role of Certifications

According to the CBI EU market study on ginger and other spices, certification can provide SMEs with a competitive edge, validating their compliance with CSR standards and dealing with sustainability issues. This is because sustainable sourcing of certified products is a major trend in the EU, with the UK, the Netherlands and Germany leading the way. CBI notes that for dried ginger,

the main certifications are organic and Fairtrade. For organic certified ginger, the most interesting markets are Germany and Switzerland, since these countries are leading organic food markets in Europe. For Fairtrade-certified ginger, the most interesting market is the United Kingdom, since it is the number one country for Fairtrade products.

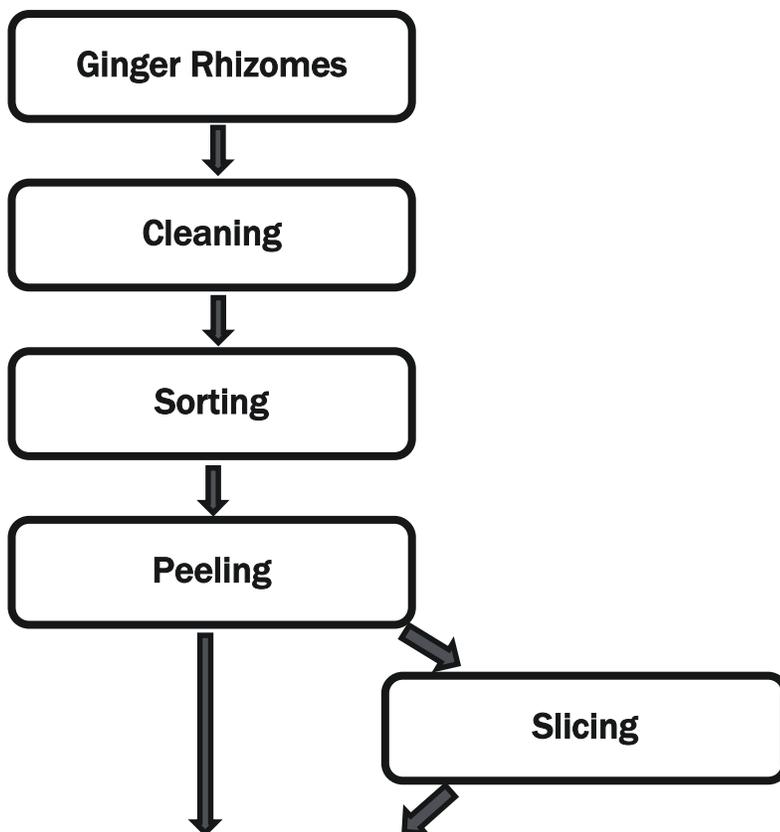
1.6.2 Potential Interventions

In the last couple of years, Peru has emerged as a major supplier of fresh organic ginger to EU markets. India mainly exports dry ginger and ginger powder to western countries with USA, UK, Morocco being the largest export markets.

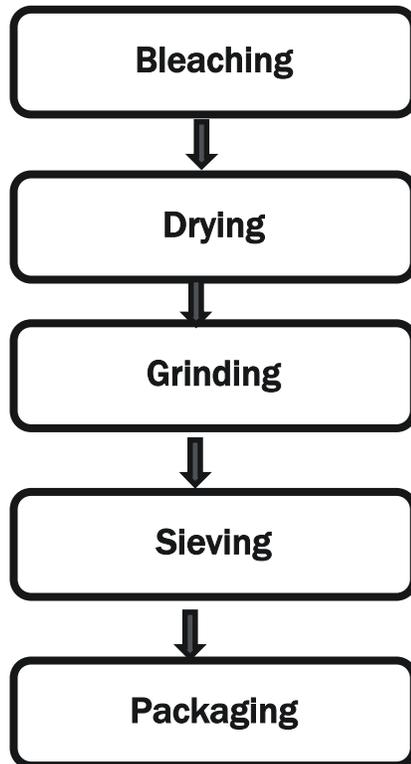
There is a higher demand for split / sliced ginger after drying as it becomes easier to control quality in such form than in ground material. During grinding of ginger, there could be many food safety issues especially the control of contamination (mycotoxins, salmonella etc.), pesticide residue levels (MRLs), detergent residue, additives. EU buyers are reported to be facing challenges in finding supplier-processors with good cutting equipment that would help in supplying ginger as thin slices.

The process flow for production of dried ginger and ginger powder is provided in the following diagram.

Process Flow for Production of Dried Ginger and Ginger Powder²



² Please refer to Annexure 1 for description of the key steps in ginger powder production



III. Infrastructure Support

E. Provision of Critical Infrastructure for Postharvest Management, Value Addition and Processing of Ginger

A1. Cleaning and Washing Stations for Ginger at Suitable Aggregation Points in Koraput (preferably at FPO Collection Centres)

It has been observed that ginger growers and their producer organisations in Koraput currently lack access to even basic postharvest management services such as cleaning and washing stations which are widely available in major ginger production districts (Hassan, Coorg, Shimoga etc.) of Karnataka. Improvement in quality of fresh ginger with the help of cleaning and washing stations can help smallholders supply fresh ginger directly to traders or wholesalers in distant / terminal markets.

A2. Cold Storage for Ginger in Koraput (preferably close to road / railway transportation hubs)

It is commonly seen that the prices of fresh ginger in Koraput hit their lowest levels in the months of January and February which coincide with the harvest period. Availability of suitable storage facility would help ginger growers to hold their produce during the peak harvest season, thus allowing them to sell at a later time (March, April, May etc.) when prices are generally better. Fresh ginger should be stored in a cold and humid environment. The shelf life of fresh ginger rhizome shelf life may be extended by storage at 10-12°C and high humidity. In a study on Hawaiian ginger, quality was stable for 28 weeks when stored at

12.5°C and 90% relative humidity (RH) as determined by dry weight, fibre content, oil content, sugars and phenols. In comparison, storage at 22 °C and 70% RH shortened rhizome commercialization to 20 weeks due to excessive water loss and fibre contents.

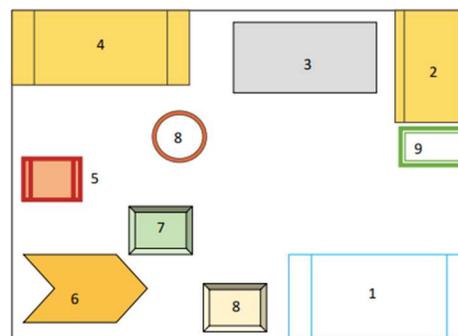
Though ginger growers in Koraput claim that fresh ginger of Koraput local variety can be stored easily for 7-8 months in ambient conditions, it is important to test this claim in the upcoming ginger marketing season (December 2022 – November 2023). A combination of biocontrol with *Trichoderma* sp. and storage in polyethylene bags at 25-30°C controlled storage rot due to the fungus *Sclerotium rolfsii* and prevented weight loss from dehydration. The Indian Institute of Spices Research recommends storage of fresh ginger in polyethylene bags with 2% ventilation prevents both dehydration and mould development.

A3. Common Facility Centre for Production of Dried Ginger Powder

Among the various products of ginger, dried ginger is the most versatile product which opens up avenues to tap both domestic and export markets including the EU markets targeted under the AMD project. Furthermore, the shelf-stable nature of dried ginger products obviates the need for distress sales by ginger growers as they can divert their fresh ginger supply for production of dried ginger products. The wide range of products that can be prepared from dried ginger allows ginger growers or their producer organisations to realise better prices over the course of the year, depending on the price behaviour of different products. Therefore, provision of a common facility centre could be a powerful risk mitigation measure to shield ginger growers from price vagaries.

It is proposed that the capacity and complexity of the common facility centre be increased in a phase-wise manner depending on the ability of the operator (possibly a lead FPO with handholding by a suitable business development support partner) to run the facility in an effective manner before an expansion or scale-up is undertaken.

An indicative layout of the proposed common facility centre is provided below.



- | | |
|---------------------|------------------|
| 1 Storage | 6 Grinder |
| 2 Washer cum Peeler | 7 Sieving |
| 3 Slicer | 8 Packing |
| 4 Dryer | 9 Weighing scale |
| 5 Polisher | |

IV. Institutional Development

F. Promoting institutional structures for effective governance of ginger value chain development programme in Koraput

The key policy making institutions comprising of agencies from Govt. of India, BMEL and Govt. of Odisha need to promote an 'agribusiness friendly' policy environment to improve incentives for private sector buyers and off-takers which will lead to lower transaction costs for ginger growers and their producer organisations. This could be achieved by developing institutional structures and mechanisms that favour cooperation and coordination among value chain stakeholders. Towards this goal, the AMD Project could look to support and facilitate an effective Public-Private Dialogue (PPD) mechanism which will seek to (i) facilitate training of main stakeholders on effective use of PPD to continue improving the performance of ginger value chain; (ii) support increased consultations among the key stakeholders in ginger value chains; for instance, through regular forums to discuss the various constraints and bottlenecks; (iii) review and update the ginger value chain development strategy; (iv) develop a shared vision and a harmonized approach to minimize potential conflict and devise mechanisms for coordinating private and public investments; (v) strengthen the capacity of key organizations overseeing the public and private sector engagement to ensure better services to ginger growers and their producer organisations; and (vi) advocate for a more enabling business environment with a view to developing inclusive value chains for ginger which deliver win-win economic outcomes to both producer organisations and the downstream private sector buyers working close to the ultimate consumers.

G. Addressing market failures and gaps in service delivery to ginger growers and producer organisations

The project should strive to develop a strong base of human capital and entrepreneurial capacity for exploiting economic opportunities in the ginger value chain through enablement of value addition and other key support services (e.g., food safety, traceability, sanitary and phytosanitary compliance, carrying and forwarding - C&F, insurance) required for integration of ginger growers with remunerative domestic and export markets. Towards this, the project could look to support the following activities: (i) technical assistance (TA) that enables selected producer organisations to raise the quality of their existing services (if any) and to create new ones in response to the demand of ginger growers; (ii) a capacity-building program to equip producer organisations and supporting agencies with requisite capacity (technical know-how and business competencies); (iii) promote linkages and partnerships with value chain actors to better meet the needs of producer organisations for domestic and export market access; for instance in terms of certification, traceability, market development advice, and technology transfer; and (iv) access to finance for upgrading/expanding the scope of services provided by producer organisations to ginger growers. It is expected that this service provision approach will engage local entrepreneurs (youth, both women and men) as service providers to create a catalytic effect in accelerating the agribusiness opportunities in Koraput especially vis-à-vis the ginger value chain opportunities. The project could look to support these service providers to expand outreach and address financial and non-financial barriers through design of appropriate incentive structures such as

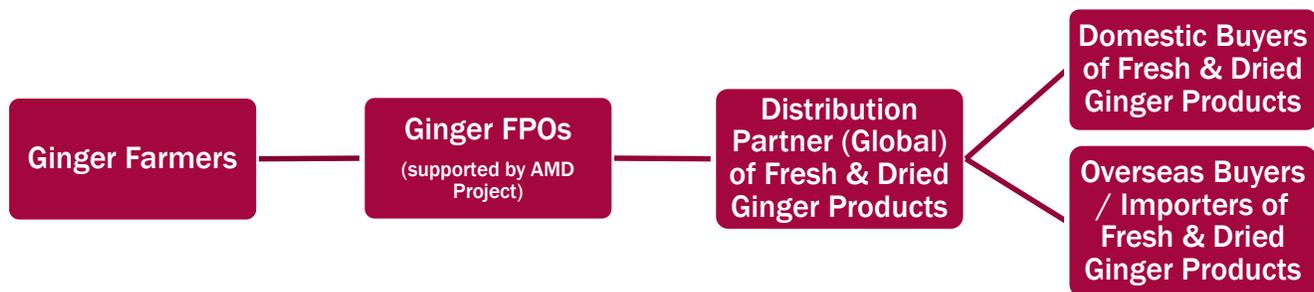
performance-based incentive, market-making incentive and facilitation support for market development.

H. Facilitating access to markets, finance and risk mitigation services

To facilitate access to markets for producer organisations, the project could facilitate suitable partnerships with the market facing players besides promoting a range of approaches including contract farming, forward contracts, linkages with integrators and other market channels viz. modern retail, responsible supply chains, organized national markets, e-markets, and exporters. Along with these partnerships and market development approaches, the project could look to strengthen support infrastructure and systems for Sanitary and Phyto Sanitary (SPS), traceability, and standards-certification. Towards improved market access, the project could strategically invest in systems for differentiating ginger-based products in destination markets viz., Geographical Indications (GI), fair trade, organic, landscape certifications while helping the producer organisations to leverage such investments. As the basic support measure for market access, the project could aim at enhancing the capacities of producer organisations, support agencies and private sector partners through exposure visits; participation in trade events; investments in branding and promotion; and provision of critical value chain infrastructure (soft and hard) to improve the overall functioning of ginger markets. The above initiatives for market access will enable the producer organisations to get closer to profitable markets (last mile players and consumers) and improve their bargaining power for realize higher returns.

Furthermore, the project should undertake concrete initiatives to address the barriers for producer organisations in accessing finance from mainstream institutional sources. While the concerns of the financial institutions related to producer organisations' capacity and intent, market demand, documentation, regulatory compliances, and business development service assistance will be addressed through other project interventions, the focus here should be on the requirements of financial institutions primarily regarding equity (net worth) and collateral available with the producer organisations. Loan guarantee instruments such as first loss deficiency guarantee (FLDG) can be furnished on behalf of producer organisations by suitable state agencies (associated with Govt. of India / Govt. of Odisha) to suitable NBFC partners or interested banks which could improve access to working capital and term loans for producer organisations. These loans can be initially deployed to promote development of infrastructure for storage and processing of ginger while also enabling aggregation and procurement by producer organisations from ginger growers. Access to formal finance for producer organisations could help address critical barriers to capital (financing, technology, production facilities) and other significant needs of producer organisations to drive business growth for the benefit of ginger growers in Koraput.

1.7 Proposed Export Oriented Value Chain



The AMD project envisions connecting producer organisations (FPOs) in Koraput directly with the markets in EU for various ginger products. The intended objective of the project could be viewed as a multi-stage or multi-level initiative which has to systematically build the capacities of selected FPOs for catering to the demands or opportunities of more challenging buyers which would in turn enable these FPOs to realize more remunerative prices for ginger products supplied by them. It becomes important to recognise here that the goal of supplying ginger products to a challenging buyer (oleoresin manufacturer) or market (EU or Japan) could be relatively simpler than the goal of developing or nurturing the selected FPOs to become an influential actor in the value chains of ginger products which serve remunerative markets such as EU. By enabling the FPO to become an influential or dominant actor in some of the targeted value chains will ensure long-term benefits not only for the associated ginger producers but also for the underlying ecosystem for ginger in Koraput. In pursuit of this goal, the focus should therefore be on building the organisational (or entrepreneurial) capacities of the selected FPO(s) especially for achieving critical scale, profitability and sophistication in its business operations especially on the postharvest and marketing side. Till the time the selected FPO reaches the critical scale, profitability and sophistication, it would be useful for it to be nurtured or supported by a private sector partner (primarily for business development support services for product distribution, market outreach, financing mobilization, stakeholder management, systems development etc.). The above diagram of export-oriented value chain factors in the requirement of a distribution partner (essentially the business development support service provider) for accessing and serving remunerative domestic and overseas buyers. The current landscape of agritech start-ups is likely to indicate or throw up names of potential social enterprises that could meet the requirement of a business development support service provider to the selected FPO(s) while meeting their own business objective of connecting producer organisations to markets (both domestic and exports).

Before an intervention for development of agricultural value chains is initiated, there should be a clear understanding about how vertical coordination shall be achieved at various stages. This would enable the key stakeholders to align their actions for improving the value added and value realized by the intervention. For example, it would help the farmer beneficiaries growing ginger to know whether vertical coordination would be achieved by individual sale in local mandi; by contract farming; by collective marketing in bulk; by collective marketing in value added form etc. To be successfully integrated as a market participant, a producer organisation cannot ignore the demand side issues esp. what the consumer wants (whether individual or institutional). Hence it is extremely important for the consumer or the institutional buyer to have a key role in determining what and how the growers should produce. FPOs and NGOs on their own are usually not able to have sustained engagements with the demand side of the market and have also not been able to deal

effectively with the last mile middlemen. Further the dissemination of latest developments in business and technology to the producer organisations is always with a lag as against the mainstream market players who have the information advantages and financial wherewithal to avail technical know-how and business competencies on a sustained basis. It is however being realized that agricultural value chains need to be competitive and efficient if they are to be sustainable ecologically and remunerative to farmers at the same time. This needs better coordination among various value chain players without which FPOs may not be able to engage effectively with the markets on a long term basis. The incentive structures of FPOs, NGOs and public agencies facilitating the integration of producers with markets are quite different from the incentive structures that drive the mainstream market participants which many-a-times lead to FPOs becoming a dormant or a less active channel for farmers to connect with market. This has somewhat also to do with the institutional nature of the FPOs and NGOs (societies, trusts, cooperatives) which traditionally lay more emphasis on social impact vis-à-vis market competitiveness.

Since post-harvest activities like sophisticated processing, state-of-the-art warehousing, packaging, branding and other marketing activities are capital intensive and require economies of scale in operations, federating FPOs into suitable organisation structures can make it worthwhile for FPOs to undertake such activities. Similarly, for farmers to benefit from domain knowledge and technical know-how, an integrating platform that can bring together technical specialists and domain experts for the benefit of FPOs and NGOs can be useful in facilitating capacity development and market integration. This builds the business case for involvement of a private sector partner (business development service provider) which could meet the requirement of technical specialists, domain experts and market player through its umbrella organisation.

Annexure 1: Key Operations in Fresh Ginger and Ginger Powder Production

Main Postharvest Operations on Fresh Ginger

i. Washing & Drying

Freshly harvested ginger rhizomes are thoroughly washed in water twice or thrice and shade dried for a day. Ginger should be scrubbed by hand or with a soft-bristled brush in clean water sanitized with 150 ppm hypochlorous acid. Care is required during cleaning to prevent bulb breakage, which increases decay and shrinkage. The ginger intended for long term storage should be washed immediately after harvest and then cured. Curing is done by drying the rhizomes in air at ambient temperature (22 °C to 26 °C or 71 °F to 79 °F) and 70% to 75% RH for several days to allow the skin to thicken and the cut surfaces to suberize.

ii. Sorting and Grading

Ginger is then pre-graded in the field for any unmarketable, damaged or diseased rhizome. Damaged and injured bulbs should be removed. The remaining marketable bulbs should be sorted according to size and overall appearance. The ginger surface should be clean, bright yellow-brown and appear fresh. It should not be wilted or have any evidence of sprouting. Export quality ginger should be smooth and firm, with uniform shape and size, be free from insect damage and decay, and have a uniform peel colour typical of the variety. The internal flesh should be firm and uniformly cream or pale-yellow coloured, without any indication of darkening.

iii. Pre-cooling & Storage

Forced-air or room cooling to 12 to 14 °C (54 to 57 °F) should be used for pre-cooling. Mature ginger rhizomes can be stored at 12 to 14 °C (54 to 57 °F) with 85 to 90% RH for 60 to 90 days. The cleaned and sorted ginger must be cured and dried to enable storage for a long period of about 6 months.

Key Operations in Production of Ginger Powder

a. Cleaning and Washing

The fingers and mothers are separated and ginger washers are used to clean the ginger. Cleaning of harvested rhizomes should be necessary to remove debris, shoots and roots. Thorough cleaning of rhizome required immediately after harvest if ginger intended for export or for long-term storage. Killing of rhizome was being followed in traditional method, in which rhizomes were

dipped in boiling water for 10 min. This method is useful in inactivation of enzymatic processes. In ginger washer water is sprayed from the top of the washer to remove the impurities.

b. Sorting

In this process all the damaged and injured rhizomes are separated and the rhizomes are separated based on size and shape. Clean, brown-yellow and bright colored ginger should be preferred. Ruptured or blot skin with bacterial or fungal infected rhizome are not recommended.

c. Peeling

Peeling serves to remove the scaly epidermis and facilitate drying. Peeling of fully matured rhizomes is done by scrapping the outer skin with bamboo splits having pointed ends and this accelerates the drying process. Deep scraping with knives should be avoided to prevent the damage of oil bearing cells which are present just below the outer skin. Excessive peeling will result in the reduction of essential oil content of the dried produce. The peeled rhizomes are washed before drying. Indian dried gingers are usually rough peeled. The rhizomes are peeled only on the flat sides and much of the skin in between the fingers remains intact. The dry ginger so produced is known as the rough peeled or unbleached ginger.

d. Slicing

The rhizomes may be sliced before drying to reduce the drying time and improve the quality of the final product (it is easier to achieve a lower final moisture content in small pieces of rhizome without spoiling the appearance of the product). The rhizomes are traditionally sliced by hand, but there are small machines available to carry out this process.

e. Bleaching

The scrapped fresh ginger is dipped in a slurry of slaked lime (1 kg of slaked lime/120 kg of water) followed by sun drying. As the water adhering to the rhizomes dry, the ginger is again dipped in the slurry. This process is repeated until the rhizomes become uniformly white in colour. Dry ginger can also be bleached by the similar process. Liming gives ginger a better appearance and less susceptibility to the attack of insect pests during storage and shipping.

f. Drying

The moisture content of fresh ginger at harvest is about 80-82 per cent which is brought down up to 10 per cent for its safe storage. The yield of dry ginger is about 19-25 per cent of fresh ginger depending on the variety and climatic zone. Generally ginger is sun dried in a single layer in open yard or clean bamboo mats or on a concrete floor which takes about 8 to 10 days for complete drying (final moisture content of 10 %). The sun dried ginger is brown in colour with irregular wrinkled surface. Using a mechanical drier will result in a better colour and a higher quality product. Tray drier, cross flow air tunnels, solar driers and cabinet driers can be used. The optimum drying temperature is 60°C temperature higher than this result in a darker coloured product. Sliced ginger pieces take only 5-6 hours to dry when a hot air drier is used. Whole peeled

ginger rhizomes take about 16-18 hours to dry in a mechanical drier. It is important to monitor the air flow and temperature during drying.

g. Milling/ Grinding

Grinding is one of the most common operations used to prepare Ginger powder for consumption and resale. The main aim of particular spice grinding is to obtain smaller particle sizes, with good product quality in terms of flavour and color. There are different ambient grinding mills and methods available for this process; such as hammer mill, attrition mill and pin mill. In India, traditionally, plate mills and hammer mills are used for Ginger grinding.

h. Sieving & Packing

The powdered dry ginger should be sieved through a mesh size of 50 to 60. The ginger powder is packed in packaging materials that deal with the common deteriorating factors of Ginger powder such as hygroscopicity, loss of aroma/ flavour, discoloration, insect infestation and microbial contamination.