Indo-German Cooperation on Agricultural Market Development

Building sustainable partnerships

Study Report on Uttar Pradesh

Prepared by the

National Short-term Expert

Abdul Rahman Ilyas

on behalf of the German project implementation consortium of

ADT Project Consulting

AFC AGRICULTURE & FINANCE CONSULTANTS

January, 2022

Draft version

1. Status of Agriculture and Allied Sector in Uttar Pradesh – An Overview

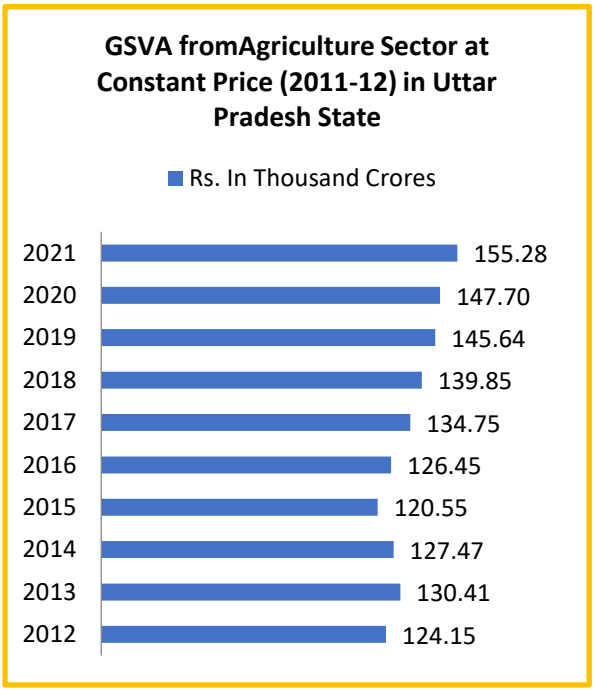
1.1. Economy and State of Agriculture in Uttar Pradesh

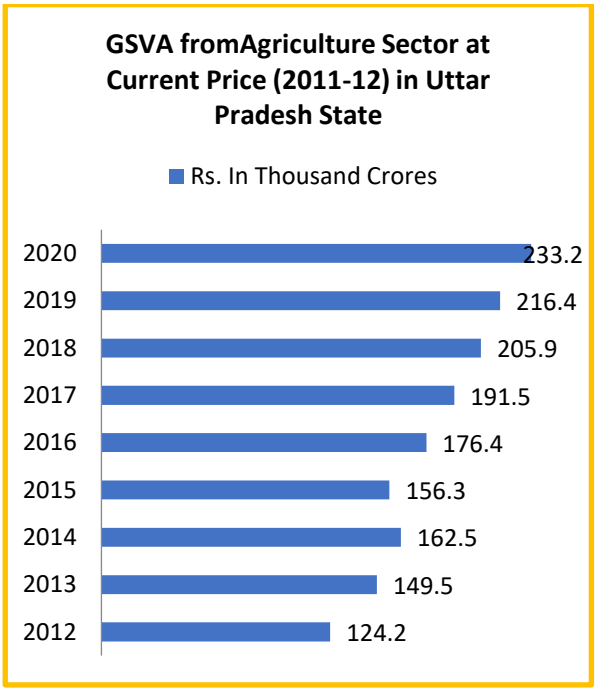
Uttar Pradesh is one of the major contributors to the national food grain stock. Wheat, rice, pulses, oilseeds, and potatoes are major agricultural products. Sugarcane is the most important cash crop throughout the state. Uttar Pradesh is one of the most important states in India as far as horticulture is concerned. Mangoes are also produced in the state.

Agriculture performance varies greatly across regions in the state. The western region is agriculturally the most progressive; the largest chunk of the state's agriculture output comes from this region (around 50 per cent). The eastern region contributes around 28 per cent, next to the western region, of the total value of the state's agriculture output. The Bundelkhand accounts for only 4 per cent of the state's gross value of agriculture output. This has strong linkages to the agroclimatic conditions in these regions.

The economy of Uttar Pradesh is primarily dominated by the tertiary sector, followed by primary and secondary sector. The state is known as the food basket of India as it is the leading producer of sugarcane, pointed gourd, peas, potato, muskmelon, watermelon, pumpkin, milk and milk products in the country. The state has the highest number of Micro, Medium and Small enterprises (MSMEs) in India.

In Uttar Pradesh state gross state value added by economic activity from agriculture sector is INR 155.28 thousand crore at constant price (2011-12) in 2021 and INR 233.2 thousand crores at current price (2011-12) in 2020.





1.2. Key Agriculture and Horticulture Crops

In Indian agriculture, Uttar Pradesh has a significant role as it contributes about 20% food grains to the national food basket. The state is a major producer of wheat (34%), rice (13%), pulses (14%), sugarcane (35%), potato (37%), vegetables (16%) and milk (18%) in the country.

Strength of Uttar Pradesh State in Agriculture and Allied Sector

Rank 1 (Production)	Rank 2 (Production)	Rank 3 (Poduction)
• Milk • Sugarcane • Wheat •Mango •Guava •Muskmelon •Anola •Potato •Peas	• Bajra • Barley •Rice • Watermelon • Bottle Guard	• Carrot • Inland Fish

Area and Production of Principal Crops in Uttar Pradesh State

Crop	2017-18		2018-19		2019-20	
	Area (In '000 Ha)	Production (In '000 Tonne)	Area (In '000 Ha)	Production (In '000 Tonne)	Area (In '000 Ha)	Production (In '000 Tonne)
Bajra	925.0	1794.5	877.0	1779.4	917.0	1939.5
Barley	144.0	403.3	151.0	455.4	167.0	523.0
Jowar	169.0	214.6	147.0	183.3	168.0	226.6
Maize	**724.0**	**1598.5**	733.0	1526.2	729.0	1693.6
Rice	5814.0	13274.0	5748.0	15545.3	5737.0	15517.8
Total Coarse Cereals	1971.0	4016.8	1914.0	3948.9	1989.0	4388.5
Wheat	9753.0	31879.1	9540.0	32741.3	9853.0	33815.5
Total Cereals	17538.0	49170.0	17202.0	52235.4	17579.0	53721.8
Arhar (Tur)	282.0	331.4	251.0	272.1	285.0	279.3
Gram	501.0	578.7	572.0	727.6	621.0	851.4
Urd	614.0	314.0	567.0	325.3	564.0	245.0
Moong	87.0	45.9	92.0	55.7	93.0	53.0
Lentil	484.0	498.0	476.0	488.4	463.0	452.8
Total Pulses	2262.0	2200.0	2291.0	2408.0	2370.0	2447.3
Ground Nut	88.0	89.1	101.0	100.4	94.0	88.6
Sesamum	278.0	82.0	327.0	73.9	356.0	65.5
Rapeseed and Mustard	679.0	945.2	753.0	1116.7	759.3	956.7
Total Oilseeds	1087.0	1145.7	1233.0	1330.8	1262.3	1146.2
Sugarcane	2234.0	177033.3	2224.0	179714.8	2208.0	179539.1

Figure 1: Area, Productivity and Production of Crops in Odisha

1.3. Agro-Climatic Conditions

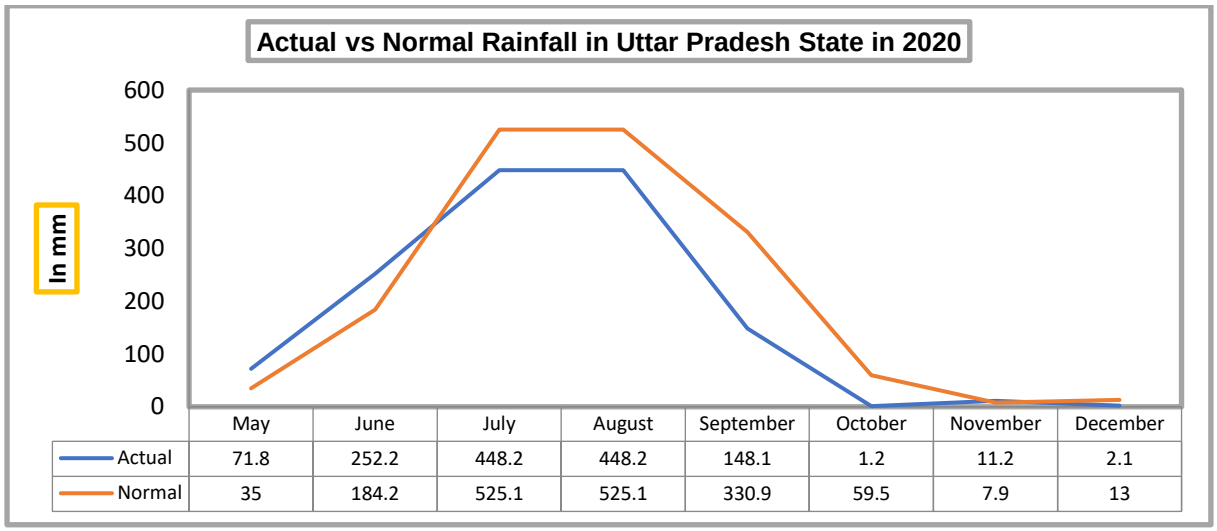
1.3.1. Topography

The state can be divided into two physiographic regions: the central plains of the Ganges (Ganga) River and its tributaries (part of the Indo-Gangetic Plain) and the southern uplands. The vast majority of Uttar Pradesh lies within the Gangetic Plain, which is composed of alluvial deposits brought down from the Himalayas to the north by the vast Ganges network. Most of that area is a featureless, though fertile, plain varying in elevation from about 1,000 feet (300 metres) in the northwest to about 190 feet (60 metres) in the extreme east. The southern uplands form part of the highly dissected and rugged Vindhya Range, which rises generally toward the southeast.

1.3.2. Climate and Weather

The climate of Uttar Pradesh is the tropical monsoon type, with warm weather year-round. Average high temperatures in Lucknow range from about 20 degree Celsius in January to over 38 degree Celsius in May and June.

About 90 percent of the rainfall occurs during the southwest monsoon, lasting from about June to September. With most of the rainfall concentrated during that four-month period, floods are a recurring problem and can cause fatalities and heavy damage to crops and property, particularly in the eastern part of the state. Periodic failure of monsoons results in drought conditions.



	May	June	July	August	September	October	November	December
Actual	71.8	252.2	448.2	448.2	148.1	1.2	11.2	2.1
Normal	35	184.2	525.1	525.1	330.9	59.5	7.9	13

1.4. Trade Statistics of Crops in Uttar Pradesh

The below table represent the export of agriculture and allied sector and horticulture produce from Uttar Pradesh state.

- There is a significant increase in export of floriculture from State.
- Export of grapes went upto 5052 MT in 2020-21 from 3312 MT in 2019-20

The overall value of export from state is 17730 crores in 2020-21. Export is gradually increasing after post covid in the state.

Sl. No	Major Commodities	2017-18		2018-19		2019-20		2020-21	
		Quantity (MT)	Rs. in Crores	Quantity (MT)	Rs. in Crores	Quantity (MT)	Rs. in Crores	Quantity (MT)	Rs. in Crores
1	Floriculture	70.04	0.79	113.46	1.37	345.57	2.3	404.56	3.42
2	Fruits and Vegetable Seeds	210.57	4.15	115.96	2.7	567.09	2.27	144.14	1.37
3	Onion	71928.7	101.7	98353.1	91.95	47573.7	62.07	74692.6	98.7

		5		5		2		7	
4	Other Fresh Vegetables	159677.57	109.43	156773.35	121.61	158755.88	141.86	157484.87	214.36
5	Fresh Mangoes	1974.57	4.39	1917.22	5.1	4029.22	6.34	105.44	1.26
6	Fresh Grapes	1811.5	3.79	2231.36	5.94	3312.14	8.38	5052.33	12.83
7	Other Fresh Fruits	52623.96	57.87	58988.99	60.17	73369.92	82.53	65844.78	89.85
8	Processed Vegetables	3777.95	65.81	3598.11	52.64	6498.39	65.54	40158.76	131.67
9	Mango Pulp	357.8	2.67	319.66	1.73	5.47	0.07	34.29	0.27
10	Processed Fruits, Juices and Nuts	1209.18	15.31	1749.78	23.15	1308.89	18.93	1454.38	20.23
11	Pulses	2287.11	25.06	3429.37	29.8	2402.42	28.21	8230.47	91.12
12	Dairy Products	9267.33	223.75	15143.01	431.74	5535.61	195.99	3799.97	151.38
13	Natura Honey	12198.12	173.92	16311.15	205.17	11590.56	128.82	8320.54	89.29
14	Ground Nut	769.46	3.53	1178.04	6.38	1076.27	7.15	598.85	3.88
15	Guar Gum	89.1	0.95	16.9	0.35	21.87	0.52	73.96	1.1
16	Jaggery and Confectionary	12692.67	104.45	10694.9	90.55	10221.61	83.62	14101.7	105.77
17	Basmati Rice	382967.91	2710.44	141945.73	1206.12	146251.2	1186.86	107265.86	845.6
18	Non Basmati Rice	275552.85	846.37	305678.24	882.87	240043.93	689.7	360906.25	913.22
19	Wheat	92050.58	153.54	85708.86	163.41	74073	146.1	124695.68	231.81
20	Maize	71992.02	102.59	86321.38	138.63	61421.04	135.96	94926.86	135.94
21	Total	1932019.45	18660.49	1697294.6	17605.06	1515784.59	15902.76	1763534.83	17729.9

1.5. Profile of Crops having Potential wrt Value Chain Development

Crop	Highlight in terms of Value Chain Development
Potato	Per capita food demand for fresh potatoes at this ACGR is estimated to increase from 19.7 kg in 2010 to 48.5 kg in 2050. The corresponding national demand for fresh potatoes is estimated at 78.5 million MT in 2050. The demand for processing quality potatoes is estimated to rise at the fastest pace for French fries (11.6% ACGR), followed by potato flakes and powder (7.6%) and potato chips (4.5%). Thus, actual demand for processable potatoes (i.e., raw material demand for the potato processing industry) is estimated to rise from 2.8 million MT in 2010 to 25 million MT in 2050 at an ACGR of 5.61%. Correspondingly, the demand for processed potato products is estimated to rise from 0.7 million MT in 2010 to 7.3 million MT in 2050. Therefore, there is immense potential to expand potato production in Uttar Pradesh and take advantage of the growing fresh market and opportunity to diversify processed potato products manufactured in the state. This will also promote best practices and infrastructure development and industry assistance as well as strengthen farmer–buyer trade interface.
Mango	Global consumption of fresh mangoes has been rising continuously, the current global market for processed mango products is estimated at $16.55 billion and is projected to grow at a rate of 6.4% per annum. The trade is expected to rise, particularly because of the growing manufacture of mango-based products by the large agroprocessors and fast-food and beverage chains. Some popular mango-based products include fruit-based meals, bakery fillings, candies, confectionery, flavored yogurt and ice cream, baby food, ready-to-serve drinks, juice mixes, and

	blends with various other beverages such as tea, coffee, and cocktails. As a result, the global market for mango pulp and puree is expected to grow from its current value of $950 to $2,120 million by 2024 at a rate of 7.7% per annum. With growing food safety and environmental concerns, the organic segment of the fruit product market is another prospective growth sector that can be tapped in both developed country markets and emerging economies.
Guava	The high perishability of fresh guava fruit, global trade in processed forms is expected to increase, particularly guava puree, which is used in a range of products such as baby food, beverages, bakery and snack items, ice cream and yogurt, and dressing and sauces. According to a market report, the revenue generated from guava puree was valued at $313.8 million in 2017 and is projected to increase at a CAGR of 5.6% during the forecast period (2017–2025). By region, Asia Pacific dominates the guava puree market, with India as a major producer of fresh fruits and derived products. The US sources most of its guava puree from South America, predominantly from Brazil and the Dominican Republic, while India exports most of its guava puree to Middle East countries. Thus, there is potential for Indian market actors to diversify into newer markets.
Gram	Currently, an estimated 9.93 million MT of gram is available for consumption in the country (per capita availability of 22 g/day). The RDA is 31 g/day.82 It is estimated that the requirements for gram will grow to 16.8 million MT in 2024. In the case of Uttar Pradesh, the current production of gram is 0.58 million MT against an RDA requirement of 2.41 million MT. Thus, production may not be sufficient to meet consumption and Uttar Pradesh relies on imported gram from Madhya Pradesh and Rajasthan to meet its domestic requirements.

2. Value Chain Assessment of Focus Crops and Gap Analysis

Based on the information discussed, below is value chain analysis of some of the focus crops grown in the state of Uttar Pradesh.

2.1. Potato

2.1.1. Potato Production in Uttar Pradesh

During 2018-19, total potato production in the state is 17056.7 thousand tonnes and major potato producing districts in the state are Agra, Aligarh, Farrukhabad, Firozabad, Hathras and Kannuaj.

Year of Production	2017-18		2018-19	
Total Production	Area (Ha)	Production (MT)	Area (Ha)	Production (MT)
	572826.00	15008697	571399.00	17056711

2.1.2. Major Potato Varieties Cultivated

Potato varieties cultivated in Uttar Pradesh include Kufri Bahar (3797), Sadabahar (302), Kufri Surya, and Kufri Chipsona-1. Below table highlights the characteristic features of these.

Varieties	Yield (tonnes/ha)	Purpose	Special Trait
Kufri Bahar	35 to 40	Table	Susceptible to late blight, moderately resistant to gemini virus and early bulker
Kufri Sadabahar	30 to 35	Table	Moderately resistant to late blight and early bulker
Kufri Surya	25 to 30	Processing	Susceptible to late blight, tolerant to heat and hopper burn, and suitable for early planting
Kufri Chipsona	30 to 35	Processing	Resistant to late blight and suitable for chips & French fries

2.1.3. Seasonality

In Uttar Pradesh normally potato sowing begins in winter season in the month of October to November end and harvesting starts at end of December and ends in March.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Uttar Pradesh												
West Bengal												
Bihar												
Punjab												
Karnataka												
Gujarat												
Uttarakhand												
Himachal Pradesh												
	Sowing					Harvesting						

2.1.4. Value Chain Analysis of Potato

2.1.4.1. Major Actors in the Potato Value Chain in Uttar Pradesh

Sl. No.	Value Chain Actor	
1	Input suppliers	Many growers use seed saved from their own farm or from fellow farmers with quality produce saved from the previous harvest. Some purchase from local seed dealers and private companies. The State Department of Horticulture and Food Processing are also engaged in the production and supply of quality potato seeds. Some FPOs have started potato seed production and supply to member farmers; however, the supply from the government department and FPOs is insufficient to meet existing demand.
2	Government department and institutions	Under the Uttar Pradesh Potato Development Policy 2014, subsidies and concessions are also being promoted; these include capital and interest subsidies, marketing support, support for the purchase of a refrigerated vehicle (reefer), exemptions from stamp duties, and incentives for export facilitation. The agriculture universities in the state are also engaged in education, research, and extension.
3	Potato farmers	Uttar Pradesh is the largest producer of vegetables in the country. In almost all the districts of Uttar Pradesh state producing potato thus, significant numbers of farmers are engaged in potato cultivation in Uttar Pradesh. Most potato growers are smallholders or marginal farmers and are involved until the harvesting and storage stages. Most farmers store their produce at cold storage facilities and sell it after a few months when the price increases (during the monsoon July–September).
4	Cold storage	Potato growers and traders mostly store their produce in February and March at cold stores and make staggered sales in later months when demand rises, to take advantage of higher prices. Producers are dependent primarily on cold storage centres for obtaining information on prevailing market rates and sales of produce. Thus, cold storage centres are important stakeholders in the value chain. More than 90% of potato production is stored for 2–7 months. Cold storage owners charge a lump sum storage fee per unit for the season (generally per 50 kg unit of potatoes stored).
5	Processors	Most potato varieties cultivated in Uttar Pradesh are table varieties and not suitable for processing, given their low dry matter content and a reducing sugars level over the prescribed limit for making quality value- added products. Kufri Chipsona-1 is the only major processable variety, cultivated in small quantities in selected production clusters in Agra and surrounding districts. Thus, despite being one of the major potato-producing states, Uttar Pradesh has relatively few large-scale processing units. Potato processing is carried out by small and unorganized units, which for the most part process potatoes into chipped products only.
6	Commission agents, traders, and wholesalers	Commission agents are licensed traders that mostly operate through the APMC markets. They facilitate trade between farmers and traders and charge a fixed commission from the trader who buys from the farmers. The produce is sold through an open-outcry auction managed by the commission agent, who deducts his/her commission after the sale.

2.1.4.2. Various Marketing Channels of Potato in Uttar Pradesh

Channel 1. Farmer ⟶ Cold storage ⟶ Large trader ⟶ Wholesaler in distant market (e.g., Delhi/Mumbai, Chennai, Bihar, Kolkata) ⟶ Retailer ⟶ Consumers (90%–95% of production)

Channel 1b. Farmer → Cold storage → Processing companies → Retailer → Consumers (2%–3% of production)

Channel 2. Farmers → Commission agent → Wholesaler in local and distant markets → Retailer → Consumers (4%–5% of production)

Channel 3. Farmers → Farmer producer organizations and lead farmers → Commission agents/wholesalers in local or distant markets → Consumers (1% of production)

Channels	Description
Channel 1	Marketing through cold storage centers. Channel 1 is the most prevalent trade channel. Between 90% and 95% of growers in the major production districts of Agra and Hathras prefer to store their produce in cold storage facilities and then sell a few months later, preferably during or after the monsoon months. Large traders buy from cold storage centers and sell in distant markets.
Channel 2	Marketing through APMC mandis. Approximately 4%–5% of the produce is directly sold by farmers in APMC mandis. This trade is mostly facilitated through commission agents operating from mandi premises. The produce is sold at auctions, and the commission agent charges a fixed commission from the trader who buys the produce from farmers. The produce from APMC mandis in the peak season and from cold storage centers in the off-season is aggregated at the wholesaler/large trader level for onward distribution and retail sales in distant locations such as Delhi, Kolkata, Bengaluru, and Mumbai.
Channel 3	Marketing through farmer producer organizations. FPOs are being promoted by the Small Farmers Agribusiness Consortium (SFAC), the National Bank for Agriculture and Rural Development (NABARD), Uttar Pradesh Bhumi Sudhar Nigam and other similar agencies.

2.2. Mango

2.2.1. Area and Production of Mango in Uttar Pradesh

In 2017–2018, the state had 0.47 million ha under fruit crop cultivation and ranked second in terms of fruit production in the country, with a total production of 10.5 million MT. Mangoes occupy more than 50% of the area under fruit cultivation in the state and account for more than 40% of total fruit production. During the past 5 years (2013–2018), the area and production of mangoes in Uttar Pradesh have increased to 0.265 million ha and 4.5 million MT, respectively. The state's share in national production is 20% and the area share stands at 12%.

2.2.2. Mango Varieties

Several varieties of mango are cultivated in the state including Dussheri, Langra, Chausa, Safeda, Ramkela, Malika (hybrid Neelum-Dussheri), Amrapali (hybrid Dussheri-Neelum), and Ambika (hybrid Amrapali-Janardan Prasad). The leading commercial cultivars are Dussheri, Langra, and Chausa, which are traded on domestic and export markets. Both Dussheri and Chausa are in demand internationally, while Chausa is considered more suitable for long-distance transport owing to its longer shelf life.

2.2.3. Seasonality

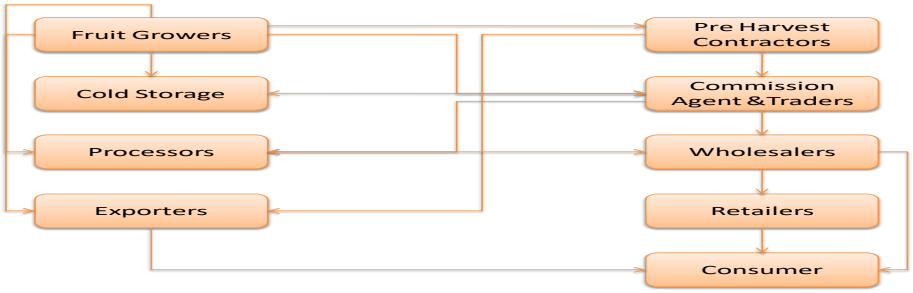
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Uttar Pradesh												

Andhra Pradesh												
Telangana												
Karnataka												
Bihar												
Gujarat												
Maharashtra												
Lean Season						Peak Season						

2.2.4. Value Chain Analysis of Mango

2.2.4.1. Major Actors/Stages in the Mango Value Chain in Uttar Pradesh

Sl. No.	Actors/Stages	Description
1	Pre-harvest contract	Pre-harvest contract is the most commonly used sales system of mangoes. The contractors evaluate the orchard during the initial stage of fruiting and payment is done to the farmer on a per kg basis. Some of the farmers also negotiate the price of their orchards on a lump-sum basis. The quantity, quality, and rates are negotiated based on mutual agreement between the farmer and the contractor. The cost of activities such as harvesting, packing, and transportation at the farm gate takes care of by the contractor.
2	Purchase by Processing Units	Processing units are directly procuring the raw material at the farm gate. Apart from this, they also procure through agents/suppliers. Processors are more price-sensitive and quality is the major concern for them.
3	APMC Market yards	Farmers in the catchments of nearest APMC bring their produce which is sold under an open auction mechanism. It is observed that at times, farmers do not bring the product to the nearest market yards and travel to a bigger market yard in expectation of a better price. The volume of trade through this mechanism is estimated to be about 5-10% of the total Mango trade.
4	Wholesaler	The wholesaler is responsible for the distribution of products to various retailers. The second level of sorting/grading has also been observed at the secondary/terminal markets. Accordingly, the produce is sold to the retailer based on specific grades.
5	Commission agent	The commission agent facilitates trade between the contractor and the wholesaler and for which they charge 6-8% commission from the contractor.
6	Exporters	Exporters are procuring directly from fruit growers and also buy from pre-harvest contractors, traders & commission agents, and processors.



2.3. Guava

2.3.1. Guava Production in Uttar Pradesh

Guava is grown in almost all states in India. In 2017–2018, guava production was estimated at 4 million MT from an area of 0.26 million ha with an average productivity of 15.3 MT/ha. Uttar Pradesh is the leading producer of guava, accounting for 23% of total domestic production and 18.7% of the area under guava cultivation in India. Madhya Pradesh, Bihar, Andhra Pradesh, West Bengal, Chhattisgarh, Punjab, Gujarat, Tamil Nadu, and Karnataka are other major guava-producing states.

State	Area ('000 Hectares)			Production ('000 Tonnes)		
	2015-16	2016-17	2017-18	2015-16	2016-17	2017-18
Uttar Pradesh	48.7	49.28	49.53	914.36	926.25	928.44
India	**254.87**	**260.07**	**264.85**	**4047.79**	**3826.4**	**4053.51**

2.3.2. Major Varieties grown in Uttar Pradesh

Name of Variety	Ripe Rind Color	Skin Surface	Flesh Color	Seediness	Seed Texture
Lucknow-49	Greenish yellow	Rough	White	High	Medium
Lalit	Saffron yellow with red blush	Rough	Pink	Medium	Soft
Shweta	Creamy white	Smooth	White	Medium	Soft
Pant Prabhat	Yellow	Smooth	White	Medium	Soft

2.3.3. Seasonality

The guava harvesting season varies by region, the harvesting seasons in various producer states. Production in Uttar Pradesh overlaps with the production season of most of the other states.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Non	Dec
Uttar Pradesh												
Madhya Pradesh												
Bihar												
Andhra Pradesh												
West Bengal												
Chhattisgarh												
Punjab												
Gujarat												

Tamil Nadu											
Karnataka											
	Lean Season						Peak Season				

2.3.4. Value Chain Analysis of Guava in Uttar Pradesh

2.3.4.1. Major Actors in the Guava Value Chain in Uttar Pradesh

Sl. No.	Actors/Stages	Description
1	Input suppliers	Most guava farmers buy planting material from government-accredited private nurseries in Uttar Pradesh. Of 43 such nurseries, 28 are in Malihabad (Lucknow District).60 Limited quantities come from the Department of Horticulture and a nursery unit at CISH in Lucknow. Some farmers buy saplings of new varieties from agriculture universities, research institutions, and KVKs, depending on the proximity of the center and the costs involved. A few orchard owners grow saplings on their farms. Other inputs such as fertilizers, micronutrients, and plant protection chemicals are sourced mostly from private dealers.
2	Government department and institutions	The Department of Horticulture supports farmers by providing technical guidance through training and exposure visits, advocating for new technology, and evaluating other needs. Extension officers, assistants, and inspectors are posted at district and block level. Block-level offices can have multiple staff responsible for different production clusters covering all crops. ICAR and CISH, in Lucknow, extend strong research support for varietal development and scientific cultivation of guava.
3	Guava producers and growers	Growers are responsible for land preparation, sourcing, and planting saplings for new orchards and replacement of old orchards. They also undertake orchard maintenance and harvesting operations.
4	Lease contractors	Sometimes orchard owners lease their orchards to other farmers in the same village or a neighboring village for an annual cycle of two seasons at a predetermined rate based on factors such as area, variety, number and age of the trees, yield, and value realization during earlier seasons. The lessor is responsible for undertaking farm maintenance activities for the specified lease period as well as postharvest handling.
5	Preharvest contactors and village aggregators	About 70%–80% of guava farmers in Uttar Pradesh sell their produce to preharvest contractors or village aggregators. The contract is normally made after the onset of the fruiting season but before harvest. The price is determined by the contractor based on a visual inspection of the farm taking into consideration the number of trees with mature fruits, fruit size, and the proportion of diseased or damaged fruit. Once harvested, the preharvest contractors collect the produce at farm gate and are responsible for sorting, grading, and packing, which is done at a collection or packing center or at a suitable place near the farm. The contractor is also responsible for marketing. When contractors buy on behalf of an exporter, only top-quality fruit that matches the specified quality parameters is exported and the rest is marketed through other trade channels.
6	Commission agents and	Some 15%–25% of guava farmers sell their produce at the nearest APMC market through auctions. Commission agents registered in that

	wholesalers	market then sell to wholesalers who trade in distant markets. Commission agents receive payment from the wholesaler and transfer a receipt to the farmer. Agents buy 5%–7% directly from the farm. In such cases, trade deals are done after the harvest and the procurement rate is based on the type and quality of the harvested produce and the market rates prevailing at that time. The cost of transportation, packaging, and the mandi cess (tax) are borne by the agent. At the market, these agents act and trade on behalf of the farmer for a commission rate of 4%–6% from the farmer and 3%–5% from the buying trader or wholesaler.
7	Processors	Processing guava involves primary activities such as sorting, grading, and packing, and secondary- and tertiary-level processing into value-added guava-based products such as pulp, ready-to-drink fruit juices, jams, and jellies. There are only a few processors in the state engaged in processing. Most are in the informal sector and have small processing capacities. A few processing units based in other states such as Gujarat and Maharashtra buy guava from APMC markets in Uttar Pradesh.

2.3.4.2. Marketing Channels of Guava

Channel 1. Guava grower **to** Preharvest contractor or Lease contractor to Wholesaler **to** Sub-wholesaler in distant market to Retailer **to** Consumers (70%– 85% of farmers)

Channel 2. Guava grower **to** Commission agent at the nearest market/Lucknow/Ghaziabad market **to** Local wholesale suppliers, vendors, retailers, wholesalers in distant markets **to** Local traders and retailers **to** Consumers (15%–25% of farmers)

Channel 3. Guava grower to Commission agent at the nearest market to Procurement agent to Processing companies to Distributors to Retailers to Consumers (5%–7% of farmers)

Channel 1: Marketing through preharvest lease contractors. About 70%–80% of the farmers in the surveyed areas were observed to be routing their produce through either lease contractors or preharvest contractors. These contractors generally have preestablished marketing links with traders in distant markets such as Delhi, Lucknow, Ghaziabad, Nepal, Bihar, Maharashtra, and Gujarat and sell through their network. Once the produce is received in a distant market, it is purchased by wholesalers and marketed through sub-wholesalers to retailers before it finally reaches the consumer.

Channel 2: Marketing through commission agents. Some 15%–25% of growers market their orchard produce on their own. Farmers adopting this marketing channel sell their produce to traders and wholesalers in a distant market such as Delhi, Rajasthan, Nepal (via Gorakhpur), Mumbai, or Kolkata. Azadpur Mandi in Delhi is the hub for guava distribution from Uttar Pradesh and offers better prices compared with local markets. Farmers who do not have direct links in distant markets sell in nearby APMC markets in the district. The commission agents cum wholesalers in these markets buy from farmers and then sell onward to wholesalers within the state or a distant market at a fixed commission rate. Responsibility for making payment to the farmer lies with these commission agents. Payments are made by check or cash almost immediately. Within this channel, farmers bear the costs associated with activities such as on-farm sorting, grading, packing, transportation from farm to market, and loading and unloading.

Channel 3: Marketing to processing unit. This channel represents the procurement of produce by processing companies based within and outside the state. Generally, processing companies buy from

APMC markets through an appointed purchase vendor, manager, or commission agent. Only 5%–7% of the produce is marketed under this channel.

Three FPOs were promoted under a novel wadi (orchard) development program by NABARD in Lalitpur District to support members of the vulnerable Saharia tribe to develop guava orchards and related activities. However, this seems to be still at the initial stage, and registered members are selling their produce individually as guava is not a major focus crop cultivated by the farmer members.

3. Available Infrastructure and Future Prospects for Development of Value Chains in Uttar Pradesh

3.1. Emerging Agri-food value chains

Uttar Pradesh is one of the leading producers of agriculture and horticulture crops in India. The emerging and sustainable agri-value chains in the state are

- Potato and its value-added products
- Dairy and its value-added products
- Mango and its value-added products
- Bakery products
- Guava and its value-added products
- Cereals and its value-added products
- Oilseeds

3.2. Major Private Players and their Opportunities to Invests in UP

According to the UP State Industrial Development Authority, in 2020-21, the largest investment was received in the food processing sector, amounting to more than ₹940 crore and making for 32% of total investments received in the year.

The 2017 policy is estimated to have attracted investments of ₹4,983 crore which are at different stages of being approved or implemented. Out of 942 applicants, 680 projects have either been sanctioned or under-process.

3.2.1. Pepsico

PepsiCo India has announced its intent to invest Rs.514 crores approx in 2019. over three years, to set up a greenfield snacks manufacturing plant in Uttar Pradesh. The new investment plan is in line with PepsiCo's goal to double its snacks business in the country by 2022 and is expected to help create over 1500 jobs (direct and indirect).

PepsiCo India's intended snacks manufacturing operation in Uttar Pradesh would also expand the company's footprint of collaborative farming for potato in the state.

PepsiCo India's Agri program presently benefits over 24,000 farmers across 14 states through various Agri and sourcing initiatives. All the potato used in Lay's and Uncle Chipps is grown in India and sourced from Indian farmers. Through its 360-degree farmer connect initiatives for potato cultivation, PepsiCo provides training and seed support, advanced plant protection programs, and assured buy-back with reasonable returns.

3.2.2. Britannia Industries Ltd

Britannia Industries Ltd has commenced work on its greenfield manufacturing facility in Barabanki, Uttar Pradesh. The plant to be set up across 30 acres, at an investment of Rs340 crore, will have an annual production capacity of 1.25 lakh tonne.

The company will make more of its flagship brands including Marie Gold, 5050, Good Day, Milk Bikis, Tiger Glucose and Rusk. This is Britannia's first greenfield manufacturing facility in Uttar Pradesh.

3.2.3. AB Mauri

AB Mauri, a UK-based bakery ingredients maker, has been allotted 257 acres of land in Pilibhit for a greenfield yeast manufacturing unit, in which it is investing ₹1,100 crore. This is over and above the ₹400 crore investment for which it had already procured land in Chitrakoot in the backward Bundelkhand region, making for a total investment of ₹1,500 crore by the company in the state.

3.2.4. Patanjali

Patanjali Ayurved, which is investing more than ₹2,100 crore in the establishment of a mega food park in Gautambuddh Nagar (Noida), where the Baba Ramdev-led company will produce food products such as biscuits and juices, expecting to generate about 20,000 jobs.

3.2.5. Haldiram, ITC ltd., Amul & K K Integrated Cold Chain

Haldiram Snacks has invested ₹490 crore in a snacks and sweets manufacturing unit in Noida. ITC is investing ₹760 crore for establishing a food processing unit in Hardoi.

Integrated Amul dairy plant to be established in Kanpur, Lucknow,Saifai & Varanasi with a capacity of 5 lac liter per day. Required investment of around Euro 18.8 Million in each unit and this project will generate employment for around 20,000 people.

K K Integrated Cold Chain Infrastructure in Dairy is being set up at Kanpur with a capacity of 10 lac liter per day capacity of plant has been proposed with an Investment of around Euro 35 Million in each unit.

3.3. Agri-food Market Infrastructure and Logistics

3.3.1. Infrastructure advantage in State

Location Advantage

- Located on Golden Quadrilateral with excellent road network
- Access to National Capital Region on the west
- Strategic access to market & resource depth of eastern India
- Largest railway network in the country spanning over 8,949 km

Connectivity

- Major national & international airports connecting the rest of India, Middle East & South East Asian countries.
- Two upcoming international airports at Jewar & Kushinagar
- Proposed NW-1 connecting Allahabad to Haldia port

Industrial Corridors

- 8.5% of DMIC catchment area and 57% of AKIC in UP
- Intersection of WDFC and EDFC at Greater Noida
- Multi-modal logistic hubs, industrial parks etc. to benefit from reduced travel time to ports

3.3.2. Logistic Infrastructure

The existing logistics infrastructure in Uttar Pradesh includes Moradabad rail linked combined domestic and EXIM terminal, Rail linked Pvt Freight Terminal and Inland Container Depot in Kanpur, ICD at Dadri Terminal, ICD at Kanpur etc. Besides these, multi modal logistics/ transport hubs are also proposed at Noida, Boraki and Varanasi.

The connectivity web of the state including existing and upcoming expressways like Poorvanchal Expressway, Bundelkhand Expressway, Lucknow- Agra Expressway etc.; 4 lane and 6 lane state

highways; national and international airports; NW 1 waterways connecting Allahabad, Varanasi and Haldia sea port etc., is expected to create a web of air, water, road and rail network that will help the state's industries and manufacturing units switch seamlessly between different modes of transport as they send their goods to markets in India and abroad. The Multi-city metro rail projects, coming up at Lucknow, Kanpur, Meerut and Varanasi, and upcoming international airport at Jewar and Kushinagar are also expected strength to State's connectivity advantage.

Public Private Partnership Projects in Uttar Pradesh State

Project name	Sector	PPP type	Project cost (US$ million)	Stage
Moradabad-Bareily	Roads	BOT-Toll	413.7	Construction
Ghaziabad-Aligarh Road Project	Roads	BOT-Toll	238.0	Construction
Bareily-Sitapur	Roads	BOT-Toll	407.0	Construction
Muzaffarnagar-Haridwar	Roads	BOT-Toll	229.5	Construction
Gorakhpur Bypass Project on NH-28	Roads	BOT-Annuity	135.4	Construction
Gwalior-Jhansi Road Project	Roads	BOT-Annuity	150.0	Construction
Bara to Orai	Roads	BOT-Annuity	131.3	Construction
Road Stretch (50 km) between Jhansi-Lalitpur on NH- 25/26	Roads	BOT-Annuity	91.7	Construction
Merrut-Muzzaffarnagar Toll Project on NH-58	Roads	BOT-Toll	139.3	Construction
Lucknow-Sitapur Road	Roads	BOT-Toll	67.1	Construction
Jhansi-Lalitpur	Roads	BOT-Annuity	68.0	Construction
Agra to Bharatpur on NH-11	Roads	BOT-Toll	40.6	Construction

3.3.3. Warehouse

There are 47 central warehouses in Uttar Pradesh with a combined capacity of 1.14 million MT. Of these, 38 are in the Lucknow region and nine in the Delhi region.99 Uttar Pradesh State Warehousing Corporation owns 110 warehouses with a capacity of 2.5 million MT. The state corporation also manages 15 rented warehouses and 30 other warehouses with a combined capacity of just over 1.4 million MT.100 In addition, there are 260 Food Corporation of India warehouses with a capacity of nearly 4.7 million MT. Uttar Pradesh Mandi Parishad (council/ assembly) has also constructed warehouses on the market premises of 66 districts in the state with a combined storage capacity of 568,000 MT.

3.3.4. Market Infrastructure and Institutional System in Uttar Pradesh

The Uttar Pradesh Agricultural Produce Marketing Committee Act of 1964 governs the marketing and trade of agricultural produce in the state. The Act divides the state into notified APMC areas with regulated markets under their jurisdiction. The objective of developing a network of physical markets is to provide farmers with a suitable place for sale and trade and to ensure reasonable price realization for farmers. Toward this end, the APMCs frame their rules and by-laws in accordance with the APMC Act and try to promote the fair trade of agricultural commodities in their market areas.

The state has 251 regulated markets (two of A+ grade, 45 of A grade, 75 of B grade, 108 of C grade). There are 381 regulated submarkets across the state, which act as auxiliary markets to the main markets and help bring the marketplace closer to the farm gate. In addition to the regulated markets and submarkets, there are rural markets, wholesale markets and yards, and rural warehouses, which form an integral part of the agricultural marketing system.

Of these 251 markets, according to the NAM, 125 have been linked with the eNAM portal and presently 82 are conducting online trading through the Government of India portal.

Particulars	Numbers
Regulated Markets	251
Sub Markets	381
Wholesale Markets	584
Rural Markets	3564
Fruit and Vegetable Market Yard	72
Rural Godowns	238

3.3.5. Industrial Infrastructure

- The state has a robust industrial infrastructure, including 15 industrial areas, 12 specialised parks, four growth centres and industrial infrastructure development centres (IIDC). As of now, the state had 23 notified special economic zones (SEZs).
- The state has proposed 40 IT/ITeS parks (apart from IT SEZs), two biotech zones and a knowledge park. Development of integrated agro/food processing zones has been proposed at Hapur, about 54 km from Delhi.
- Integrated logistics hubs (free-trade warehousing zones) have been proposed in collaboration between IL & FS, Mineral and Mining Trading Corporation and Mitsui (Japan).
- Thus far, the state government has recommended 56 SEZs proposals to the Government of India. Of these proposals, 21 SEZs have been notified. Until date, Uttar Pradesh has nine functional SEZs.
- Under a central government scheme, integrated industrial development centres have been established to encourage development of micro and small industries at Kosi Kotwan (Mathura), Etah, Banthar (Unnao), Baghpat, Masuri Gulawati (Ghaziabad), Kursi Road (Barabanki) and Chandauli.
- The Greater Noida Phase-II has 19.0 per cent land reserved for industrial use.
- An IT City is proposed to be built on about 100 acres of government land at Gajaria farms on Sultanpur Road in Lucknow. The state has granted approval for the city.

3.3.6. Industrial Park in State

Infrastructure (type)	Location	Area (acres)
Growth centres	Bijoli, Jhansi	385
Growth centres	Shajahanpur	311
Growth centres	Dibiyapur	246
Growth centres	Jainpur	331
Agro parks	Barabanki	180
Agro parks	Varanasi	261
Apparel parks	Tronica City	146
Textile and hosiery parks	Kanpur	173
Leather technology parks	Banthar, Unnao	233
Export promotion industrial parks	Greater Noida	200
Export promotion industrial parks	Shastripuram, Agra	102

Software Technology Parks of India (STPI)	13,000 sq ft, of which 9,296 sq ft of area is being utilised by 15 units. The park is fully operational.

3.4. SWOT Analysis of the State Agri-Food System

Strength	Weakness
• Availability of Raw material • Good infrastructure facilities such as warehouse, cold storage, power, transportation etc • Availability of labours • Export • Government schemes and subsidies	• Seasonal availability of fruits • Large domestic demand for table consumption • Lack of funds to purchase/install machinery and equipment • Traditional approach • Lack of modern technology
Opportunities	**Threat**
• Value added products for fruits & vegetables, milk, meat and cereals & pulses • Increasing market span • Enhancement of Income and employment • More export earning • Entrepreneurship development in rural area	• Price fluctuations • Global competition • Huge cost on modern technology • Unorganized markets • Bad trade practises

4. Assessment State Agri-Food Market

4.1. State Agri-food Market Development Opportunities

4.1.1. Supply related opportunities

- Encourage farmers to adopt proven best practices for cultivation such as mulching and drip irrigation.
- Conduct training and capacity-building for farmers on postharvest management of produce, including encouraging them to adopt modern sorting, grading, and cleaning practices and increasing farmer awareness on quality and standards.
- Promote and strengthen farmer collectives to enable them to undertake aggregated sales and marketing and dissemination of advanced technologies among members.
- Expose farmers to other trading platforms such as eNAM and encourage them to use web-based applications such as agriculture market information systems for real-time market intelligence, especially grade-specific pricing and transparent price discovery.

4.1.2. Demand related opportunities

- The quality of produce sold by farmers is considered low as a result of factors such as lack of uniformity in grain size, percentage of moisture, and presence of impurities. Thus, investment

in facilities for sorting and grading to ensure market standards would lead to an increase in price realization for farmers

- Create dry and cold storage infrastructure to cater to the requirements of smallholder farmers for storage of their produce.

4.1.3. Policy and regulatory related opportunities

- Strengthen market intelligence and price discovery mechanisms for providing real-time information on fruit/vegetables/cereals/pulses/dairy/poultry arrivals and grade-specific pricing at different markets within and outside the state to help increase farmers' value realization by enabling them to make well-timed sales.
- Establishment of incubation centre at district level
- Establishment one cold storage and dry storage unit at district level
- Capacity building and training programme to traders, processors, farmers etc.

4.1.4. State Agri-Food Market Development Opportunities

Value chain level	Drivers of change	Possible Supply related interventions	Possible Demand related interventions	Possible Policy / Regulatory related interventions
Production	Improving Productivity	Precision farming; Digital agriculture to improve input use efficiency; Alternative farming techniques	Block chains to connect crop planning to commodity markets	Innovation grants and subsidies; Enhanced knowledge & market intelligence platforms
	Improving quality	Improved on-farm harvest techniques (e.g., sorting & grading produce to increase quality consistency & shelf life)	Enhanced consumer market intelligence and data sharing	Improve access / support for quality certification
	Enhancing economies of scale	Farmer producer group formation / expansion	Clarification of product / market standards & requirements	Group certification grants/ subsidies
Agri-logistics	Quality control & loss reduction	Technologies to enhance product traceability across targeted value chains	Leveraging technology for implementation of agri-logistics platforms	Innovative investment schemes and grants;
	Efficient storage & distribution	Intermediate collection points / storage & commodity transport hubs (Farmer group owned); enhanced linkages to food parks		Grant / credit programmes to promote investment in efficient storage & distribution systems/ services
Food Processing	Food safety	Technologies to increase shelf life (e.g., waxing of fruits; irradiation treatment for meat)		Control of food hygiene standards; containment of borne diseases; Improving compliance with labelling standards and packaging standards to ensure freshness
	Automation in manufacturing	Enhanced automation & predictive maintenance to reduce dependence on manpower/ improve efficiency	Scale up capacity in-line with demand through predictive analytics to be able to react to demand fluctuations	Promotion of processing support through national marketing campaigns / schemes
Food Distribution	Consistent & reliable supply	Real-time connectivity between processors & distributors for faster		Food produce transportation and storage standards

		market access		
Food Retail	Convenience & reliability	Packaging and quality branding	Integrated online & offline processes to enhance consumer browsing & shopping experiences	Control of food hygiene standards; containment of borne diseases; Improving compliance with labelling standards and packaging standards to ensure freshness
	Consumer engagement	Farmer direct marketing and sales operations	Enhanced consumer buying behaviour data mining systems; Niche market short supply chains; Leveraging technology to create collaborative & local networks	
Food Services	Convenience	Farmer direct marketing and sales operations	Predictive analysis to predict consumer demand & enable data-led decisions /efficiency gains	
	Consumer engagement	Point of sale promotions; Food service provider farm visits	Digital platforms for just in time ordering / home delivery	Regulation of standards for on-line food delivery platforms
Food consumers	Health & nutrition	Dynamic and agile service delivery models		Consumer surveys; Public awareness campaigns; Promotion of sustainability through 'Made in …… (regional/ geographic/ national branding)' schemes; Cross-compliance policy frameworks for access to grants/ subsidies
	Sustainable products	Low input farming / water and land use efficiency		

5. Recommendation

An integrated approach needs to be adopted for value chain development of crops in the state of Uttar Pradesh. The interventions must also take into cognizance the geographic terrain of the state and overall economic vulnerability of small and marginal growers.

Holistic approach comprising of combination of both soft and hard interventions is proposed to be implemented for increasing the production and productivity of crops discussed above in the state and facilitating value addition.

- **Soft interventions** (training and capacity building) are proposed to be implemented across the clusters/ districts and would consist of production, post-harvest management and processing/value addition related short-term training & exposure visit envisaged to enhance the technical skill for farmers as well as technician, extension workers, entrepreneurs and other operating in the sector. Such interventions are proposed to be delivered through institutions specialising in the subject area.
- **Hard interventions** (infrastructural assistance) are majorly being proposed to meet cluster specific requirements based on the assessed need. Hard interventions under the programme shall cater to all the value nodes of value chains and primarily aim at creating tangible common/community-based assets to support the developmental requirement of value chains in Uttar Pradesh.

The proposed soft & hard interventions are focused on forging the vertical as well as horizontal linkage along the value chains. Placing the proposed interventions in the value chain context, the soft & hard interventions can be categorized into following 5 components.

- ✓ Production
- ✓ Post-harvest
- ✓ Marketing
- ✓ Processing
- ✓ Overarching across value chain nodes

5.1. Hard Interventions: Infrastructural Assistance

- ✓ Hard Interventions: Infrastructural Assistance
- ✓ Seed Production Hub
- ✓ Encouraging collaborative models to ensure timely availability of hybrid seeds
- ✓ Encouraging collaborative models to ensure timely availability of hybrid seeds
- ✓ Farm Mechanization to reduce animate labour
- ✓ Promotion of Micro-irrigation

5.2. Soft Interventions

- ✓ Capacity Building & Exposure
- ✓ Skill Development Centre
- ✓ Consolidation on the FPOs promoted and Training on Collectivized Activities
- ✓ Crop Insurance & Credit