# Cluster Gap Assessment Report
# Crop: Turmeric
# Cluster: West Jaintia Hills
# State: Meghalaya

**Meghalaya State Agriculture Marketing Board**

CDA, West Jaintia Hills Cluster

Department of Agriculture and Farmers' Welfare

Government of Meghalaya

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# 1. About Cluster Development Programme (CDP)

To address the challenges and enhance the global competitiveness of the Indian horticulture sector, the Ministry of Agriculture and Farmers' Welfare (MoA& FW), Government of India, has launched the Cluster Development Programme (CDP). It is a central sector programme, implemented by the National Horticulture Board (NHB). The programme aims to enable holistic growth and development of identified horticulture clusters to make them globally competitive and entrench them into national and global value chains.

The CDP is designed to leverage the geographical specialisation of horticulture clusters and promote integrated and market-led development through interventions in pre-production & production, post-harvest & value addition, and logistics, branding and marketing. MoA& FW has identified 53 horticulture clusters, of which 12 have been selected for the pilot launch of CDP. Based on the learning from the pilot project, the programme will be scaled up to cover all the 53 clusters.

## 1.1. Objectives

The main objectives of the programme are as follows:

- Address concerns of the horticulture value chain, from pre-production & production activity, post-harvest & value addition activity, and logistics, branding and marketing, in an integrated manner to accelerate competitiveness in domestic and export markets
- Reduce harvest and post-harvest losses by developing/expanding/upgrading infrastructure for post-harvest handling of produce, value addition and developing market linkages
- Facilitate the introduction of innovative technologies and practices to enhance the global competitiveness of focus cluster crops
- Facilitate the dovetailing of resources, including the convergence of various government schemes, to entrench stakeholders in the global value chains
- Build stakeholder capacity and enhance farmers' income through cluster-specific interventions, including brand promotion

## 1.2. Need for Cluster Gap Assessment

The cluster gap assessment report will capture the baseline data of the cluster regarding the focus crop. These data will be assessed for

identification of gaps across the value chain along with the reasons, based on which interventions will be proposed along with tentative quantum, investment, and timelines.

## 1.3. Output of the Cluster Gap Assessment

The overall aim and output of the cluster gap assessment are as follows:

- Study will capture as-is scenario, baseline information of the cluster along with best practices and case studies
- Identification of gaps in the cluster along with the required interventions.
- Basis of the proposed intervention in each vertical, on which the call for proposals shall be floated. It will have three components
  - Pre-production and Production
  - Post-harvest management and Value Addition
  - Logistics, Marketing, and Branding
- Estimation of the proposed interventions cost against each vertical
- Developing timelines and future action plans
- The proposed assessment shall also help the Implementation Agencies (IA) to develop their Detailed Project Report

# 2. Cluster snapshot

## 2.1. Turmeric in India

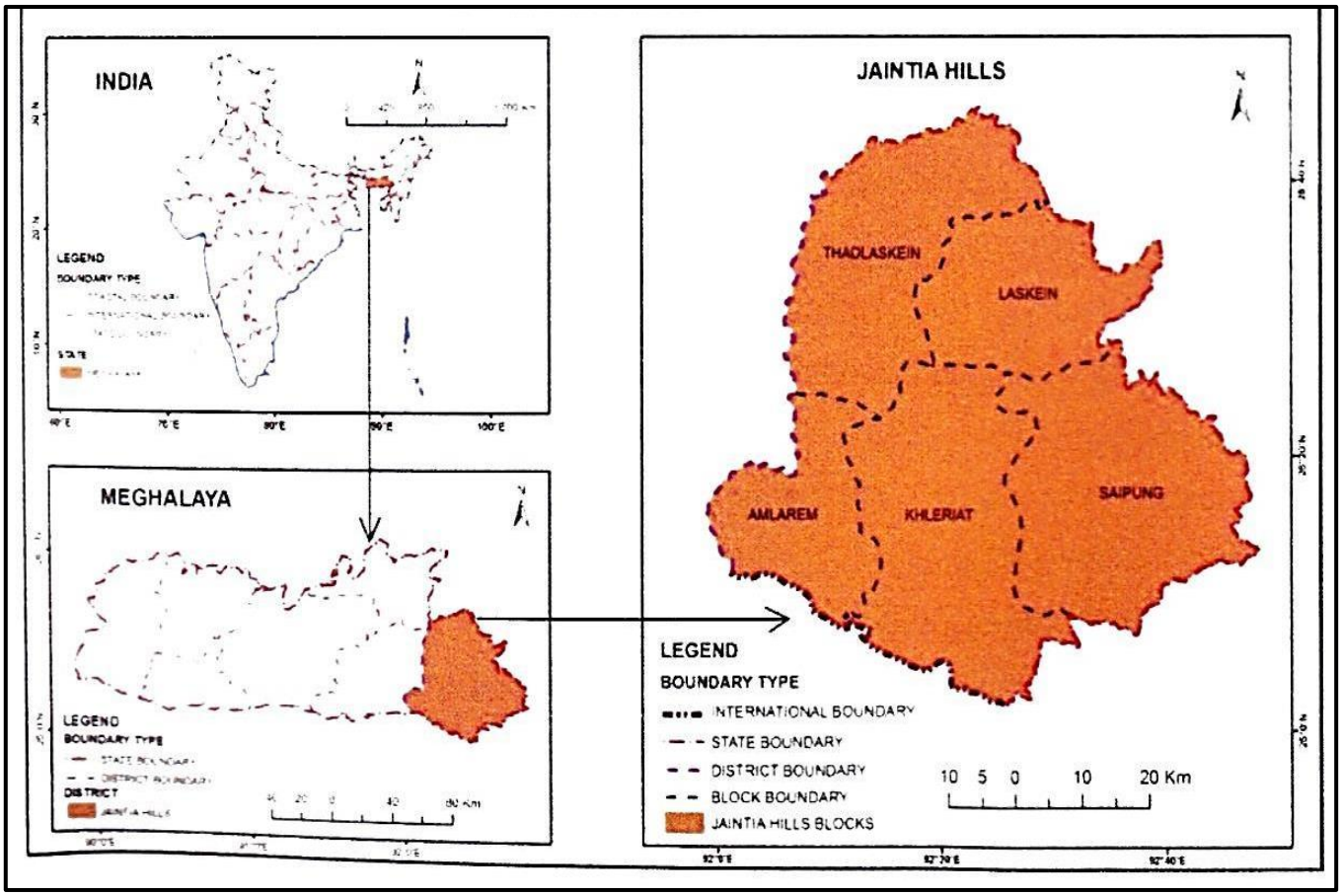
India is the largest producer, consumer, and exporter of spices in the world; it produces 75% of the world's Spices (Foretell Business Solutions 2017). India is also the top producer of turmeric (Cucurma longa), contributing about 78% of the world's production (Viraja et al. 2018).

In 2016–17, 8,122,000 metric tons (MT) of spices were produced from the total cultivated area of 3,671,000 hectares (ha) (GoI 2017). Within India, Rajasthan is the leading state in spice production, contributing about 27.35% of the area and 17.14% of the production.

The north-eastern region of India is considered a major hub of spices, with a share of 9.38% of total production in 2016–17 and 6.51% of the country's land area under cultivation. Turmeric ranks fifth in area and fourth in production among the major spices, and it occupies about 6% of the area and 13% of the production of spices and condiments in the country (National Horticulture Board 2017). In 2016–17, the leading turmeric producers in India were Telangana (294 MT) and Maharashtra

(224 MT). The north-eastern region of India is considered a major hub of spices. In 2016–17, its share of the country's production was 9.38% and of the land area under cultivation was 6.51%. The leading turmeric producers in the North-East were Assam (16.75 MT), Mizoram (27.82 MT), and Meghalaya (15.86 MT).

***Figure 1 :Lakadong cultivated in West Jaintia Hills District***




Meghalaya has natural advantages in growing a variety of spices of which the prominent ones are

- Turmeric
- Ginger
- Chilli
- Black pepper
- Bay-leaf.

The Jaintia Hills region consisting of the two districts of East and West Jaintia Hills produces at least three varieties of turmeric, each having their separate identity

- Lakadong

- Lachein
- Ladaw

The Lakadong turmeric is unique in the world as it contains high oleoresin and curcumin content. With a curcumin content of more than 7% (almost 2% higher than other varieties), traditionally grown, the Lakadong turmeric from the region is much sought after for use in the cosmetic, pharmaceutical and food industry. The demand for the Lakadong turmeric is huge but the volume of production is less for which reason the name is being used by other producers from other areas who have latched onto the name to sell sub-standard or even adulterated turmeric. Thereby, confusing the market and lending a bad name to the variety and to the original areas from where it is produced. The farmers of the district have not, till date, been able to realise the full economic potential of this crop primarily because of the preponderance of small and marginal farmers, inadequate research, low individual volumes exacerbated by lack of organized aggregation, weak post-harvest management and market infrastructures, lack of universal access to information, skills and technology, unreliable price discovery, dominance of middle men, trader cartelization, weak extension, poor access to finance and most importantly, insufficient quality planting material. The cultivation of turmeric (Lakadong variety) is concentrated in the following clusters:

| Sl. No. | Name of Cluster | Villages | Area (Ha) | Area covered through Mission Lakadong (Ha) |
|---|---|---|---|---|
| 1 | Shangpung | Mynska, Khlokynrin, Shangpung Pohshnong, Shangpung Khliehmushut, Shangpung Mission, Mynkrem, Myntriang, Lumlyntur | 141 | 16 |
| 2 | Thadbamon | Thadbamon, Lummuriap, Musiaw, Umsalang, Latymphu, Sookhlieh, Moobando, Khliehriat, Mynkrem, and Takhniang | 238.3 | 65.45 |
| 3 | Barato | Barato, Maitdein, Iongkynshur, Mukroh, Saba, Thangrain, ShilliangMyntang, Samatan, Khliehsniriang, Thadsning, Thadialong, Bhain | 277.6 | 174.56 |
| 4 | Sahsniang | Sahsniang A, Sahsniang B, Umsalait, Mooshrot, Iongkasaro, Tum-Tum, Thangthring, Ynniawkmai, Mynksan, Jongulang, Madanrwan, Kyrwen, Khatkasla, Psiar, MyntangTiehwieh, Mowluber | 191.4 | 122.27 |

| | | | | |
|---|---|---|---|---|
| 5 | Saphai | Iooksi, Priang, Lakadong, Iawthymmei, Saphai, Umdienglieng, Biar, Nongryngkoh, Rtiang, Pyntei, ChutwakhuSarhen, MadanPohkseh, Madanrwai, Khonshnong | 264.2 | 165.72 |
| 6 | Laskeiñ | Laskeiñ, Mukhap, Mowkaiaw, Mulum, Mulieh, Nongkynrih | 66.6 | 50.24 |
| 8 | Mupliang | Mupliang, Myrjai, Nangbah | 20 | 18.7 |
| 9 | Sanaro | Sanaro, Pdeiniadaw | 60 | 2.8 |
| | | | **1259.1** | **615.7** |

It has been reported by the project on Site Suitability Analysis for Area Expansion of Turmeric in Jaiñtia Hills of Meghalaya conducted under Coordinated Horticulture Assessment and Management using Geoinformatics (CHAMAN) by Mahalanobis National Crop Forecast Centre, Ministry of Agriculture & Farmers Welfare, Govt. of India, New Delhi, Space Application Centre (SAC), Ahmedabad, North eastern Application Centre (NESAC), State Remote Sensing Application Centre (SRSAC) and State Department of Horticulture, Govt. of Meghalaya that the agro-climatic conditions of Jaiñtia Hills region provide excellent conditions for growing turmeric. The project through various criteria for identification of suitable sites for turmeric cultivation in the Jaiñtia hills district of Meghalaya has identified the potential sites for Turmeric cultivation and classified the villages under different suitability classes. Based on the criteria adopted like land use land cover, land capability classes, soil drainage, soil reaction, availability soil phosphorus, availability soil potassium, elevation, slope, aspect, and climatic parameters potential sites for turmeric cultivation has been classified.

West Jaintia Hills is having three Community and Rural Development (C&RD) blocks:

- Amlarem
- Laskein
- Thadlaskein

Highly suitable areas for turmeric cultivation were found to be highest in

- Laskein which is 4.64%
- Thadlaskein which is 1.39%
- Amlarem which is 0.28%

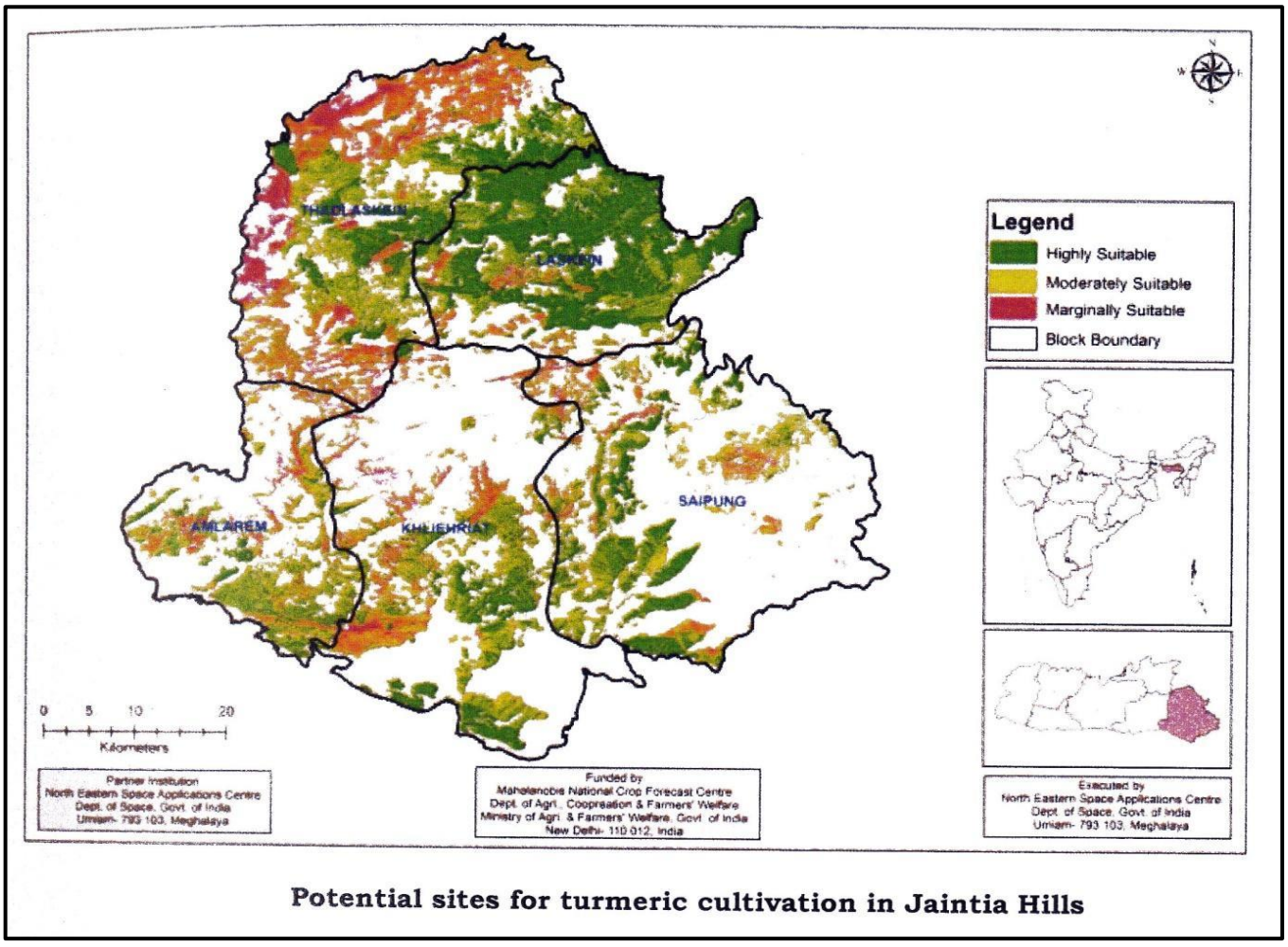
Moderately suitable areas for turmeric cultivation were found to be highest in:

- Laskein which is 3.46%
- Thadlaskein which is 2.88%
- Amlarem which is 1.35%.

Marginally suitable areas for turmeric cultivation were found to be highest in:

- Thadlaskein which is 4.10%
- Amlarem which is 1.75%
- Laskein which is 1.75%

*Figure 2:Potential sites for turmeric cultivation in Jaintia Hills*




**Potential sites for turmeric cultivation in Jaintia Hills**

## 2.2. Villages under different suitability classes in West Jaintia Hills

115 villages were found to be in the proximity of suitable areas for turmeric cultivation in Jaintia Hills of Meghalaya. This has been

observed that Thadlaskein block has the highest number of villages falling under different suitability classes (59 nos.) followed by Laskein (46 nos.) and Amlarem (10 nos.) However, Laskein block has the highest number of villages (33 nos.) under highly suitable class followed by Thadlaskein (26 nos.) and Amlarem (7 nos.) has only a few villages under highly suitable class.

Jaintia Hills accounts for 58.0 % of the total area in the state due to its favourable soil and climate. The State produces around 16 thousand MT of turmeric, of which 72.0 percent is contributed by Khasi-Jaintia Hills. Production grew at an annual rate of 2.47 per cent and area at 3.14 per cent per annum, indicating that yield may have marginally declined.

The Cluster -West Jaintia Hills has been a part of the MIDH Annual Action Plan in the last five years

| Year | Component | Cost Norm Assistant/ unit | Area covered (Ha) | Financial (Lakhs) | Intervention undertaken |
|---|---|---|---|---|---|
| 2016-17 | Lakadong Turmeric | 0.15 | 1.6 | 1.2 | Area expansion |
| 2017-18 | Lakadong Turmeric | 0.15 | 4 | 3 | Area expansion |
| 2018-19 | Lakadong Turmeric | 0.15 | 4.6 | 3.5 | Seed production |
| | | 0.15 | 40 | 30.00 (1st released) | Area Expansion |
| | | 0.15 | 40 | 30.00 (2nd released) | Area Expansion |
| 2019-20 | Lakadong Turmeric | 0.15 | 0.6 | 0.53 | Seed production |
| | | 0.15 | 9 | 6.75 | Area expansion |
| 2020-21 | Lakadong Turmeric | 0.15 | 0.5 | 0.18 | Seed production |
| **Total** | | | **100.3** | **74.16** | |

| Sl. No. | Name of Scheme | Allotment | Activities |
|---|---|---|---|
| 1 | **Mission Lakadong (2018-2019)** | **67,00,000** | a) Farmer's mobilization & capacity Building- 22 Nos.<br>b) Exposure Visit to Wayanad Kerala & Erode Tamil Nadu- 1 no.<br>c) Bio pesticide, Metarhizium distributed to affected farmers with field demonstration.<br>d) Training of Fabricators on Solar Hybrid Dehydrators to NIRD & PR and Tee wave Technologies, Hyderabad<br>e) 3 nos. of Solar Dehydrators have been developed and issued to farmers group.<br>f) 2 nos. of small capacity Turmeric Grinders |

| | | | |
|---|---|---|---|
| | | | were issue to farmers group.<br>g) Area Expansion at farmer's field, 1099 Nos. of farmers, 88 Ha area covered and 1408 MT production.<br>h) Production of planting Materials at Iongkyndar Hub.<br>i) Single bud rhizome pro-tray method trial<br>j) Tissue culture at NEHU, Shillong |
| 2 | **Mission Lakadong (2019-2020)** | **1,16,48,000** | a) Farmers Training on Farm Production of Organic Manure and Bio-pesticides - 9 villages<br>b) Random Sampling Curcumin Testing - 38 villages<br>c) Area expansion – 184.2 Ha<br>i)No. of beneficiaries- 1494 nos.<br>ii)Production – 1481 MT |
| 3 | **Mission Lakadong (2020-2021)** | **4,45,00,000** | a) Area expansion-544 Ha<br>b) No. of beneficiaries- 2806<br>c) Seed production at Iongkyndar Hub & Multiplication of Lakadong Turmeric transplants through single bud rhizome pro-tray technique.<br>d) Purchase of Bio-pesticides and distributed to Farmers |
| | **Total** | **6,28,48,000** | |

During the last five years the Cluster- West Jaintia Hills has been part of the MIDH Annual Action Plan. The intervention taken up with regard to Turmeric is the Area Expansion and Seed Production. About 100.3 Ha of Area Expansion for Lakadong Turmeric was covered under MIDH Scheme. In addition, the Government of Meghalaya has allotted about Rs. 6.28 crore under Mission Lakadong Project for various interventions. The main interventions taken up are Area Expansion in which 1056.83 Ha has been covered with 6,512 Nos. of Farmers benefitted. With the above interventions the area and production under Lakadong Turmeric have been increased by 38% and 22.97% in the year 2019-20 and 2020-21 respectively.

*Figure 3: Assessment of area expansion activities taken up under Mission Lakadong*

## 2.3. Total area and production under horticulture in the cluster (last 5 years)[1]

*Table 1 & 2*

| Sl. No. | Items | 2016-17 | | | 2017-18 | | | 2018-19 | | | 2019-20 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Area | Production | Yield | Area | Production | Yield | Area | Production | Yield | Area | Production | Yield |
| 1 | Citrus Fruits | 876 | 4921 | 5618 | 877 | 4957 | 5652 | 878 | 4964 | 5654 | 880 | 4976 | 5655 |
| 2 | Pineapple | 62 | 534 | 8613 | 63 | 543 | 8619 | 63 | 543 | 8619 | 64 | 552 | 8625 |
| 3 | Sohiong | - | - | - | 7 | 130 | 18571 | 7 | 130 | 18571 | 7 | 130 | 18571 |
| 4 | Tubers | 1104 | 3685 | 17576 | 1243 | 4469 | 3595 | 1245 | 4479 | 3598 | 1247 | 4489 | 3599.83 |
| 5 | Spices | 1779 | 12564 | 7062 | 1783 | 12602 | 7068 | 482 | 4362 | 9050 | 2101 | 14633 | 6964.77 |
| 6 | Plantation Crops | 1550 | 2480 | 1600 | 1628 | 2503 | 1537 | 1629 | 2504 | 1537 | 1629 | 2504 | 1537 |
| 7 | Banana | 257 | 858 | 3339 | 259 | 866 | 3344 | 259 | 866 | 3344 | 260 | 870 | 368 |
| 8 | Papaya | 16 | 53 | 3320 | 16 | 53 | 3313 | 16 | 53 | 3313 | 16 | 53 | 3313 |
| 9 | Jackfruit | - | - | - | 15 | 118.73 | 7915 | 16 | 131 | 8188 | 16 | 131 | 8188 |
| 10 | Vegetables | 2141 | 24159 | 11284 | 2219.5 | 25460 | 11471 | 2225.5 | 25524 | 11469 | 2271.943 | 26268.31 | 11562 |
| | **Total:** | **7785** | **49254** | **6326.8** | **8110.5** | **51701.73** | **6374.7** | **6820.5** | **43556** | **6386.04** | **8491.9** | **54606.31** | **6430.37** |

[1]*Source: Directorate of Economics and Statistics, Govt. of Meghalaya*

## 2.4. Area, Production & Productivity of Focus Crop (Turmeric) in the Cluster[2]

*Table 3*

| Sl. No. | Year | Area (in ha) | | | Production (in MT) | | | Productivity (Mt/Ha) |
|---|---|---|---|---|---|---|---|---|
| | | Thadlaskein | Laskein | Amlarem | Thadlaskein | Laskein | Amlarem | |
| 1 | 2020-21 | 231 | 1732 | 14 | 1531 | 11258 | 72 | 6.51 |
| 2 | 2019-20 | 265 | 1417 | 12 | 1670 | 8956 | 60 | 6.31 |
| 3 | 2018-19 | 161 | 1208 | 12 | 1013 | 7615 | 60 | 6.29 |
| 4 | 2017-18 | 161 | 1207 | 12 | 1013 | 7608 | 60 | 6.29 |
| 5 | 2016-17 | 160 | 1206 | 12 | 1008 | 7598 | 60 | 6.29 |

[2]*Source: Directorate of Economics and Statistics, Govt. of Meghalaya*

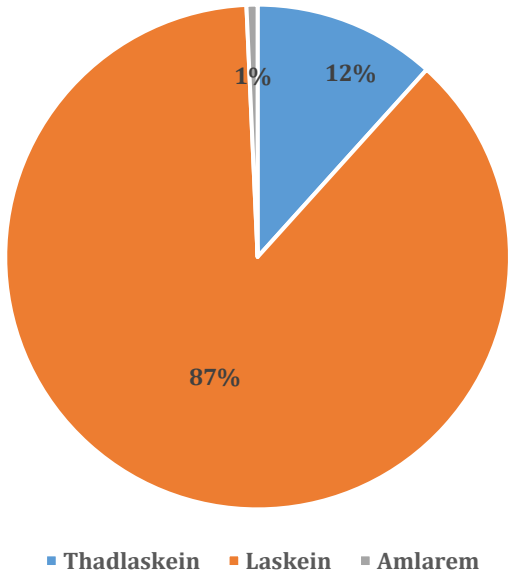
## 2.5. Block wise area and production of Turmeric

There are three varieties of Turmeric existing in West Jaiñtia Hills, viz. Lakadong, Lacheiñ and Ladaw, each having their separate identity. Among the three varieties, Lakadong variety has very good commercial value in the market due to its high curcumin content of more than 7%. The volatile oil content in dry turmeric varies between 3.6% and 4.8%. Therefore, Lakadong variety has the highest share in term of area and production whereas the other local varieties occupy only a negligible area. On the basis of the commercial value of the varieties of Turmeric, only the cultivation of Lakadong variety is being promoted through various developmental activities of the Government. The cultivation of the other varieties is being discouraged such that farmers can get more income per unit area, by shifting to Lakadong variety. The area and production are mainly concentrated in Laskein Block (87%) followed by Thadlaskein Block (12%).

*Table 4*

| Blocks | 2017-18 | | 2018-19 | | 2019-20 | |
|---|---|---|---|---|---|---|
| | Production (MT) | Area (Ha) | Production (MT) | Area (Ha) | Production (MT) | Area (Ha) |
| Thadlaskein | 1013 | 161 | 1013 | 161 | 1670 | 265 |
| Laskein | 7608 | 1207 | 7615 | 1208 | 8956 | 1417 |
| Amlarem | 60 | 12 | 60 | 12 | 60 | 12 |

*Block wise area under turmeric in 2020-21*




*Block wise Production of turmeric in 2020-21*

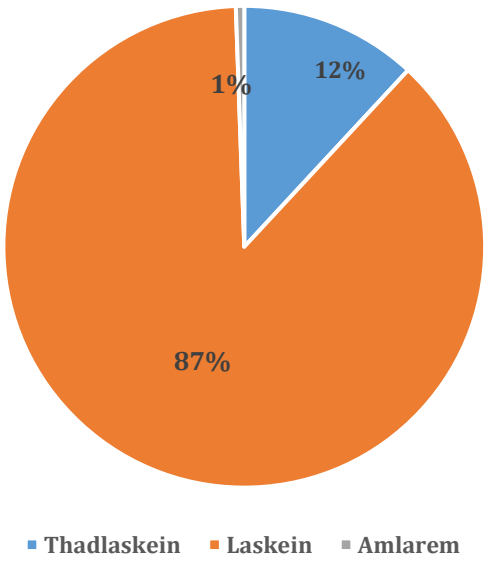



*Table 5: Variety wise production details in the cluster (2019 – 20)*

| Sl. No. | Variety | Year | Area (Ha) | Production (MT) | Growth Trend for last 3 yrs.(%) increase/decrease |
|---|---|---|---|---|---|
| 1 | Lakadong Turmeric | 2017-18 | 1021.2 | 6423.94 | - |
| | | 2018-19 | 1132.42 | 7124.16 | 10.9 |
| | | 2019-20 | 1558.48 | 9831.12 | 38 |
| | | 2020-21 | 1897.92 | 11832.1 | 22.97 |
| 2 | Other varieties | 2017-18 | 358.8 | 2257.06 | - |
| | | 2018-19 | 248.58 | 1563.84 | -30.71 |
| | | 2019-20 | 135.52 | 854.88 | -45.33 |
| | | 2020-21 | 79.08 | 1028.88 | -9.73 |

## 2.6. Percentage loss in the crop

The crop loss in the case of Lakadong Turmeric is more during the production stage which is about 25% followed by Post-harvest of about 7%. The losses at the production are due to infestation by major pests like white grub (Holotrichia spp.), rhizome scale insects and diseases infection like leaf blotch, leaf spot and rhizome rot. The losses at the post-harvest management are due to weather fluctuation which delayed the drying process and leads to development of blackish colour on the slices thereby losing the market value. The lack of proper storage also leads to microbial growth when the humidity rises especially during rainy season. Losses during distant transportation occurred from leakage due to improper sealing of the bags and unavailability of bags sealing machines at the packing place. Initiatives like common facility centres having the facilities for washing, slicing, drying and storage at a cluster level, Solar Hybrid Dehydrators / Poly Tunnel Dryer, Hermetic bags, and the bag sealing machines can reduce the losses.

*Figure 4: Conventional storage facility of turmeric being done by the farmers*

*Table 6: Total losses*

| Sl. No | Year | % loss in Production (A) | % loss while Harvesting (B) | % loss in post-harvest Management (C) | % loss in during transportation (D) | % losses at retail level (E) | Total % losses (A+B+C+D+E) |
|---|---|---|---|---|---|---|---|
| 1 | 2016 | 18 | 1 | 6 | 0 | 0 | 25 |
| 2 | 2017 | 18 | 1 | 6 | - | - | 25 |
| 3 | 2018 | 17 | 1 | 8 | - | - | 26 |
| 4 | 2019 | 20 | 1 | 9 | - | - | 30 |
| 5 | 2020 | 25 | 1 | 8 | - | - | 34 |

## 2.7. Farmers involved in Horticulture crops

Majority of the farmers are small and marginal farmers with an average holding of 1 Hectare

*Table 7*

| Sl. No. | Type | Total No. of farmers | Average farmers income (Rs. /Ha) | Blocks with higher concentration of farmers to be specified | % farmers with KCC |
|---|---|---|---|---|---|
| 1 | Marginal (< 1 Ha) | 8123 | 60,000.00 | Laskein and Thadlaskein | - |
| 2 | Small (1to 2 Ha) | 7418 | - | - | - |
| 3 | Medium | 345 | - | - | - |
| 4 | Large (> 4 Ha) | 6 | - | - | - |

## 2.8. Farmers involved in focus crop

Farmers involved in Lakadong Turmeric are mostly marginal farmers with an average holding of 0.3 Hectare with low individual volume. As their production per farm is small, they have less bargaining power and most of the time have to sell their produce either at the farm gate or in the local markets at prices determined by the traders. They have limited access to technical, market information and financial resources, and are less capable of negotiating for better prices with buyers.

*Table 8*

| Sl. No. | Type | Total No. of farmers | Average farmers income (Rs. /Ha) | Blocks with higher concentration of farmers to be specified | % farmers with KCC |
|---|---|---|---|---|---|
| 1 | Marginal (< 1 Ha) | 12998 | 60,000.00 | Laskein | 10% |
| 2 | Small (1to 2 Ha) | - | - | - | - |

## 2.9. FPOs/Growers Association/PGs involved in the crop

The farmers involved in Lakadong Turmeric are mostly individual farmers. Lack of strong organisation among the producers severely limits their ability to stock produce and facilitate procurements for larger buyers. Through the initiatives under National Rural Livelihood Mission (NRLM), Meghalaya Basin Management Agency (MBMA) programme, the Government of India scheme and through Central Sector scheme for formation and promotion of 10,000 Farmers Producer Organization (FPO), the farmers are mobilized and organised into Farmer's group / Producers' group / Cooperatives / FPO and FPCs. The farmers need to develop social cohesion and the power of collective action for establishment of a strong central association which may solve the marketing issues through an aggregation model.

*Table 9*

| Sl. No. | Name & Address (FPOs/Growers Association/PGs etc.) | Total No. of farmers in the network | Area coverage (Ha) | Cluster requirement for formation of new FPOs (in numbers etc.) | Constraints/Gaps with its reason |
|---|---|---|---|---|---|
| 1 | Buddienv.o, Kyndongtuber Village, Laskein Block | 51 | 0.943 | 2 | Currently very few numbers of FPOs exist in the cluster. |
| 2 | Iaidshaphrangv.o, Kyndong tuber Village, Laskein Block | 52 | 2.59 | | |
| 3 | Iaipynskhemv.o, Raliang Village, Laskein Block | 38 | 4.689 | | |
| 4 | Chirup-i v.o, Khonshnong Village, Laskein Block | 23 | 1.726 | | |
| 5 | Chirynjupv.o, Mowkaiaw Village, Laskein Block | 25 | 3.4 | | |
| 6 | Iasohlangv.o, Umsalait Village, Laskein Block | 14 | 1.986 | | |
| 7 | Kynhunmanbeiv.o, Sahsniang B, Laskein Block | 32 | 12.8 | | |
| 8 | Kyntulangv.o, Sahsniang a, Laskein Block | 11 | 0.111 | | |
| 9 | Kyrmendaroiv.o, Mynksan Village, Laskein block | 121 | 11.72 | | |
| 10 | Lapangapv.o, Namdong Village, Thadlaskein Block | 46 | 4.086 | | |
| 11 | MukhlaSohshriehv.o, Wahiajer Village, Thadlaskein Block | 1 | 13.333 | | |
| 12 | Pynteinamv.o, Pyntei Village, Laskein Block | 39 | 2.21 | | |
| 13 | Seinmanbei, Mowtyrshiah a Village, Laskein Block | 6 | 0.253 | | |
| 14 | Shankylliangv.o, Mukhap Village, Laskein Block | 20 | 5.059 | | |
| 15 | Shisurv.o, Mukroh Village, Laskein Block | 81 | 9.442 | | |
| 16 | Synroplangv.o, Thadmuthlong Village, Laskein Block | 24 | 1.78 | | |
| 17 | Synroplangv.o, Mulum Village, Laskein Block | 52 | 6.466 | | |
| 18 | Umshangiarv.o, Mulum Village, Laskein block | 3 | 0.16 | | |
| 19 | Wyrchav.o, Raliang Village, Laskein block | 44 | 5.026 | | |
| 20 | Pdeintaloov.o, Namdong Village, Thadlaskein block | 20 | 1.23 | | |

To foster collective action among the farmers in cluster, following 15 farmers group and cooperative societies which are located at different clusters have been selected for establishing Collective Marketing Centres (CMCs). Each CMC is proposed to be provided with a collection centre, rhizomes washing machines, turmeric slicers, and poly tunnel dryers. They will serve as the node for aggregation, basic processing, and marketing of Lakadong turmeric in the villages and cluster.

| Sl. No. | Name of SHG/Cooperative Societies/Farmers Group | No. of farmers |
|---|---|---|
| 1 | Shangpung Turmeric Lakadong Farmers' Co-operative Society Ltd. Shangpung Village | 181 |
| 2 | Iakyntulang S.H.G, Saphai Village | 11 |
| 3 | Farmers Union Shangpung Pohshnong, Shangpung Village | 25 |
| 4 | Farm Connect Development Society, Mooshrot Village | 13 |
| 5 | Iahluti S.H.G, Lummuriap Village | 10 |
| 6 | Ieinskhem Spice Producers Industrial Co-operative Society Ltd. Mulieh Village | 25 |
| 7 | West Jaintia Hills Farmers Producer Company Ltd., Sanaro Village | 24 SHGs & 240 members |
| 8 | KynhunManbei V.O, SahsniangSaitthadVillage | 300 |
| 9 | Iahluti Multipurpose Co-operative Society Ltd., Iooksi Village | 20 |
| 10 | SynroplangThadmuthlong A Village Organisation, Thadmuthlong village | 150 |
| 11 | Iakyrsulang Village Organisation, Barato village | 160 |
| 12 | Pynmyntoilang Village Organisation, Biar village | 20 |
| 13 | Sdangseinlang Self Help Group, Kyndongtuber Village | 10 |
| 14 | Iashanlang SHG, Mupliang Village | 11 |
| 15 | Iaroilang I SHG, Laskein village | 12 |

## 2.10. Major export quantity and value for last 5 years[3]

After the launch of 'Mission Lakadong' in 2018, Lakadong turmeric commercial potential is known globally. Importers from counties like USA, Japan, Netherland, and Russia have set foot to the production sites in West Jaintia Hills to understand the reality about this crop and had tied up with the local entrepreneurs for the export shipment to their countries. A small consignment of export consignment has started by the exporters from the other states like Gujarat and Assam as the entrepreneurs from the cluster are not equipped with export requirements. However, quality control mechanism and infrastructures are the need of the hour for promoting export from the cluster.

*Table 10: Export quantity*

| Sl. No | Year | Quantity (MT) | Value (Rs) |
|---|---|---|---|
| 1 | **2021** | 14 | 24,50,000 |
| 2 | **2020** | 3.15 | 5,25,000 |

## 2.11. Major export destinations and cost (outside the country)

*Table 11: Export destinations*

| Sl. No. | Countries | Country wise value of export (in Rs.) | Country wise mode of Transport (sea, air etc. Io be specified) | Cost of transport (Rs/Kg) | Country wise growth in exports in the last 3 years |
|---|---|---|---|---|---|
| 1 | **Netherland** | 90,000.00 | Sea | 300 | - |
| 2 | **UK** | 60,000.00 | Sea | (cost is high because of small quantity) | |
| 3 | **Russia** | 25,50,000.00 | Sea | 60 | |
| 4 | **USA** | 2,75,000.00 | Air | 1000 (cost is high because of small quantity) | |

[3] *Source: District Horticulture Office, West Jaintia Hills Jowai in consultation with the exporters*

## 2.12. Major domestic destinations and cost

The major buyers of Turmeric produced from Jaintia Hills are the nutraceutical firms and pharmaceutical firms involved in curcumin extraction and food supplements. Kerala, Hyderabad, Bangalore, Mumbai, Delhi, and Assam are some of the major domestic destinations. Since Turmeric is being used as immunity boasters to avoid infection, especially after the Covid-19 outbreak, the demand for Lakadong Turmeric across the country has increased. Many of the local private entrepreneurs and firms like Zizira, COLKS, Country Spices, Nest, Wan's, Hunbait, LIFE Cooperative Society, Ieinskhem Spices and Industrial Cooperative Society, D.D. Spices, etc. had procured from the Lakadong farmers, and also processed and value added the Lakadong turmeric and supplied it to the clients across the country. There are also buyers who procured directly from the farm gates or through the local/ village trader and process it outside the cluster. The product is transported by road or by train for larger volume and for small volume it is generally sent through courier and travel agencies.

*Table 12: Major domestic destinations*

| Sl. No. | Year | States | State wise mode of Transport (sea, air etc. to be specified) | Cost of transport (Rs/Kg) | State wise growth in exports in the last 3 years |
|---|---|---|---|---|---|
| 1 | 2020-21 | Kerala, Delhi, Maharashtra, Hyderabad, Rajasthan, Assam, West Bengal, Haryana, Gujarat, UP, Tamilnadu, Orissa | By road | 12.5 | - |
| 2 | 2019-20 | | By road | 13 | - |
| 3 | 2018-19 | | By road | 15 | - |
| 4 | 2017-18 | | By train | 15 | - |
| 5 | 2016- 17 | | By road | 3 - 4 | - |

## 2.13. Domestic Logistics Facilities (Mode of transport and supporting infrastructure)

**Mode of transport and available infrastructure in the cluster:**Currently the infrastructures available are pack house of small capacity located at some villages which are meant for multi commodities developed under MIDH Scheme. However, there are no designated secondary and tertiary infrastructures available. Collection centre should be made in the form of Common Facility Centre (CFCs) for production cluster with provision of facilities for raw material depot, complementing production processes and training. CFCs should be equidistant for a set number of villages to ensure access for all.

*Figure 6: Mode of transport for picking up the products from the farmers*

*Table 13*

| Sl. No | Particulars | Cluster Connectivity | Mode of transportation (refer trucks/normal trucks etc.) | Availability in numbers and capacity. | Cost of Transportation per kg/km. | Infrastructure available at origin and exit point | Constraints /Gaps |
|---|---|---|---|---|---|---|---|
| 1 | Primary (Farm gate to Pack house) | Internal road | Pick-Up Vehicle | 15 Nos. 5 MT each | Rs. 4 paise per kg/km | No infrastructure available | Poor quality and small approach road and lack of transportation facilities |
| 2 | Secondary (Pack to Processor to Aggregation Point) | State Highway | Normal Truck | 9 | Rs. 4 paise per kg/km | | There is no transport agencies operating in the cluster |
| 3 | Tertiary (Aggregation point to Domestic terminal markets Railway's station/Ports/ Airports | - | - | - | - | | There is no availability of Tertiary infrastructure |

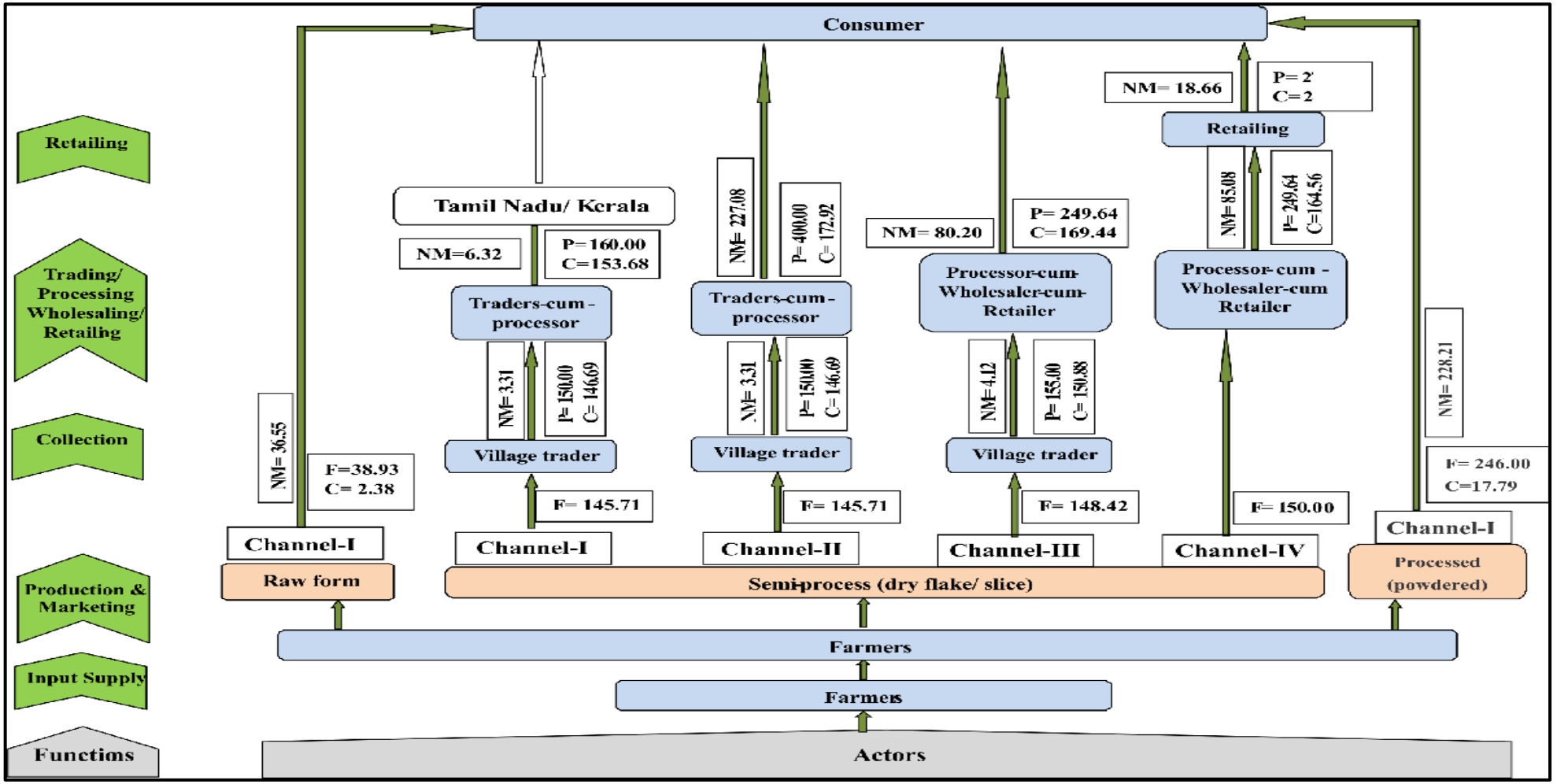
Status of Protection & Promotion Initiatives on the basis of GI, trademarks etc. - GI Registration is under progress.

## 2.14. Access to credit and facilitating agencies (ED institutions, credit facilitating NGOs etc.

*Table 14*

| Sl. No. | Name of the Bank/FI | No. of beneficiaries availing credit (%) | | Total Credit disbursed last year | | Nature of Credit (KCC, term loan for farm infrastructure, working capital for storage – specify) | Constraints/ Gaps |
|---|---|---|---|---|---|---|---|
| | | Farmers/FPOs | Value Chain Operators | Farmers FPOs | Value Chain Operators | | |
| 1 | Bank of Baroda | 0.647466 | | 0 | | KCC | - |
| 2 | Bank of India | 3.170351 | | 5 | | KCC | - |
| 3 | Canara Bank | 0.31257 | | 0 | | KCC | - |
| 4 | Indian Overseas Bank | 0.044653 | | 0.47 | | KCC | - |
| 5 | Punjab National Bank | 3.058718 | | 1 | | KCC | - |
| 6 | State Bank India | 51.84193 | | 36.03 | | KCC | - |
| 7 | Union Bank of India | 2.121009 | | 10.42 | | KCC | - |
| 8 | Meghalaya Rural Bank | 61.1967 | | 34.08 | | KCC | - |
| 9 | Meghalaya Cooperative Bank | 28.17593 | | 16.6 | | KCC | - |

## 2.15. Value chain of Lakadong Turmeric in Meghalaya[4]




[4] *Source: Value chain analysis of Lakadong Turmeric in Meghalaya: a micro-level study by Ram Singh, AletheaDympep, S. Passah, S.M. Feroze, A. Choudhury, Shiv Kumar and A. Jhajharia*

## 3. Pre- production and Production

### 3.1. Adoption of new practices, innovation & technology in pre-production and production

Majority of the farmers follow the traditional method of growing Turmeric through mixed cropping of turmeric, maize, beans/ pumpkin in flat bed system. New practices like inter cropping turmeric with maize + soya bean on raise bed was accepted by few farmers only. As the turmeric is grown continuously every year in the same land, there was a mixture of different varieties. As a result, to get the genuine Lakadong Turmeric seeds, a method called single bud rhizomes pro-tray technique which was found successful in States like Tamilnadu, and Kerala is tried at farm level and found to be successful at nursery level under West Jaiñtia Hills conditions.

*Table 15*

| Sl. No. | Practice/Technology | Practice undertaken by Govt./Private sector etc. | No. of farmers using it | Cost of adoption (Rs) | Area coverage (Ha) | Details of technology | Potential to scale up (High/Medium/Low with reason) | Constraints/ Gaps |
|---|---|---|---|---|---|---|---|---|
| 1 | Single bud rhizome pro-tray technique | Government | None | 2,55,000 | 1 | 1.Planting material: Finger rhizome with single bud<br>2. Seed rhizome rate: 600-700 Kg/ Ha<br>3. Media: Cocopeat, Pseudomonas fluorescens and | High | The technology is successful at nursery level and it is under field trial performance verification. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Trichoderma<br>4. Growing condition: 50% shade net with micro irrigation<br>5. Nursery: 40 days in pro-trays | | |

## 3.2. Production of planting material

### Nursery: Focus Crop nurseries in the cluster

Majority of the farmers follow the traditional method of growing Turmeric through mixed cropping of turmeric with maize, beans/ pumpkin in flat bed system. Whereas, new practices like inter cropping turmeric with maize + soya bean on raise bed were accepted by few farmers only. As the turmeric is grown continuously every year in the same plot, the purity of seeds is reduced due to mixing of different varieties. In order to maintain quality of seeds, a method called single bud rhizomes pro-tray technique which was found successful in States like Tamilnadu, and Kerala is tried at farm level and found to be successful in production of planting materials under West Jaiñtia Hills conditions.

*Table 16*

| Sl. No | Type of nursery producing planting material of focus crop (Hi-tech/ Small) | Name & Address | Major varieties (including recently introduced varieties) | Capacity (number of plants/year) | Area coverage (Ha) | Average Selling Price (Rs/Plant) | Capacity utilization % | Certified /Accredited | Annual demand of cluster (number of plants/year) | Need for Upgradation / demand for new infrastructure | Constraints / Gaps with its reasons |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Small/ Hi-tech | Iongkyndar Turmeric Hub, Mowkaiaw village | Lakadong Turmeric | 30 MT | 3 | 40/ Kg | 38% | Not accredited | 1000 MT | 05 | There is no certified nursery which can produce good quality planting materials of pure Lakadong Turmeric and of high curcumin content |

## Availability of Labs and Farm Mechanisation in the cluster

The capacity of the existing soil / water testing lab needs to be upgraded for upscaling its capacity to offer better services to farmers. Because of the undulating topography the adoption of farm mechanization is not feasible and the cultivation practised is manual. Presently there are12998 farmers belonging to 121 villages in West Jaintia Hills who are actively growing Lakadong Turmeric. However, most of them are small and marginal farmers with an average growing area of only 0.25 Ha as they could not afford to expand the cultivation due to subsistence farming and less income. Small machineries which are suitable for hill farming like Power tillers, Rotary tillers and others are required for achieving larger area expansion by converting new uncultivated land into Turmeric cultivation. These machineries will speed up the field operation especially ploughing which is labour intensive.

Meghalaya has a great scope in practising organic farming because most of the farming community are still following traditional method of cultivation. To achieve the status of organic state, more Bio- control strategies like setting up of more Bio- control laboratory for mass production and supply are needed. In the whole State of Meghalaya there is only one well established Bio- control Laboratory which could not cater to the need of the farmers.

Farm mechanizations play an important role in carrying out the work more efficiently and help inreducing the manpower requirements whichmay also bring down the cost of cultivation. In West Jaintia Hills District, there is less awareness about farm mechanization and custom hiring centre which could not provide farming operation services to the farmers. To overcome these problems, custom hiring centres can be set up in the clusters for providing such machineries to the farmers on hiring basis. Based on village size, the number of machineries required can be worked out accordingly.

Custom Hiring Centres (CHC) are basically a unit comprising a set of Farm machinery, implements and equipment meant for custom hiring by farmers. The main objective of CHC is to supply of Farm implements to small, marginal, and poor farmers at subsidy rates on hire. This enables the small and marginal farmers to take up farm operation on time. The advantages of CHC are to reduce drudgery, cost of cultivation and provide work opportunities to skilled labour, increase in cropping intensity wherever feasible, efficiency in use of resources and applied inputs, crop diversification, timely production and provide farm advisories.

*Table 17*

| Sl. No. | Particulars | Numbers | Names and details of major service providers | Type of entity (Govt./ Private/ Coop./ KVK etc.) | Level of utilization of facility (High/ Medium/ low) with reason | Current cluster coverage (%) of the facility | Cluster requirement (in numbers and capacity) | Need for Upgradation/ demand for new infrastructure | Constraints / Gaps |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Tissue Culture Labs | 0 | - | - | - | - | - | - | - |
| 2 | Plant health Clinic | 0 | - | - | - | | 2 | 2 | No such facilities exist in the cluster |
| 3 | Bio Control Labs | 0 | - | - | - | - | 1 | 1 no. New infrastructure | No such facilities exist in the cluster |
| 4 | Farm Mechanization Banks/ Custom Hiring Centres | | Assistant Agriculture Engineer Mechanical (AAE), Jowai | Government | High. Due to a smaller number of machineries available the coverage is less (Demand for Machineries are more but the capacity of the entity is less) | 30% | 4 | 4 no. of CHC | Currently cultivation of Turmeric is done through manual power. Therefore, the scope for Area Expansion is less as farmer could not afford due to low facilities for farm mechanization |

### Nursery: Import of planting material

Import of planting material of focus crop during 2019-20

*Table 18*

| Sl. No. | Varieties | Variety type (Table or Processable) | Import Quantity | Import destination | Imported by (Govt. / Private/ Coop. /KVK etc.) | Major blocks (with % coverage) | Reason of Import | Annual Cluster requirement (in numbers) | Constraints / Gaps |
|---|---|---|---|---|---|---|---|---|---|
| 1 | There is no importing of planting materials as the focus crop is Lakadong Turmeric which is very location specific crop to the cluster only | | | | | | | | |

## 3.3. Cost of production of focus crop

Labour cost is higher due to total dependency on human labour which made it labour intensive. Interventions like use of Power tillers may help in reducing the labour cost.

*Table 19*

| Sl. No. | | Cost (in Rs.) |
|---|---|---|
| **Cost of Production (Per Ha)** | | |
| a. | Cost of planting material | 60,000 |
| b. | Agri inputs | 33,375 |
| c. | Labour cost including land preparation @ 357/ MD | 1,39,230 |
| d. | Farm Mechanization | - |
| e. | Utilities | - |
| f. | Crop care practices | - |
| g. | Cost of irrigation | - |
| h. | Add others | - |
| **Total Cost** | | **2,32,605** |

## 3.4. Area expansion/rejuvenation

Area expansion has been taken up in the past by the Department of Agriculture, but the area expansion was not taken up on larger scale cultivation. The current area under Lakadong Turmeric in West Jaintia Hills is about 1977Ha and a production of 12861 MT in green and out of this only about 1000 MT of dried form is available as marketed surplus which many sources have quoted as not being enough to feed the demand. With the launch of Lakadong Mission, Lakadong Turmeric is widely known as the golden spice with a high commercial potential, many of the corporate players especially the nutraceutical firms involved in curcumin extraction and export have made inroads into Meghalaya to source it from the turmeric growing villages of Jaintia Hills. There are around 14 grinding units with an average output of 200kg per day per mill located in the turmeric growing areas. There are also a number of local private entities which have either tied up with Lakadong farmers to buy turmeric from them or are processing Lakadong turmeric to feed their own clients. It was learnt from all the above sources that currently the annual requirement of dried turmeric is more than 2000 MT.

*Table 20*

| Sl. No. | Particulars | No. Of Plants/ha | Existing area covered (in Ha.) | Service provider (Govt. / Pvt.) | Existing No. of farmers covered | Major blocks (with% coverage) | Integrated package with drip irrigation (Cost/Ha) | Cost/Ha without integration | Increase in productivity noted per Ha | Cluster requirement (in numbers and capacity) | Constraints/ Gaps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Normal Plantation | Seeds = 1500 kg/ ha Plants= 80,000/ ha | 1977 | Govt. and Pvt. | 12998 (for 3 years) | Laskein (87%) | NA | 2.32,605 | 16% (7 MT) | 1000 Ha | Labour intensive, pest (White grub- *Holotrichia spp.*) infestation and heterogeneity of seeds |

## 3.5. Protected cultivation (if applicable to focus crop)

*Table 21*

| Sl. No. | Particulars | Existing area coverage (Ha) | Service provider (Govt./Private | Existing No. of farmers covered | Major blocks (with % coverage) | Cost (Rs) | Cluster requirement (in numbers/area/capacity etc.) | Constraints /Gaps with its reasoning |
|---|---|---|---|---|---|---|---|---|
| 1 | NA | | | | | | | |

## 3.6. Adoption of new practices, innovation & technology in pre-production and production

The major pest faced by Lakadong turmeric farmers are white grub-holotrichia spp. and mealy bug Formicococcus polysperes. The grubs are polyphagous and feed on the tender rhizomes, roots, and base of the pseudostems which affect the rhizomes quality. The colonies of the mealy bug suck the sap from rhizomes causing yellowing and eventually lead to drying of the plants. To manage these pests in an eco-friendly manner, an Integrated Pest Management tactics should be encouraged to reduce the population of the pest below the economic threshold level. The lost due to pest infestation is as high as 25% which caused heavy loss to the Turmeric farmers. Specific SoPs has not been developed for Lakadong Turmeric and as IPM involve cultural, mechanical, biological, and chemical methods; SoP's development has to be done for the effective control of the above-mentioned pests and without the use of chemicals.

*Table 22*

| Sl. No. | Particulars | Service Providers (CoEs /NRCs/Universities/ Pre-contractors | Area Coverage (Ha) | Major blocks (with % coverage) | Cost (Rs) | No. of farmers covered | Cluster requirement Numbers/Area/ Capacity etc.) | Constraints/Gaps with its reasons |
|---|---|---|---|---|---|---|---|---|
| 1 | Procurement of Biopesticides, Bio fungicides, Biofertilizers, Organic manure, etc | - | - | - | 50,000 | - | 1000 Ha | To meet the demand of organic farming and GAP |

## 3.7. Adoption of organic farming

The farmers in the cluster have been growing turmeric for decades through traditional method which is also organic by default. However, to be able to sell as certified organic products certain guidelines and standards have to be followed. Government of Meghalaya is also promoting organic farming in the State where the subsidy for chemical fertilizers and pesticides has been stopped in Meghalaya since 2014. Due to the more preference of consumers for safe and healthier food there is an increased demand for organic food. Under the Scheme Mission Organic Value Chain Development (MOVCD) for North East Region about 500 Ha area is under conversion stage but considering the high quality and more demand for Lakadong Turmeric it is much needed to bring more area under organic certification to increase the economy of scale and it will also bring remunerative price to the growers.

*Table 23*

| Sl. No. | Particulars | Existing area coverage (Ha) | Service \|Provider (Govt/Private) | Existing Nos. of farmers covered | Major blocks with% coverage) | Cost (Rs./ Ha) | Cluster requirement (numbers/area/ capacity etc.) | Constraints /Gaps with its reasons |
|---|---|---|---|---|---|---|---|---|
| 1 | MOVCD | 500 Ha | Government | 818 | Laskein | 20,000 | 1000 Ha | 1.High cost of registration 2.High demand for organic certified products but no volume available |

## 3.8. Irrigation mechanism

*Table 24*

| Sl. No. | Type of Irrigation method (Drip/Sprinkler/ Flood) | Percentage of farmers using the irrigation method | Major blocks (with% coverage) | Productivity of crop/Ha | Cost of production Rs/Ha with different means of irrigation | Source of water | Cluster requirement (In numbers/ area/capacity) | Gaps in Irrigation mechanism |
|---|---|---|---|---|---|---|---|---|
| 1 | **NIL** | | | | | | | |

## 3.9. Good agricultural practices

**Certification:** ThePrevalence of good agricultural practices in the cluster. Till date there has been no initiative undertaken in Turmeric for Global/ India GAP certification.

*Table 25*

| Sl. No. | Particulars | State/Cluster level agency providing Certification (names to be specified) | Service providers assisting in certification | Area coverage (Ha) | Major blocks (with % coverage) | Cost (Rs./Ha) | No. Of farmers covered | Cluster requirement (in numbers / area/capacity etc.) | Constraints/ Gaps with it reasons |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Currently there is no GAP certification in the state | | | | | 10,000 | - | 100 Ha | It has not been implemented by any agency |

## 3.10. Harvesting practices

The farmers follow traditional method of harvesting. Research and Development (R&D) is needed to evaluate available modern tools for harvesting the Turmeric with high efficiency and capacity.

*Table 26*

| Sl. No. | Activity | No. Of farmers following the practice | Cost of activity | Coverage (% of cluster area) | Losses in harvesting | Highlight best practices and potential to scale up (High/Medium/Low with reason | Constraints/ Gaps with it reasons |
|---|---|---|---|---|---|---|---|
| 1 | Harvesting with crowbar and spade | 12000 | 7500 ((Table 19, Sl. no:11)) | 100 | 1% | Power tiller mounted harvester (Initial acceptance by the farmers-Medium) | Time consuming |

## 3.11. Capacity building and training of farmers/FPOs

Capacity building and training on improved organic production, Pests and diseases control through organic methods, on farm production of organic manure and Bio-pesticides, organic adoption and organic certification are some of the course curriculums that are very much relevant to the present scenario.

*Table 27*

| Sl. No. | Type of activity (workshop/ demo farms/ exposure visits, study tour etc.) | Service provider (Govt./Private) | No. of farmers covered (cumulative of last three years) | Cost per farmer/ Officials | Cluster requirement (in numbers/ area/ capacity etc.) | Constraints / Gaps |
|---|---|---|---|---|---|---|
| 1 | Formation and adoption of FPOs | Government | - | - | 2 | To strengthen the bargaining power of the farmers |
| 2 | Awareness meeting on Lakadong Mission | Government | 310 | 200 | - | Lack of exposure on post-harvest, processing, value addition and marketing |
| 3 | On Farm Production of Bio- Pesticides & Organic Manures | Government | 935 | 200 | - | |
| 4 | Exposure Visit<br>a) Out of State<br>b) Within the State | Government | <br>9<br>40 | <br>560<br>200 | <br>100<br>500 | |
| 5 | Workshop on Turmeric Cultivation for SHGs in Collaboration with NRLM | Government | 110 | 200 | - | |
| 6 | Training on Pricing Mechanism and cost of cultivation of Lakadong Turmeric | Government | 25 | 200 | - | |
| 7 | Training on Cost Analysis for | Government | 50 | 200 | - | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | fixing the minimum price of Turmeric | | | | | |
| 8 | Training on Organic Certification, ICS & Farm Diary | Government | 96 | 200 | - | |
| 9 | Training and Exposure for scaling up State Horti officials | Government | - | - | 2 | |
| 10 | Common facility centre (CFC) | - | - | - | - | |

## 3.12. Major diseases in the cluster

Giving awareness and training to the farmers on controlling the diseases which is acceptable to the organic standards, production of Bio agents and easy access to the farmers by leveraging the expertise of KVKs, CoEs, Private sectors, Central Agriculture University Umiam, State Biological Control Lab.

*Table 28*

| Sl. No. | Diseases in the crop | Activities undertaken to address it | Area Impacted (Ha) | Number of plants affected per year | Average loss to production per year (in MT) (A) | Average monetary losses per year (in Cr.)/(A*Average annual farm price of the cluster) |
|---|---|---|---|---|---|---|
| 1 | Rhizome rot (*Pythium*sp) | Seed treatment and manure incorporation with *Trichodermaharzianum Pseudomonas flourescens*@ 5g/kg of rhizome. | 20 | - | 1% | 0.13 Cr. |
| 2 | Leaf blotch | The disease can be controlled by spraying of bordeaux mixture @ 1% | 800 | - | 2% | - |
| 3 | Leaf spot | The disease can be controlled by spraying of bordeaux mixture @ 1% | 800 | - | 2% | - |

## 3.13. Conclusion

***Table 29***

| Sl. No | Component | Reason for proposed Component | Intervention Required | | |
|---|---|---|---|---|---|
| | | | Numbers | Quantity (MT, Ha, Sqm, set, participant) | Reference in the report |
| 1 | Nursery | There is no certified nursery which can produce good quality planting materials of pure Lakadong Turmeric and of high curcumin content | 5/1 | Ha | Refer Table No. 16 |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Farm Mechanisation Banks/ Custom Hiring Centres (Power Tillers/ Slicers/Grinder etc.) | Due to a smaller number of machineries available the coverage is less (Demand for Machineries are more but the capacity of the entity is less) | 4 CHCs | Nos. | Refer Table No. 17 |
| 3 | Procurement of Biopesticides, Bio fungicides, Biofertilizers, Organic manure, etc. | To meet the demand of organic farming and GAP | 1000 | Ha | Refer Table No. 22 |
| 4 | Adoption of Organic farming | High cost of registration | 1000 | Ha | Refer Table No. 23 |
| 5 | Organic Certification | High demand for organic certified products | 1000 | Ha | Refer Table No. 23 |
| 6 | GAP | It has not been implemented by any agency | 100 | Ha | Refer Table No. 25 |
| 7 | Bio- control Lab | For production of Bio- agents | 1 | No. | Refer Table No. 17 |
| 8 | Plant Health Clinic | No such facilities available in the cluster | 2 | Nos. | Refer Table No. 17 |
| 9 | Training and Exposure for scaling up State Horti officials | | 2 | No. | Refer Table No. 27 |
| 10 | Capacity building and awareness programmes | Lack of exposure on post-harvest, processing, value addition and marketing | 600 | Participants | Refer Table No. 27 |
| 11 | Formation and adoption of FPOs | To strengthen the bargaining power of the farmers | 2 | Nos. | Refer Table No. 27 |

## 4. Post-harvest management and value addition

Lakadong Turmeric may have the highest curcumin content but the quality of the final product whether it is slices, powder, or fingers, depends to a very large extent on the post-harvest treatment and processing of the turmeric. There are around 14 mills with an average output of 200 Kgs per day per mill located in the turmeric areas. The existing mills have limited facilities for only grinding but do not have facilities for packaging and storing. In the private sector, the LIFE Spices Processing Cooperative Society Ltd is the most well equipped with an oleoresin and powdering plant in Laskein block but has not been able to achieve full production due to lack of training, marketing outreach and skilled manpower.

There is only one turmeric processing plant established by the Directorate of Horticulture at Thadlaskein farm which has the facilities for washing, slicing, drying, and grinding. These establishments sourced the product from the farmers which have been processed at farm level. The traditional method of curing turmeric involves the slicing of the rhizomes and then open sun drying, which takes about 10 to 15 days depending on the thickness of the slices. This method results in poor quality of the dried slices due to the effect of weather fluctuation, contamination, and increased chances of microbial and fungal growth especially under humid conditions. This resulted in farmers losing about 10% to 20% of the market value of the produce.

There is a lack of knowledge on the improved post-harvest management and value addition among the farmers and entrepreneurs. Currently, Turmeric is sold mostly in dried slices or powder form using ordinary packaging materials or in loose packets which attract a lesser price for the product. Seed constituted 36.71 per cent of the total production while the family consumption was 0.20 per cent of the total production. The total marketable surplus was 63.08 percent of the total production whereas the marketed surplus was worked out to be 60.56 per cent of the total production. Marketed surplus is less than marketable surplus due to deduction and weight loss which constituted 1.26 per cent each. In a value chain of analysis in Meghalaya by Ram Singh it was found that the market surplus was about 75.77 % was higher than the marketable surplus 73.54 % which may be because of infestation by disease and pests on account of lack of storage. About 70 % of the Turmeric is sold in the form of dried slices outside the cluster whereas only 30% of the dried Turmeric is grounded through the available grinding units in the cluster and sold as powder. This indicates the lack of value addition in Turmeric in the cluster and therefore has high scope for the value addition.

## 4.1. Integrated Post-Harvest Management Infrastructure

*Table 30: Integrated Post-Harvest Management Infrastructure in the cluster*

| Sl. No. | Name and Address of the Facility | Cap. | Variety/ Grade processed | Capacity Utilization | No. of days of operation | Captive / Rental | Lease Charges (Rs. /Kg) | Single/ Multi commodity | Cluster requirement (in number/ area/ capacity etc.) | Demand for new Infrastructure | Constraints/Gaps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pack house | 5 MT | Lakadong | 3 MT | 90 | Captive | | Multi-commodity | - | - | - |
| 2 | **Integrated Pack House** | | | | | | | | | | |
| i | Functional Infrastructure for collection, sorting,grading,and packing | | | | | | | | 4 | 4 | Not available in the cluster currently |
| ii | Integrated Post-harvest infrastructures for Lakadong turmeric | | | | | | | | 4 | 4 | Not available in the cluster currently |
| 3 | **Pre-cooling units/Mobile Pre-cooling units** | | | | | | | | | | |
| i | NIL | | | | | | | | | | |
| 4 | **Cold Storage** | | | | | | | | | | |
| i | NIL | | | | | | | | | | |
| 5 | **Refrigerated Transport Vehicles** | | | | | | | | | | |
| i | NIL | | | | | | | | | | |
| 6 | **Ripening Chamber** | | | | | | | | | | |
| i | NIL | | | | | | | | | | |
| 7 | **Collection Centers** | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| i | Currently no such facilities are available in the cluster | | | | | | | | 8 | 8 | Essential as Lakadong turmeric is only marketed in weekly hats |
| 8 | **Primary processing facilities (cleaning, washing, sorting, grading)** | | | | | | | | | | |
| i | Horticulture Hub, Thadlaskein | 500 kg | Lakadong Turmeric | 1 hr | 3 days / month | | 10 | Single commodity | 4 Nos/ 3000 Sq. ft. each / 100kg Cap. per day | 4 Nos. | Necessary for reduction of processing time, manpower and better quality of the finished product |
| 9 | **Packaging facilities** | | | | | | | | | | |
| i | Currently no such facilities are available in the cluster | | | | | | | | 5 Nos. of 200 kg per day | 2 Nos. | Currently there are no proper packaging facilities |
| 10 | **Integrated Cold Chain Supply System** | | | | | | | | | | |
| i | NIL | | | | | | | | | | |

There are around 17 numbers of small Farm Pack houses in the Cluster created under the MIDH scheme with a capacity of 5 MT at different clusters. However, these Pack Houses are used as a Multi commodity facility; thus, the actual capacity for Packaging of 5MT is not available entirely for Lakadong turmeric but distributed among various other commodities. Since the Farmers in the state are small and marginal, farmers as individuals face difficulties in various aspects including aggregation, processing, packaging, or marketing/selling. Thus, a collective action is required in the form of collection centres in cluster wise. Since Lakadong Turmeric is of higher quality it has the

export potential thereby giving more margins to farmers. Such that the quality of processed products should meet the export standards through improved post-harvest Infrastructure/facilities in the form Integrated Pack house. Lakadong turmeric being a non-perishable product which it can be slice, dry and powder and store, its shelf life could be enhanced. Facilities such as pre-cooling units/Mobile pre-cooling units, cold storage, etc., are not required.

## 4.2. Value Addition Infrastructure in the cluster (Processing units)

*Table 31: Integrated Post-Harvest Management Infrastructure in the cluster*

| Sl. No | Name and Address of the Facility | Capacity/ Kg | Variety/ Grade processed | Capacity Utilization (Kg//day) | No. of days of operation | Cost of procurement / Kg | Cluster requirement (number & capacity) | Need for Upgradation | Constraints/ Gaps |
|---|---|---|---|---|---|---|---|---|---|
| **Preservation, Value addition and Processing Unit** | | | | | | | | | |
| 1 | LIFE Spices Processing Co-Operative Society, Laskein | 200 | Turmeric Powder | 100 | 100 | 130-160 | 4 | 4 | The existing units are old and outdated |
| 2 | M/S Hunbait Food Industries, Shangpung Khliehmuchut | 200 | Turmeric Powder | 100 | 230 | 130-160 | | | |
| 3 | Chi Iung Spices Co-Operative Society, Mootyrshiah | 200 | Turmeric Powder | 100 | 120 | 130-160 | | | |
| 4 | M.S. Papang Enterprise, Shangpung Khliehmuchut | 200 | Turmeric Powder | 100 | 230 | 130-160 | | | |
| 5 | IniShadap, Shangpung Pohshnong | 200 | Turmeric Powder | 100 | 150 | 130-160 | | | |
| 6 | MarjanChullet, Shangpung Moolibang | 200 | Turmeric Powder | 100 | 230 | 130-160 | | | |
| 7 | DeimonRabon, Shangpung Khliehmuchut | 200 | Turmeric Powder | 100 | 230 | 130-160 | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | M/S PhiarlyHadem Turmeric processing Unit, Mowkaiaw Village | 200 | Turmeric Powder | 100 | 200 | 130-160 | | | |
| 9 | M/S BitorinLyngdoh, Mukhap Village | 100 | Turmeric Powder | 50 | 80 | 130-160 | | | |

Most of the processing units are old and outdated and need to be revamped. Under the Lakadong Mission two processing unit (M/S Hunbait Food Industries, Shangpung Khliehmuchut, and Chi-Iung Spices Co-Operative Society, Mootyrshiah) will be upgraded. The remaining (at least 3 units) need to be upgraded in order to meet the standards and the market requirement. Since some existing units are not viable for upgradation owing to limitation of land, human resource etc., a minimum of 3 (three) new units needs to be set up with new entrepreneurs.

## 4.3. Packaging material manufacturing/supplying units in the Cluster

*Table 32*

| Sl. No. | Name and Address of the Facility | Capacity | Type of packaging material supplied (punnets, corrugated box etc.) | | Average cost/unit of packaging material (in Rs.) | Cluster requirement of unit (Quantity & Number) | Demand for new Infrastructure | Constraints / Gaps |
|---|---|---|---|---|---|---|---|---|
| | | | For export market/ A Grade | Domestic market | For export market/ A Grade | | | |
| 1 | Nil | Nil | Nil | Nil | Nil | 1 | 1 | No packaging materials manufacturing unit available in the cluster |

Currently there are no packaging material suppliers in the clusters. Most of the farmers procure the packaging materials from the open market in the state or form neighbouring cities like Guwahati. The qualities of these packaging materials procured from the open market are poor in quality and are also higher in price. Farmers use packaging material such as jute bags, ordinary plastic bags etc. which compromise the quality and shelf life of the product. Due to poor packaging practices, the product get contaminated with inert material (such as dust, stone, jute fibre etc.) or attracts fungal infections due to humidity (the moisture enters the products due to bad packaging and damages the product). These factors reduce the quality of the product despite being of superior breed and having the potential for high value in the market. The product either gets rejected in the market or is sold at a cheaper price than what it deserves. Thus, it is required to have a packaging material manufacturer which can provide quality packaging material in the clusters at a reasonable price which will retain the quality of the product and increase profitability for the farmers. Improvement in packaging quality can also increase the shelf life of the product thereby allowing farmers to store the product for a longer period and wait for a better price in the market.

## 4.4. Infrastructure for quality assessment in the cluster

*Table 33*

| Sl. No | Name & Address of the Facility | Type of entity (Govt./Private) | Level of utilization (High, Medium, Low) | Type of related test | INR – Per Test | Cluster requirement (quantity & number) | Demand for new Infrastructure | Constraints/ Gaps |
|---|---|---|---|---|---|---|---|---|
| 1 | Instant Quality testing machine | Nil | Nil | Nil | Nil | 2 | 2 | Quality testing samples need to be sent to Delhi, Mumbai, Kolkata, Hyderabad, Cochin, Gujarat for quality testing which is very long distance and difficult for farmers and entrepreneurs |

## 4.5. Adoption of new practices, innovation & technology in post-harvest management and value addition

*Table 34*

| Sl. No. | Practice/ Technology | Need for the proposed technology | Details of technology | Details of stakeholders using it | Cost of adoption (in Lakh) | Capacity coverage (in MT) | Potential to scale up (High/Medium/ Low with reason) | Constraints/ Gaps |
|---|---|---|---|---|---|---|---|---|
| 1 | Solar Hybrid tunnel dehydrator | 40 Nos. of 120 kg cap. per batch | Details of technology as below | a) LIFE Spices Processing Co-Operative | 3.15 | 360 | High | High cost of raw materials (Food grade steel |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Society, Laskein.<br>b) Ieinskhem Spice Producer and Industrial Co-operative Society, Mulieh.<br>c) Iasnohktilang Village Organisation, Khliehrangnah village.<br>d) MAAACS, Barato village<br>e) Ieintylli Village Organisation, Madankynsaw<br>f) Iaraplang Para I Kur Tang SHG, Thadmuthlong village | | | | SS-304) |
| 2 | Slicer | 20 Nos. | Electric slicer, Slicing 1-15mm thickness, tampered ss 304 blade, 0.5 HP motor, single phase | 21 nos. | 0.3 | 60 | Medium | Manual slicing is time consuming |
| 3 | Rhizome washer | 20 Nos. | Capacity: up to 50kg/batch | 21 nos. | 3.25 | 60 | Medium | Manual Washing is time consuming |
| 4 | Purchase of Hermetic bags rate as per actual | 4 units @ 500 Nos./ unit | 50 kg capacity | 21 nos. | 0.5 | - | Medium | Prevention from bacterial and fungal infection |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | company price list | | | | | | | |

Solar Hybrid Dehydrator is used for the purpose of drying the food products especially Lakadong Turmeric in the most hygienic method with less space occupancy. The Dehydrator consists of rigidly fabricated structure with stainless steel of food grade covered with polycarbonate sheet to withstand solar heat and transfer the heat to the food products kept for drying inside the drying chamber. For effective Dehydration process Solar heat Collector unit which consists of heat pipe exchange (HPHE) and the heat collected is blown into the drying chamber which generates hot air inside the chamber. Further Air heaters are also incorporated for continuous drying process, in case of cloudy weather or no sunshine and also to maintain an expected level of temperature, which shall result in high effectiveness. Compared to open sun drying method, the Solar Hybrid Dehydration process shall meet the modern requirement of safe, hygienic, and clean food, in addition to that the moisture content of food product will be able to maintain within the limit to avoid fungus formation and increase the shelf life. Quick removal of moisture from food products also prevents the growth of micro- organism. Since the structure is covered with polycarbonate sheet, the food product is free from dust and other dirt.

**Components:**

- **101 X 101 X 91 SS-304 TUNNEL STRUCTURE:** The Outer Structure is for Fixing the Polycarbonate sheet on Tunnel Profile
- **POLYCARBONATE Sheet:** To absorb Solar Heat and to Prevent UV and IR Radiations
- **25mm PUF INSULATED SHEET:** Used as Flooring Material to Prevent Heat Transfer to Ground structure through HPHE
- **AC Hot Air Blower (2KW):** These are installed inside the main structure driven with AC Power with PID controller to maintain the required temperature in case the intensity of sunlight is low
- **5" AC/DC Fans:** These exhaust fans are fitted at the top or real side of the main structure to remove the release humidity from chamber to atmosphere
- **50-Watt SPV Modules**: Solar Panel are used to run the DC Fans using Sun Energy
- **Inner Stand with SS 316 Mesh:** The Trays used for Drying

*Figure 7: Machineries available at WJH Farmer Produce Company Ltd, Thadlaskein*

*Figure 8: Conventional techniques of slicing and drying used by the farmers*

## 4.6. Conclusion

*Table 35*

| Sl. No | Component | Reason for proposed component | Intervention required | | |
|---|---|---|---|---|---|
| | | | Nos. | Quantity (MT, Ha, Sqm, set, participant etc.) | Reference in the report |
| 1 | Collection centre | Currently not available in the cluster | 8 | nos. | Table no.30 |
| 2 | Functional Infrastructure for collection sorting grading packing | Currently not available in the cluster | 4 | nos. | Table no.30 |
| 3 | Integrated Post-harvest infrastructures for Lakadong turmeric | Currently not available in the cluster | 4 | nos. | Table no.30 |
| 4 | Primary processing centres | Insufficient availability of primary processing centre in cluster | 4 | nos. | Table no.30 |
| 5 | Secondary Processing unit | Insufficient availability of processing unit in cluster | 2 | nos. | Table no.32 |
| 6 | Packaging infrastructure | Unavailable of packaging infrastructure in cluster | 2 | nos. | Table no.31 |
| 7 | Packaging Material Manufacturing/Supplying Unit | Need arise for good quality packaging materials | 1 | nos. | Table no.33 |
| 8 | Instant Quality Testing Machine | Non-existence of quality testing units | 2 | nos. | Table no.33 |
| 9 | Solar Hybrid Dehydrator | For efficient and quality drying | 40 | nos. | Table no.34 |
| 10 | Turmeric Slicer | Safe time and hygienic | 20 | nos. | Table no.34 |
| 11 | Rhizome washer | Safe time and hygienic | 20 | nos. | Table no.34 |
| 12 | Purchase of Hermetic bags rate as per actual company price list | Safe and hygienic | 4 units @ 500 nos. / unit | nos. | Table no.34 |

## 5. Logistics, marketing, and branding

The market functionaries stated four major problems faced by them in marketing of turmeric. Poor storage facilities were ranked first followed by poor road condition, risk in transportation and storage and low-quality produce.

### 5.1. Mode of Transportation for domestic market

*Table 36*

| Sl. No. | Mode of Transport | For Domestic Market | | | | | Cluster requirement in numbers and capacity |
|---|---|---|---|---|---|---|---|
| | | Major market (location) | Cost/ Kg/ Km | Transit time (Hrs) | % losses incurred during transportation | Constraints and gaps | |
| 1 | Pick up vehicle | For Local market within Meghalaya | 3.5 | | - | Poor quality and small approach road and lack of transportation facilities | 6 nos. |
| 2 | By Train | Kerala, Delhi, Maharashtra, Hyderabad, Rajasthan, Assam, West Bengal, Haryana, Gujarat, UP, Tamil Nadu, Orissa | 11 -15 | | - | Products got delayed in reaching the destination due to time constraints | - |

## 5.2. Mode of Transportation for export model

*Table 37*

| Sl. No. | Mode of Transport | For Export Market | | | | | Cluster requirement in numbers and capacity |
|---|---|---|---|---|---|---|---|
| | | Major market (location) | Cost/ Kg | Transit time (Hrs) | % losses incurred during transportation | Constraints and gaps | |
| 1 | Sea | Netherland | 300 | 700-750 | Nil | High cost for small quantity shipment | 4 nos. |
| 2 | Sea | United Kingdom (UK) | 300 | 700-750 | Nil | | |
| 3 | Sea | Russia | 60 | 700-750 | Nil | | |
| 4 | Air | USA | 1000 | - | - | | |

For the domestic market, the most prevalent mode of transport is by road as most locations do not have other means of transport such as air, rail, or sea. However, for the export market, these products are transported mostly by sea after the initial transport by road, rail and/or air.

Since most of these clusters are located remotely, logistic arrangement is still a challenge. However, recently with the Government initiative to provide logistics to farmers through iTEAMS, the burden of finding local transport has been reduced to some extent. While these initiatives have brought some relief to the farmers there are still few challenges that are faced by the farmers such as the right carriage capacity. As iTEAMS currently only has arrangements for small carriage facilities, farmers have to look for alternative arrangements for larger capacity. Thus, there is a requirement for improvement in the logistic arrangement by providing carriage facilities for different capacities

## 5.3. Multimodal transportation

*Table 38*

| Sl. No. | Particular | Availability in the Cluster | Cost/ Km | Transit time (Hrs) | Transport subsidy (Central/State Govt.) Cost/kg/ km | Capacity of crop handled/ year | No. of farmers leveraging the initiative | Benefits and Constraints of the initiative | Days of operation |
|---|---|---|---|---|---|---|---|---|---|
| 1 | - | - | - | - | - | - | - | - | - |

## 5.4. Market channels in the cluster[5]

*Table 40*

| Sl. No | Marketing Channel | Percentage of farmers covered | Volume of crop handled (in MT) | Selling Price Rs. /Kg | Constraints/Gaps with its reason |
|---|---|---|---|---|---|
| 1 | Preharvest Contractor | NIL | NIL | NIL | NIL |
| 2 | Directly with the Corporate | 4% | 20 | 150-170 (dried slice) | Aggregation is difficult as production is in small quantities and is scattered. |
| 3 | Through Traditional Channels (Traders/APMC etc.) | 70% | 1200 | 130-150 (dried slice)<br>300-400 (powder) | Lack of storage facilities |
| 4 | Directly to consumer<br>a.Through retail shops/ carts/vending shops | 20% | 250 | 300-500 (powder) | Poor packaging and branding |
| | b. Through e-commerce platform | 6% | 52 | 1000-2000 (powder) | Lack of capacity building |

In Meghalaya, the marketing of turmeric takes place primarily in unregulated markets called "haats", or weekly bazaars. Traders come from Shillong and Assam to purchase at wholesale price in Jaintia hills and even at the farm gate of cultivators. Even organized trading companies such as ITC Ltd. procure turmeric from the rural haats of Jaintia Hills through local middlemen. However, the small and marginal farmers of Jaintia hills are unable to realise good prices for their produce due to lack of bargaining power.

## 5.5. Cluster Brand Initiative for the focus crop

*Table 41*

| Sl. No. | Major Cluster Brands | SOPs/ POPs available | QA certification/Audit mechanism available | FPO/Farmer coverage under the brand | Major brand promoting activities | Training and Support mechanism | GI tag available | USP of the cluster brand | Constraints/Gaps |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Not available at present** | | | | | | | | |

[5]*Source - Stakeholder consultation with existing enterprises, respective Central/State Govt. department*

## 5.6. Available Markets/Exit Points

Under the Lakadong mission, the state is working towards creating a cluster brand by promoting Jaintia hills as the home to Lakadong turmeric for which a GI registration is also under progress. To enable this, 15 CMCs from the cluster of Jaintia hills region will be created under the mission. These CMCs will do the pre-processing of Lakadong turmeric which includes washing, sorting & grading, slicing, and drying. The pre-processed turmeric will then be further processed and packaged in the two processing units which will be upgraded under the mission. These finished products will then be sold under the brand "Meghalayan Age Lakadong Turmeric " at a premium price. The government has created an Emporium in Delhi where Lakadong turmeric along with other state products will be launched and sold under the "Meghalayan Age" brand. The authenticity of the brand will be achieved by enabling traceability for the whole supply chain starting from Farmers field to the final consumer.

## 5.7. Major terminal and wholesale markets available for the focus crop value chain

*Table 42*

| Major Terminal Markets in the cluster | | | | | Major Wholesale markets in the cluster | | |
|---|---|---|---|---|---|---|---|
| **Name & address** | **Capacity handled** | **Need for Upgradation/demand for new infrastructure** | **Constraints/Gaps** | **Name & Address** | **Capacity handled** | **Need for Upgradation/demand for new infrastructure** | **Constraints/Gaps with reasons** |
| NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL |

## 5.8. Available markets/exit points

*Table 43: Major terminal and wholesale markets available for the focus crop value chain*

| | Major Rural Markets in the cluster | | | | Major Retail markets/outlets in the cluster | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Name & address** | **Capacity handled** | **Need for Upgradati** | **Constraints/Gaps** | **Name & Address** | **Capacity handled** | **Need for Upgradation/demand for new infrastructure** | **Constraints/ Gaps** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **on on/d ema nd for new infra struc ture** | | | | | |
| 1 | IawPynsi eñ-Ummulo ng, | 3.2 MT | - | Operate only once a week | Iawm usian g | - | 4nos. | Operat e only once a week |
| | IawKhan duli, | 2.1 MT | | | | | | |
| | IawMuch ai-Shangpu ng, | 5.2 MT | | | | | | |
| | IawMook aiaw, | 5.7 MT | | | | | | |
| | IawRalia ng, | 3.4 MT | | | | | | |
| | IawMulo ng-Sahsnia ng | 4.0 MT | | | | | | |

## 5.9. Market promotion infrastructure

*Table 44*

| | Distribut ion centres (name, type of facility) | Distri ct /Stat e | Infrastruc ture available | Total capacity at distributi on/ exit point | Cluster requirement (in numbers/cap acity etc.) | Need for Upgradati on demand for new infrastruc ture | Constraints/ Gaps |
|---|---|---|---|---|---|---|---|
| 1 | Nil | | | | 4 | 4 nos. | Not available in the cluster at present |

Currently there is only one promotion infrastructure called “Meghalaya Emporium” in Delhi where Lakadong Turmeric will be promoted. However, there is a need for more such emporiums in the state as well as other major cities where the Lakadong turmeric can be exhibited. Thus, similar emporiums can be replicated in other Major cities like Mumbai, Kolkata, Bangalore, and Hyderabad.

## 5.10. Service providers for market promotion

*Table 45*

| Sl. No. | Existing services provider | Names of service providers & contact details | Services offered (branding, logo design, media coverage, advertisements etc. | Cluster Coverage | Cluster requirement (Specify needs with reason) | Constraints/Gaps |
|---|---|---|---|---|---|---|
| 1 | - | - | - | - | - | - |

## 5.11. Exit point infrastructure: Market Promotion distribution infrastructure outside/within the cluster

*Table 46*

| Sl. No. | Type of infrastructure (Pack house, Cold store etc.) | Ownership (Govt./Private) | Capacity Utilisation (%) | Quantum handled (MT) | Cluster Coverage | Need for Upgradation/demand for new infrastructure | Constraints/ Gaps |
|---|---|---|---|---|---|---|---|
| 1 | Sea Ports(s) | NIL | NIL | NIL | NIL | NIL | NIL |
| 2 | In-land Container Depot | NIL | NIL | NIL | NIL | NIL | NIL |
| 3 | Railways | NIL | NIL | NIL | NIL | NIL | NIL |
| 4 | Airport(s) | NIL | NIL | NIL | NIL | NIL | NIL |

## 5.12. State Government Initiative, Including Subsidy, Partnership, MoUs

The State government has taken several steps to ensure a better market for the Lakadong turmeric. Several trail packs have been sent to European and other International markets for testing the quality and standard of the product. The Lakadong Turmeric of Jaintia hills, Meghalaya has been highly acclaimed and accepted in the international markets with demands for procurement due its high curcumin content.

## 5.13. Conclusion

*Table 47*

| Sl. No. | Component | Reason for proposed component | Intervention Required | | |
|---|---|---|---|---|---|
| | | | Nos. | Quantity (MT, Ha, Sqm, set, participants etc.) | Reference in the report |
| 1 | Retail Markets/ outlets | For continuous availability of the product and flow of income flow the farmers as well | 4 | No. | Table 43 |
| 2 | Rural Markets/ Apnimandies / Direct Market | - | - | - | - |
| 3 | Terminal markets/ wholesale markets | - | - | - | - |
| 4 | Market promotion distribution infrastructure in the cluster | Not available in the cluster at present | 4 | No. | Table 44 |
| 5 | Exit point infrastructure | - | - | - | - |
| 6 | Marketing intelligence Services | Not available in the cluster at present | 4 | No. | - |
| 7 | Branding and marketing activities for promotion of cluster Brand abroad (in-store Branding, Electronic/ Social Media and Print Media, Outdoor publicity, billboard, commercial advertisement on channels etc.) | There is a need for branding of the product in order to realize better price | 4 | No | - |
| 8 | Branding & Marketing activities for promotion of Cluster Brand in domestic market | There is a need for branding of the product in order to realize better price | 8 | Nos. | Table 41 |
| 9 | Transportation for domestic market | Very limited numbers of transportation vehicles are available | 6 | Nos. | Table 36 |
| 10 | Transport and marketing assistance for export market | Not available in the cluster at present | 4 | Nos. | Table 37 |
| 11 | Seminars conferences, workshops, exhibitions, KisanMela horticulture shows, honey festivals etc. | Necessary for recognition and in order to realize better price for the product | | Nos. | |
| | a) National level | | 4 | | |
| | b) State level | | 12 | | - |
| | c) District level | | 12 | | |

## 6. Indicative Value Chain Activity (Vertical) wise Interventions (Data)

### Summary of total cost of the project

| Sl. No. | Component | Cost (Rs) |
|---|---|---|
| 1 | Indicative Value Chain Activity (Vertical) wise Interventions (Data) including List of equipment's for establishment of quality control and analytical laboratory | **46,83,24,000** |

### Detail cost estimates of the project

| Sl. No. | Value Chain Activity | Recommended Component | Numbers | Units (M.T, Ha, Sqm. Set, Participant etc.) | Estimated Cost Per Unit (Rs. In Lac.) | Cost of Interventions (in Lacs) | Timelines for implementation |
|---|---|---|---|---|---|---|---|
| **A** | | | | | | | |
| 1 | **Pre-Production and Production** | Setting up of nurseries (Small nurseries) | 5 | Nos. | 15 | 75 | 2022-24 |
| 2 | | Hi-tech nurseries | 1 | Nos. | 25 | 25 | 2022-24 |
| 3 | | Area expansion | 1000 | Ha | 0.934 | 934 | 2023-24 |
| 4 | | Adoption of Organic farming | 1000 | Ha | 0.2 | 200 | 2022-26 |
| 5 | | Organic certification | 1000 | Ha | 0.2 | 200 | 2022-26 |
| 6 | | Adoption of good agricultural practices (GAP) | 100 | Ha | 0.1 | 10 | 2022-23 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | | Organic input production | 50 | Nos. | 1 | 50 | 2022-24 |
| 8 | | Procurement of Biopesticides, Bio fungicides, Biofertilizers, Organic manure, etc. | 1000 | Ha | 0.05 | 50 | 2022-26 |
| 9 | | Bio control Lab | 1 | No. | 90 | 90 | 2022-23 |
| 10 | | Plant health clinic | 2 | Nos. | 25 | 50 | 2022-23 |
| 11 | | Custom Hiring Centre (CHC) | 4 | Nos. | 15.5 | 62 | 2022-23 |
| 12 | **Capacity Building & Workshop** | Formation and adoption of FPOs | 2 | Nos. | 35.26 | 70.52 | 2022-23 |
| 13 | | Training and Exposure for scaling up State Officials/Staffs | 2 | No. | 20 | 40 | 2022-23 |
| 14 | | **Training & Exposure Visit of farmer** | | | | | |
| 15 | | Within the State | 500 | Participants | 0.01 | 5 | 2022-23 |
| 16 | | Outside the State | 100 | Participants | 0.15 | 15 | 2022-23 |
| **Sub Total** | | | | | | **1876.52** | |
| **B.** | | | | | | | |
| 1 | **Post-Harvest Management and Value Addition** | Collection centre | 8 | Nos. | 4 | 32 | 2022-24 |
| 2 | | Functional Infrastructure for collection, sorting, grading, packing | 4 | Nos. | 15 | 60 | 2022-24 |
| 3 | | Integrated Post-harvest infrastructures for Lakadong turmeric | 4 | Nos | 50 | 200 | 2022-24 |
| 4 | | Primary Processing unit | 4 | Nos. | 25 | 100 | 2022-24 |
| 5 | | Secondary Processing units | 2 | Nos. | 40 | 80 | 2022-24 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | | Quality control and analysis lab | 1 | The detailed cost estimates are mentioned in Annexure I: List of equipment for establishment of quality control and analytical laboratory | | 1,141 | 2022-24 |
| 7 | | Instant Quality (Curcumin, etc.) testing machine | 2 | Nos. | 7 | 14.0 | 2022-23 |
| 8 | | Packaging Unit | 2 | Nos. | 20 | 40 | 2022-24 |
| 9 | | Packaging materials manufacturing unit | 1 | Nos. | 15 | 15 | 2022-23 |
| 10 | | Solar Hybrid Dehydrator/ Solar tunnel dryer | 40 | Nos. | 3.15 | 126 | 2022-23 |
| 11 | | Turmeric Slicer | 20 | Nos. | 0.586 | 11.72 | 2022-23 |
| 12 | | Rhizome washer | 20 | Nos. | 3.25 | 65 | 2022-23 |
| 13 | | Purchase of Hermetic bags | 4 | Nos. | 0.5 | 2 | 2022-23 |
| **Sub Total** | | | | | | **1886.72** | |
| **C.** | | | | | | | |
| 1 | | Transport vehicles | 6 | Nos. | 10 | 60 | 2022-23 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | | Transport and marketing assistance for export market | 4 | Nos. | 15 | 60 | 2022-23 |
| 3 | | Retail markets/ Outlets | 4 | Nos. | 15 | 60 | 2022-23 |
| 4 | | Market promotion, Distribution Infrastructure in the Cluster | 4 | Nos. | 100 | 400 | 2022-23 |
| 5 | | Marketing, Market Intelligent Service, Statistic and Export Promotion council (EPC) | 4 | Nos. | 30 | 120 | 2022-24 |
| 6 | | Branding & Marketing activities for promotion of Cluster Brand in domestic market | 8 | Nos. | 5 | 40 | 2022-24 |
| 7 | **Logistic Marketing and Branding** | Branding & Marketing activities for promotion of Cluster Brand in abroad (In-store Branding, shelf space renting, listing fee, electronic/social media and print media, billboard, commercial advertisement on channels, etc.) | 4 | Nos. | 25 | 100 | 2022-24 |
| 8 | | Seminars conferences, workshops, exhibitions, KisanMela horticulture shows, honey festivals etc. | | | | | 2022-24 |
| | | a) National level | 4 | Nos. | 5 | 20 | |
| | | b) State level | 12 | | 3 | 36 | |
| | | c) District level | 12 | | 2 | 24 | |
| **Sub Total** | | | | | | **920** | |
| **Grand Total** | | | | | | **4,683** | |

## 6.1. Conclusion

The implementation of this project would address:

- Concerns of the turmeric value chain in an integrated manner to accelerate competitiveness in domestic and export markets.
- Reduce harvest and post-harvest losses by developing/expanding/upgrading infrastructure for post-harvest handling of produce, value addition and developing market linkages
- Facilitate the introduction of innovative technologies and practices to enhance the global competitiveness of focus cluster crops
- Facilitate the dovetailing of resources, including the convergence of various government schemes, to entrench stakeholders in the global value chains
- Build stakeholder capacity and enhance farmersincome through cluster-specific interventions, including brand promotion

## Annexure I: List of equipment for establishment of quality control and analytical laboratory

| I(A). Pesticide Residue, Soil, Water and Nutritional Profile Testing Laboratory | | | | |
|---|---|---|---|---|
| SUPPORT FUNDING | | | | Total |
| Sl. No. | Equipment | Qty | Rate | |
| 1 | Atomic Absorption Spectrophotometer | 1 | 1210000 | 12,10,000 |
| 2 | Automated Nitrogen evaporators (N-Vap) | 1 | 550000 | 5,50,000 |
| 3 | Automated Solid phase extractor | 1 | 485000 | 4,85,000 |
| 4 | ButyroRefractometer Reading<br>System with temperature control | 1 | 15000 | 15,000 |
| 5 | BOD Incubator | 1 | 60000 | 60,000 |
| 6 | BOD Analyzer | 1 | 100000 | 1,00,000 |
| 7 | Centrifuge-Micro | 1 | 185000 | 1,85,000 |
| 8 | Clean bench systems Biosafety cabinets | 1 | 200000 | 2,00,000 |
| 9 | Clavenger Apparatus | 1 | 25000 | 25,000 |
| 10 | COD Digestion Unit | 1 | 40000 | 40,000 |
| 11 | Conductivity Meter- Bench top | 1 | 32000 | 32,000 |
| 12 | Deep Freezer -40 | 1 | 800000 | 8,00,000 |
| 13 | Electronic Balance | 1 | 63000 | 63,000 |
| 14 | Electronic pH meter | 3 | 62000 | 1,86,000 |
| 15 | Flame Photometer | 1 | 40000 | 40,000 |
| 16 | Fully automated Fiber analyzer | 1 | 1100000 | 11,00,000 |
| 17 | Fully automated Kjeldahl system | 1 | 500000 | 5,00,000 |
| 18 | High speed floor model centrifuge | 1 | 250000 | 2,50,000 |

| | | | | |
|---|---|---|---|---|
| 19 | Hot air Oven | 1 | 44000 | 44,000 |
| 20 | Multimode ELISA reader and plate washer | 1 | 200000 | 2,00,000 |
| 21 | Gas Chromatography | 1 | 1000000 | 10,00,000 |
| 22 | Germination Chamber | 1 | 190000 | 1,90,000 |
| 23 | High Speed Blender | 1 | 6000 | 6,000 |
| 24 | Liquid chromatography | 1 | 820000 | 8,20,000 |
| 25 | Low Volume Nitrogen Evaporator | 1 | 550000 | 5,50,000 |
| 26 | Spectrofluorometer | 1 | 1200000 | 12,00,000 |
| 27 | Solid Phase Extractor Manifold | 1 | 330000 | 3,30,000 |
| 28 | Tabletop microfuge (Refrigerated) | 1 | 500000 | 5,00,000 |
| 29 | Kundera-Danish Concentrator with Snyder and Micro-Snyder Columns | 1 | 7000 | 7,000 |
| 30 | Kjeldahl for Nitrogen | 1 | 2000 | 2,000 |
| 31 | Soxhlet Apparatus | 1 | 90000 | 90,000 |
| 32 | Tintometer | 1 | 300000 | 3,00,000 |
| 33 | Viscometer | 1 | 50000 | 50,000 |
| 34 | Video Microscope | 1 | 200000 | 2,00,000 |
| 35 | Vacuum Desiccator | 1 | 12000 | 12,000 |
| 36 | Water purification system (Element analysis grade) | 1 | 2500000 | 25,00,000 |
| 37 | Digital Incubator | 1 | 150000 | 1,50,000 |
| 38 | Variable Volume Micropipette | 10 | 5000 | 50,000 |
| 39 | Variable Volume Macropipette | 10 | 5000 | 50,000 |
| 40 | Ultrasonic Water bath | 1 | 43000 | 43,000 |
| 41 | Electric Bunsen Burner with energy regulator | 4 | 5000 | 20,000 |
| 42 | Desiccator (300MM) | 2 | 7000 | 14,000 |
| 43 | Fume Exhaust Hood | 1 | 80000 | 80,000 |

| | | | | |
|---|---|---|---|---|
| 44 | High Performance Liquid Chromatography (HPLC) | 1 | 690000 | 6,90,000 |
| 45 | Heating Mantle with Energy Regulator (500 ml) | 2 | 19000 | 38,000 |
| 46 | Hot Plate with Energy Regulator (Temperature range 100$^{o}$C) | 2 | 10000 | 20,000 |
| 47 | Refrigerator (264 L; 3-80$^{o}$C) | 2 | 40000 | 80,000 |
| 48 | Digital Cyclomixer | 2 | 17800 | 35,600 |
| 49 | Standard Weight | 1 | 24000 | 24,000 |
| 50 | Vacuum Pressure Pump | 1 | 12000 | 12,000 |
| 51 | Weighing Balance | 1 | 5600 | 5,600 |
| 52 | Analytical Balances (0.01, 0.001 and 0.0001g accuracy) | 2 | 90000 | 1,80,000 |
| 53 | Auto pipettes - (1 - 5ml Range) | 2 | 60000 | 1,20,000 |
| 54 | Bottle dispensers | 5 | 10000 | 50,000 |
| 55 | Centrifuges | 1 | 185000 | 1,85,000 |
| 56 | Desiccators | 5 | 2400 | 12,000 |
| 57 | Frost free Double Door Refrigerators | 1 | 90000 | 90,000 |
| 58 | HandheldRefractometer | 5 | 1500 | 7,500 |
| 59 | Heating Mantles | 1 | 15000 | 15,000 |
| 60 | Hot plate cum stirrers | 2 | 6000 | 12,000 |
| 61 | Incubators 37 °C | 1 | 50000 | 50,000 |
| 62 | Laboratory Blender | 1 | 15000 | 15,000 |
| 63 | Magnetic Stirrer | 1 | 10000 | 10,000 |
| 64 | Muffle Furnace – 450°C | 2 | 150000 | 3,00,000 |
| 65 | Oven – Moisture -100°C for glassware drying | 1 | 45000 | 45,000 |

| | | | | |
|---|---|---|---|---|
| 66 | Sample Shakers | 1 | 50000 | 50,000 |
| 67 | Rotatory Vacuum Evaporator | 1 | 125000 | 1,25,000 |
| 68 | RT-PCR | 1 | 500000 | 5,00,000 |
| 69 | Solvent Dispensers - Organic & Acids – | 2 | 40000 | 80,000 |
| 70 | TDS meter | 1 | 15000 | 15,000 |
| 71 | Vortex Mixers | 2 | 15000 | 30,000 |
| 72 | Waring Blender/grinding mill | 2 | 5000 | 10,000 |
| 73 | Water Bath Shaker | 1 | 15000 | 15,000 |
| 74 | Gel doc system& Electrophoretic unit | 1 | 100000 | 1,00,000 |
| 75 | UV-Visible Spectrophotometer | 3 | 360000 | 10,80,000 |
| 76 | µC Turbidity Meter | 1 | 100000 | 1,00,000 |
| 77 | Inductively Coupled Plasma- Mass Spectrometer | 1 | 14000000 | 1,40,00,000 |
| 78 | Gas Chromatography-Mass Spectrometer/MS | 1 | 15000000 | 1,50,00,000 |
| 79 | Liquid Chromatography-Mass Spectrometer/MS | 1 | 15000000 | 1,50,00,000 |
| 80 | Microwave Sample Digester | 2 | 500000 | 10,00,000 |
| 81 | UPLC-MS/MS | 1 | 15000000 | 1,50,00,000 |
| | | | **Sub-Total-I(A)** | **7,83,50,700** |
| **I(B). Microbiology Laboratory** | | | | |
| 1 | Anaerobic Jars | 10 | 5000 | 50,000 |
| 2 | Analytical Balance (Macro) | 2 | 80000 | 1,60,000 |
| 3 | Vertical Autoclave | 4 | 70000 | 2,80,000 |
| 4 | Automated Culture Media Preparator with pourer stacker | 1 | 500000 | 5,00,000 |
| 5 | Automated glassware washer | 1 | 100000 | 1,00,000 |

| | | | | |
|---|---|---|---|---|
| 6 | Binocular Microscope | 1 | 50000 | 50,000 |
| 7 | Bio Safety Cabinet Class II Type B2 (Total Exhaust) | 1 | 200000 | 2,00,000 |
| 8 | BOD Incubator (Fungi, Bacteria, Mycorrhiza) | 3 | 60000 | 1,80,000 |
| 9 | Carbon di oxide incubator | 1 | 230000 | 2,30,000 |
| | Colony Counter | 1 | 100000 | 1,00,000 |
| | Digital pH Meter | 1 | 62000 | 62,000 |
| 11 | Frost Free Double door (side by side) Refrigerator | 2 | 45000 | 90,000 |
| 12 | Fumigator | 1 | 89000 | 89,000 |
| 13 | Hot Air Oven | 1 | 15000 | 15,000 |
| 14 | Howard Mold Counter | 10 | 900 | 9,000 |
| 15 | Laminar Air flow | 2 | 80000 | 1,60,000 |
| 16 | Micro Filtration Assembly | 1 | 170000 | 1,70,000 |
| 18 | Micropipettes | 6 | 5000 | 30,000 |
| 19 | Orbital shaker | 1 | 355000 | 3,55,000 |
| 20 | Refrigerated Centrifuge | 1 | 300000 | 3,00,000 |
| 21 | Upright Frost Free Vertical Deep Freezer (-25 °C) | 1 | 800000 | 8,00,000 |
| 22 | UV Viewing Chamber | 1 | 12000 | 12,000 |
| 23 | Ultrapure Water Purification System | 1 | 560000 | 5,60,000 |
| | | | **Sub-Total-I(B)** | **45,02,000** |
| | | | **GRAND TOTAL** | **8,28,52,700** |
| **II. Furnishing and fabrication of the Laboratory: Cost for furnishing and fabrication of the Laboratory as per NABL layout of the Laboratory** | | | | |

| Sl.No. | Item/particular | Amount (Rs) |
|---|---|---|
| 1 | Furnishing and fabrication of the Laboratory- Partitioning, construction of shelves, working areas, etc. | 10,00,000 |
| 2 | Purchase and installation of workbenches, furniture, taps, etc. | 5,00,000 |
| 3 | Electrification and water connection | 5,00,000 |
| | **GRAND TOTAL** | **20,00,000** |

**III. Consumables**

| Sl. No | Particulars | Y1 | Y2 | Total |
|---|---|---|---|---|
| 1 | Chemicals | 5,00,000 | 3,00,000 | 8,00,000 |
| 2 | Glassware's | 5,00,000 | 3,00,000 | 8,00,000 |
| 3. | Other Items& Accessories | 5,00,000 | 2,00,000 | 7,00,000 |
| 4 | Contingency | 2,00,000 | 1,95,000 | 3,95,000 |
| | **GRAND TOTAL** | **17,00,000** | **9,95,000** | **26,95,000** |

**IV. Testing Fees: Cost for testing of fresh, dried or processed turmeric samples; soil & water quality testing, nutritional profiling including curcumin content analyses, plant health analyses**

| Sl. No | No. of test | Rate of test (Rs) | No. of clusters | Total |
|---|---|---|---|---|
| 1 | 50 | 10000 | 53 | **2,65,00,000** |
| | | | | |
| **GRAND TOTAL (I(A)+I(B)+II+III+IV)** | | | | **11,40,47,700** |