

VALUE CHAIN STUDY OF MORINGA CROP THENI & DINDIGUAL, TAMIL NADU

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We sincerely hope and believe that the findings and recommendations of this report will help to further the cause of Honorable Prime Minister's vision of doubling farmers' income by 2022 as well as provide relevant insights in dovetailing to the recently initiated 'Operation Greens' under the Union Budget 2018-19. We believe this report will serve as a valuable resource, providing the necessary framework to inform various stakeholders across the tomato value chain in Jharkhand as well as other states across India updating of live hood at farmer.

(Dr,P.K. Gupta)

Director NHRDF

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1 About NHRDF

The National Horticultural Research and Development Foundation (NHRDF) was established by National Agricultural Co-operative Marketing Federation of India Ltd. (NAFED) on 3 November, 1977 under Societies Registration Act, 1860 at New Delhi. Head Office & Registered Office of NHRDF is at New Delhi. The aim of establishment of NHRDF was to guide the farmers, exporters and others concerned for improving the productivity and quality of horticultural crops in order to make available sufficient quantity for domestic requirement and also to boost up export of onion and other such export oriented horticultural crops in the country. Onion was the first crop on which the NHRDF has started its Research and Development programmes to meet the above mentioned aim and subsequently garlic, okra, chilli, French bean crops etc. have been added. The NHRDF initially started as a small centre at New Delhi in 1978 and now it has 5 Regional Research Stations, Laboratories on different aspects and 18 Extension Centres spread all over the major onion and garlic growing pockets of the country. It has also established one Krishi Vigyan Kendra at Ujwa in New Delhi to cater the needs of farmers of Delhi State.

The NHRDF has standardized production, protection and post-harvest technologies for growing onion and garlic in different regions. Popularization of improved varieties of onion and garlic, quality seed production and distribution of their varieties all over the country through well spread extension network has been well recognized by the Govt. of India. The NHRDF is also conducting Research and Development activities on all aspects of crop production, protection, seed technology, post-harvest technology and also transfer of technology of onion and garlic crops. The NHRDF since its inception is also engaged in quality seed production and distribution of

important vegetable crops particularly onion, garlic, okra, potato, French bean, chili etc. as a service to the farmers.

The NHRDF carries out its Research and Development programmes with the guidance of its Scientific Advisory Committee under the chairmanship of Dy. Director General (Horticulture), Indian Council of Agricultural Research (ICAR) consisting of eminent scientists from different disciplines as members.

2 Value chain study of Moringa

The value chain is a concept which can be simply described as the entire range of activities required to bring a product from the initial input-supply stage, through various phases of production, to its final market destination. The production stages entail a combination of physical transformation and the participation of various producers and services, and the chain includes the product's disposal after use. As opposed to the traditional exclusive focus on production, the concept stresses the importance of value addition at each stage, thereby treating production as just one of several value-adding components of the chain.

2.1 Introduction to the Moringa crop

Moringa oleifera Lam. belonging to the family Moringaceae is a handsome softwood tree, native of India, occurring wild in the sub-Himalayan regions of Northern India and now grown worldwide in the tropics and sub-tropics for its tender pods and also for its leaves and flowers. The pod of moringa is a very popular vegetable in South Indian cuisine and valued for its unique flavour and aroma. For South Indian any meal without moringa and pulses is considered incomplete. In Tamil Nadu, moringa was cultivated as sole trees in homesteads, round cattle sheds, on farm boundaries, and as isolated plants

in fences and as groups of trees on village waste lands. In the early 1990s in southern Tamil Nadu people started growing perennial moringa types - Moolanoor as an intercrop on field scale and their allies were cropped with vegetables and Sorghum. This system evolved as moringa offered some protection to alley crops from drying winds during summer and moringa provided some additional income. With the migration of people from South to North India, and the elsewhere in the world the demand for moringa has picked up. Farmers found that growing moringa crops during summer season was remunerative. Thus, moringa gained a foothold as a summer vegetable. The demand for the moringa pod also increased due to increased urban settlements and migration of people to urban colonies. Tamil Nadu is one of the largest producers of moringa with an annual production of 3.6 lakh tonnes of tender fruits from an area of 7343 ha. Among the districts in the state, Tuticorin leads in both area and production [1646 ha] followed by Dindigul [1440 ha], Theni [1397 ha], Karur [810 ha] and Erode [633 ha]. Madurai, Perambalur, Tirunelveli and Cuddalore also have considerable area under moringa. The remaining districts have a total area of 333 ha only.

In Tamil Nadu, Theni district is well known for moringa cultivation. Though there are many eco-types that thrive well in this region alone. Among different ecotypes Madurai Vilaiyapatti moringa is one variety. Nearly a decade back not much information was available on it, which is now widely grown in Theni district. Moringa is one crop which is still not commercially exploited fully. Commercially there are no machines available for oil extraction. A tree which practically requires no expense for its care, and gives back multifold returns in terms of leaves, pods, stem, bark etc. needs to be popularized among farmers to make them take up its cultivation on a large scale based on its significance. It is an imperative to trace the value chain of moringa which portends the future of business logistics and supply management, it needs to have improved methods of cultivation, harvesting and post-harvest management, value addition, marketing and export promotion.

To improve the value chain of moringa in Theni and Dindigul districts of Tamil Nadu, National Horticulture Research & Development Foundation (NHRDF) has assigned a study on “Value Chain of Moringa in Theni and Dindigul Districts of Tamil Nadu State to Amity International Centre for Post-Harvest Technology and Cold Chain Management, Amity University Uttar Pradesh.

2.2 Scope of Value Chain study of Moringa crop

- Value chain study is a useful analytical tool will help to understand the overall trends of industrial reorganization and identify change agents and leverage points for policy and technical interventions.
- Value chain analysis also reveals the dynamic flow of economic, organizational and coercive activities involving actors within moringa farming sector. It shows the power relations to understand how entry barriers are created, and how gain and risks are distributed throughout supply chain.
- Value chain study can be used by donors and development assistance agencies, to better target their support and investments in various areas such as trade capacity, enterprise competitiveness, income distribution and equity among value chain participants by revealing strengths and weaknesses of value chain study by participating actors to develop a shared vision of how the chain should perform and to identify collaborative relationships which will allow them to keep improving chain performance.
- Value chain study has a great scope to identify chain actors at each stage and discerning their functions and relationships; determining the chain governance, or leadership, to facilitate chain formation and strengthening; and identifying value adding activities in the chain and assigning costs and added value to each of those activities.

- Value chain has scope to know the flows of goods, information and finance through the various stages of the chain and evaluated in order to detect problems or identify opportunities to improve the contribution of specific actors and the overall performance of the chain.
- By going beyond the traditional narrow focus on production, value chain analysis scrutinizes interactions and synergies among actors and between them and the business and policy environment.
- It overcomes several important limitations of traditional sector assessments which tend to ignore the dynamic linkages with and among productive activities that occur outside the particular sector under assessment or involve informal operations.

2.3 Objective of the Study

The main objective of the assignment is to understand the gaps in value chain of Moringa and measures required to improve the value chain to sustain the livelihood of farmers and other stakeholders of the area: The broad objectives of the study are:

- Identification of on farm constraints, non-farm constraints and logistic constraints
- Current status of Moringa value chain in the Theni district
- Cost of productions and margin distribution among stakeholders
- Price fluctuations and existing trader involvement
- Losses/wastage from harvest to consumption
- Important areas of intervention and policy recommendation
- Constraints in market linkage throughout supply chain

3 Approach and Methodology

3.1 Approach

The approach adopted for this study was to analyze both the secondary data as well as primary data collected through interviewing 200 farmers from Theni and 100 farmers from Dindigul districts including stockists, mandi traders, exporters, input suppliers, wholesalers and retailers to arrive at conclusions which were, particularly usefulness for the farmers. For this study the following steps were primarily adopted:

1. Collection and review of Secondary data like Country/state/district level database, reports, documents, Government policies, plans and programs.
2. Development of questionnaires and checklists for primary data collection.
3. Mobilization of the study team.
4. Expert interaction and interview with traders and mandi agents.
5. Field survey in the selected farmers list in Andipatti Taluk and Dindigul areas to analyze the emerging scenario.
6. Analysis of secondary and primary data using appropriate tools.

3.2 Methodology

To fulfil the objectives of the study, both quantitative and qualitative analysis methods have been employed to provide strong evidence of achievements against the key review questions. In the last stage, report is structured in line with client requirements and gives concise summaries of findings pertaining to project indicators yielding expected outcome, clear conclusions and well thought out recommendations based on both internal factors & external factors. The value chain study was mainly carried out through primary data collection by:

- Qualitative Interviews of value chain participants
- Quantitative data through structured questionnaire

Questionnaire was designed on the basis of following scope of work

- On-farm moringa production constraints

- Availability Infrastructure facility
- Non-farm constraints
- Logistics constraints
- Current state of Moringa supply chain in the Theni and Dindigul districts
- Cost of productions and margins distribution among stakeholders
- Different market linkages and constraints
- Losses/wastage from harvest to consumption
- Post-harvest operations and constraints
- Value addition
- Processor/commercial manufacturing unit
- Key areas of intervention and policy recommendation

Losses/wastage from harvest to consumption

- Key areas of intervention and policy recommendation
- Constraints in market linkages

3.2.1 Sample Design and Sample Selection

For collection of primary data, field survey has been undertaken with the following stakeholders:

- Farmers
- Stockists
- Mandi Traders
- APMC officials
- Exporters
- Seed/Input Suppliers
- Wholesalers
- Retailers

For value chain study of Moringa, Theni and Dindigul districts of Tamil Nadu were selected. Total sample sizes targeted were 200 and 100 respectively. The sample size was selected from 6 blocks of each Theni and Dindigul districts. With 5 villages from each block and 33 farmer's samples from each block distributed in five villages. Thus, farmer samples will be approximately 198 and 2 large farmers cum trader and exporters in Theni and in Dindigul 5 blocks were selected for baseline line survey. Further 5 villages from each block and 20 farmer's samples from each block distributed in 5 villages thus farmer sample size will be 100.

Purposive Random Sampling Method was adopted to conduct field survey. The samples have been collected from all the identified blocks and villages. The sample is representative and covers all categories of farmers. The sampling has been done with the existing moringa growers and taking into account the condition of the farming community in the selected areas of the respective targeted crop.

4 Moringa Overview

Moringa is packed with vitamins A, C, E, and is high in calcium, which supports bone health and prevents heart disease. Moringa is also a great source of potassium, which reduces anxiety and stress. Moringa the second fastest growing plant in the world, moringa is able to grow up to two inches a day. A single moringa tree can mature quickly enough to feed an entire family within a year. Unlike other superfood greens, the moringa tree continues to produce long after the first harvest, making it a long-lasting source of nutrition. Moringa considered as good quality meal. India is the prevalent prime producer of moringa (drumstick) with an annual production of 2.2 million tons of tender fruits from an area of 38, 000 ha. Among the states, Andhra Pradesh leads in both area and production (15,665 ha) followed by Karnataka (10,280 ha) and Tamil Nadu (7,408 ha). In other states, it occupies an area of 4,613 ha. Tamil Nadu is the pioneering state in so much as it has varied genotypes from diversified

geographical areas, as well as introductions from Sri Lanka. Among the districts in the state, Dindigul (1963.025 ha), Theni (3921.01 ha) districts are playing prominent role in area expansion under moringa cultivation. Interestingly, 80 per cent of the production of moringa leaves happens in India, fetching crores of foreign exchange for the country. In India, moringa trees are grown in about one lakh acre. It is grown in about 9689 acres in Theni district in Tamil Nadu alone. The block wise distribution of area devoted to cultivation of Moringa has been summarized in Fig. 1 for Theni and Fig. 2 for Dindigul. Comparative area coverage for cultivation of moringa in the district of Theni and Dindigul has been depicted in Fig. 3.

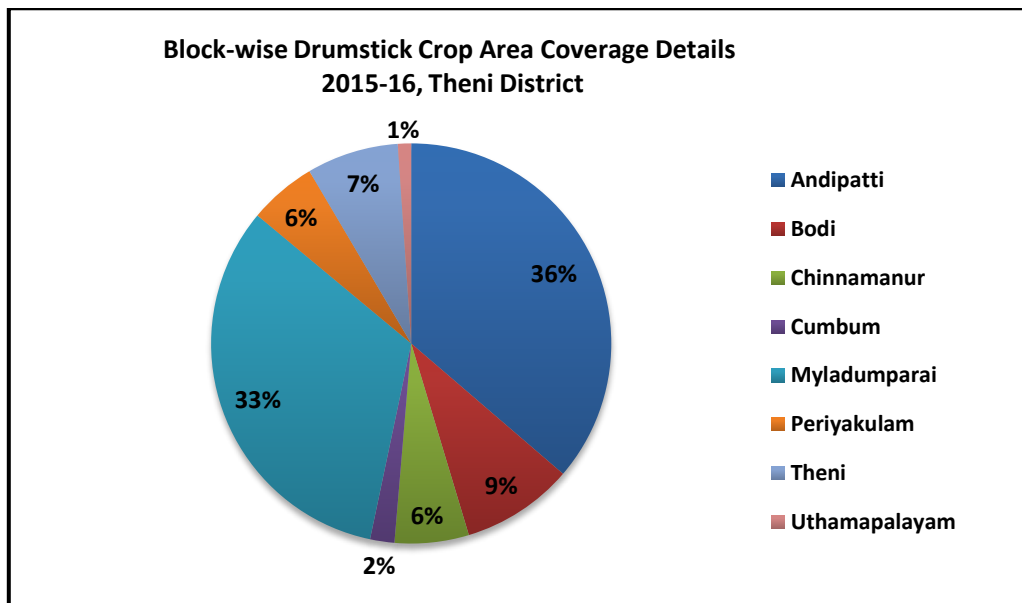


Figure 1: Block-wise Drumstick Crop Area Coverage Details 2015-16, Theni District

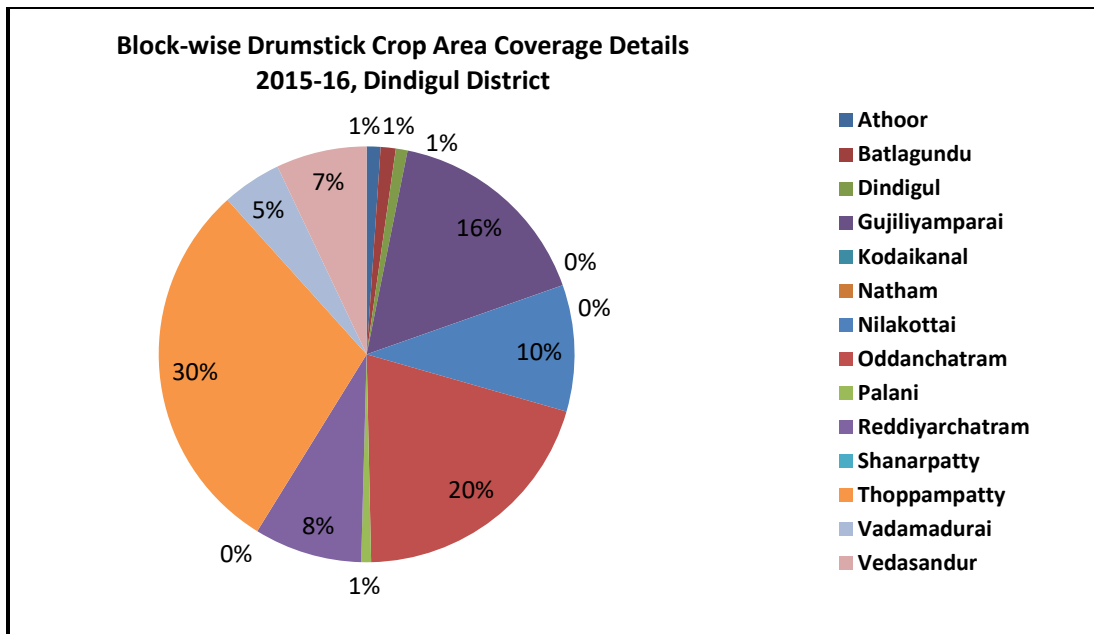


Figure 2: Block-wise Drumstick Crop Area Coverage Details 2015-16, Dindigul District

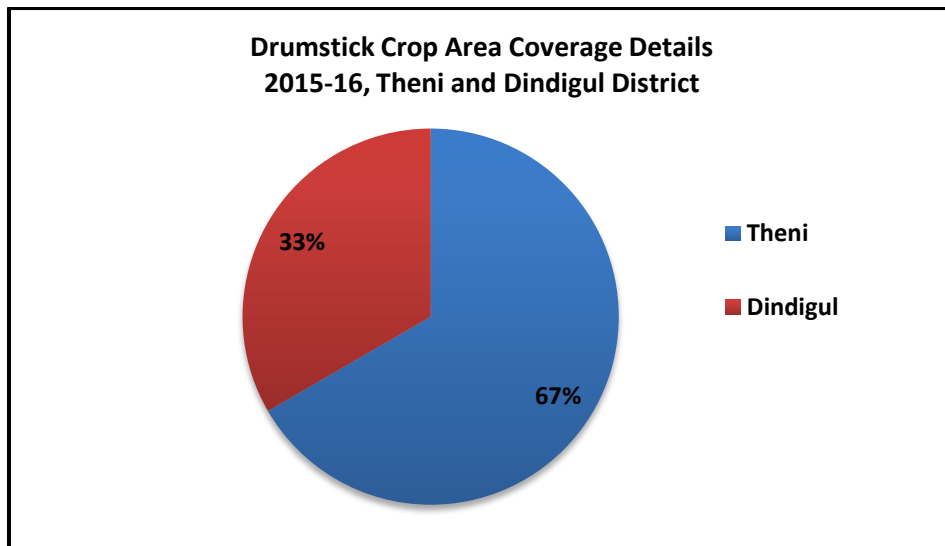


Figure 3: Comparative Area Coverage Details 2015-16, Theni and Dindigul District

In India farmers found that growing moringa crops during summer season was more remunerative. Thus, moringa gained a foothold as summer vegetable. Moringa

crop is suitable for more intensive production because of the multiple uses of moringa which include wide and dark green leaves, long and tender pod, and seeds for oil (Ben oil) production for both domestic and industrial purposes. Variety PKM is growing in significance for its heavy biomass and tender leaves, PKM2, CO2 and Rohit1 are for tender pod production. At the present time, annual moringa occupies about 70 per cent of the total area under moringa cultivation in Tamil Nadu, propagated solely by seed. In Andhra Pradesh State (India) alone, over 90% of the total area under moringa cultivation involves seed-propagated annual types.

4.1 Study Region

Tamil Nadu is pioneering state in moringa crop as it has varied genotypes from diversified geographical areas. The selection of Tamil Nadu state and prioritization of value chain study in Theni and Dindigul districts were analyzed.

4.1.1 Basic features of Tamil Nadu State

4.1.1.1 Geographical Features

Tamil Nadu, with a land area of 1,30,058 sq km and a long coastline along the Bay of Bengal in the east, the towering Western Ghats forming a natural border to the west separating the state from Kerala, the states of Karnataka and Andhra Pradesh sitting on its top in the northwest and north respectively and the state of Tamil Nadu has two main geographical types - lush, green and fertile plains in the east and Western and Eastern Ghats to the west-northwest consisting of lofty mountains. The Cauvery river irrigates most of the plains where agriculture and related activities still offer livelihood to thousands of people. Farther down south, the flatlands of Madurai and Ramanathapuram districts suffer from water scarcity and depend on monsoon for relief. Apart from Cauvery, other rivers like Ponnaiyar, Tamarabarani, Palar and Vaigai flow eastward from the hill ranges.

Hill districts Nilgiris and Kodaikanal originate mostly from the Western Ghats, while lower peaks (Javadi, Kalrayan and Shevaroy) that are offshoots of the Eastern Ghats are at the central zone of the state. Some of the peaks at Nilgiris, Anaimalai and Palani hills exceed 8,000 feet in height. More specifically, the Anai Peak (8,842 feet) in the Anaimalai hills is the highest mountain in the peninsular India.

4.1.1.2 General Climatic Features

Tamil Nadu state heavily dependent on monsoon rains, the agriculture is worst hit whenever there is shortage of precipitation. Moreover, the state used to suffer from periodical bouts of drought and the government used to take emergency measures to tide over the exigencies. Tamil Nadu state is mainly tropical in nature; the climate varies from dry sub-humid to semi-arid.

Monsoon Season Tamil Nadu both southwest monsoon (June to September) and northeast monsoon (October- December) with dominant wind pattern bring in copious rain to the state, while the period from January to May is dry and humid. The average rainfall for Tamil Nadu is 945 mm, of which 48% comes from NE monsoon and 32% is through SW monsoon. If the rains fail to recharge the groundwater, reservoirs and lakes, then the state has no alternative but to rely on water supply (or river flow) from neighboring Kerala, Andhra Pradesh and Karnataka.

4.1.1.3 Agro-Climatic Zones

Tamil Nadu, nestled in the South-East part of peninsular India is blessed with varying Agro-climatic zones from dry sub-humid to semi-arid because of the presence of 1000 K.M. long Coastal Line and ghat areas to its West and hilly areas along the North.

Agro-climatic Zones: There are seven Agro-climatic zones in Tamil Nadu based on the climatic conditions and monsoon patterns prevailing in those areas. The zones are

tabulated in table 1. The four seasons in Tamil Nadu are not distinct and over-lap with the following season: There are two monsoon seasons viz., South-West Monsoon and North-East Monsoon. We also get some summer showers during the month of April-May. Hence, the average annual Rainfall of Tamil Nadu is 968 mm.

Table 1: Agro-climatic zones of Tamil Nadu

Sl.No.	Agro-climatic zone	Districts
1	Western Zone	Coimbatore, Erode, Thiruppur, Dindigul and Theni
2	Southern Zone	Madurai, Ramanathapuram, Thirunelveli, Sivagangai, Virudhunagar, Thuthukudi, Pudukottai and Karur
3	North Eastern Zone	Kancheepuram, Thiruvallur, Vellore, Thiruvannamalai , Cuddalore, and Villupuram.
4	North Western Zone	Dharmapuri, Krishnagiri, Salem, Namakkal, Perambalur, and Ariyalur
5	Delta Zone	Thanjavur, Thiruvarur, Nagapattinam and Trichirapalli
6	High Rainfall Zone	Kanyakumari
7	Hilly and Tribal Zone	The Nilgiris

4.1.1.4 Demographic Characteristics

As per details from Census 2011, Tamil Nadu has population of 7.21 Crores. Total population of Tamil Nadu as per 2011 census is 72,147,030 of which male and female are 36,137,975 and 36,009,055 respectively.

Growth Rate: The total population growth in this decade was 15.61 percent while in previous decade it was 11.19 percent. The population of Tamil Nadu forms 5.96 percent of India in 2011.

Literacy: Literacy rate in Tamil Nadu has seen upward trend and is 80.09 percent as per 2011 population census. Of that, male literacy stands at 86.77 percent while female literacy is at 73.14 percent. In actual numbers, total literates in Tamil Nadu stands at 51,837,507 of which males were 28,040,491 and females were 23,797,016.

Population Density: Total area of Tamil Nadu is 130,060 sq. km. Density of Tamil Nadu is 555 per sq km which is higher than national average 382 per sq km.

Sex Ratio: Sex Ratio in Tamil Nadu is 996 i.e. for each 1000 male, which is below national average of 940 as per census 2011.

Table 2: Demography of Tamil Nadu

Description	Census 2011
Population	72,147,030
Male	36,137,975
Female	36,009,055

Sex Ratio	996
Literacy level	80.09 %
Urban population	34,917,440 (48.40%)
Rural population	37,229,590 (51.60%)

4.1.1.5 Status of Horticulture in Tamil Nadu State

Tamil Nadu is the largest contributor to India's GDP, 70% of the people are Agrarian and Agriculture and allied activities contribute significantly to the State's economy. Due to the determined and persistent efforts of the State Government and continued support from the Central Government, the State has made head-way progress in Horticulture in the last five years.

Traditional Horticulture Crops have been introduced in non-traditional areas and non-traditional horticultural crops have been introduced in suitable areas. The Horticulture crops grown in Tamil Nadu have been classified into six categories viz., fruits, vegetables, spices and condiments, plantation crops, flowers and medicinal and aromatic plants.

Major fruit crops are Banana, Mango, Citrus, Grapes, Guava, Sapota, Papaya, and Pineapple. These are grown in 2,93,146 ha mainly in districts like Krishnagiri, Dindigul, Thirunelveli, Vellore, Theni, Erode, Trichy, Thiruvallur, Dharmapuri and Madurai.

Major Vegetable crops grown are Tapioca, Onion, Tomato, Potato, Brinjal, Bhendi, Drumstick, beans and Carrot in an area of 2,26,502 ha mainly in districts like Namakkal, Salem, Dharmapuri, Trichy, Thiruppur, Dindigul, Erode, Villupuram, Krishnagiri, Perambalur, Nilgiris and Theni Districts.

Important Spices and Condiments grown are Chillies, Turmeric, Tamarind, Coriander, Pepper, Cardamom and Cloves in an area of 1,45,559 ha. In districts like Ramnad, Thoothukudi, Erode, Salem, Virudhunagar, Dindigul, Dharmapuri and Sivagangai Districts. Tea, Coffee, Rubber and Cashew are the important Plantation Crops grown in an area of 2,32,988 ha in Districts like Nilgiris, Ariyalur, Cuddalore, Kanyakumari, Dindigul, Coimbatore, Pudukottai and Salem.

In addition to the traditional flowers like Jasmine, Crossandra, Tuberose, and Chrysanthemum, cut flowers like Rose, Carnations, and Gerbera are also being produced in the State. The cut-flower industry is growing day by day due to high export prospects. Flowers are grown in an area of 25309 ha in districts like Dindigul, Dharmapuri, Krishnagiri, Salem, Madurai, Tirunelveli, Thiruvallur, Vellore and Thiruvannamalai.

Medicinal and Aromatic crops like Gloriosa, Senna, Coleus, Lemon-grass and Periwinkle are grown in an area of 11,230 ha. In districts like Virudhunagar, Dindigul, Thiruvallur, Ariyalur, Madurai, Thiruvarur, Dharmapuri, Salem, Nagapattinam, Trichy.

4.1.2 Overview of Theni District

Theni is a district of [Tamil Nadu](#) state in [South India](#). The city of [Theni](#) is the district headquarters. Theni district is situated in the Western Agro climatic zone. The district is divided into two natural divisions: The hilly areas are constituted by parts of the three taluks Periyakulam, Uthamapalayam and Andipatti with thick vegetation and perennial streams from the hills on the western side and Cumbum valley which lies in Uthamapalayam taluk District. Theni is one among the horticulture Potential districts of Tamil Nadu the entire district area is situated in foot hills of Western Ghats; Theni District is gifted moderate climate suitable for cultivation of all Tropical, Sub Tropical and Temperate horticulture crops. Minimum temperature prevailing is 24°C and

maximum temperature is 38°C. Soil types: sandy loam, clayey and alluvial soil is the soil types found in the district.

In India, moringa trees are grown in about one lakh acre. It is grown in about 5000 hectares in Theni district in Tamil Nadu alone. Majority of the Moringa growers, however, market their produce at distant markets, mainly at the Theni wholesale market and to some extent centers outside the district. The growers who sell at the field or primary markets do so only if the price at these markets is favorable or when the quality of the produces low. Even if the quantity produced is very small in order to hire a truck, which is the main mode of transport, the usual practice is that, the required number of growers transport their produce jointly and share the transport cost accordingly. Hence, for the majority of the growers, the long distance between the producing Centre and the marketing Centre and the high transportation cost in view of the small marketed surplus does not seem to come in the way of marketing the produce at the desired place.

Table 3: Horticulture statistics of the Theni District

S.No.	Name of the Crop	Area	Production	Productivity
1	FRUITS	18729	553593	29.56
2	VEGETABLES	7099	158440	22.32
3	PLANTATION CROPS	5564	23027	4.14
4	SPICES & CONDIMENTS	4476	11083	2.48
5	FLOWERS	401	3423	8.54
6	MEDICINAL & AROMATIC CROPS	63	954	15.14
	TOTAL	36332	750520	20.66

Source: DHPC, Agriculture Department, Government of Tamil Nadu

4.1.3 Overview of Dindigul District

Dindigul district is an administrative region in the south of Tamil Nadu, India. The district was carved out of Madurai District in 1985. It has an area of 6266.64 km² and comprises three Revenue Divisions, nine Taluks, and 14 Panchayat Unions. The district is bound by Tirupur, Karur, and Trichy districts in the north, the Sivaganga and Trichy districts in the east, the Madurai district in the south, and the Theni and Coimbatore districts and the state of Kerala in the west.

In Dindigul district, three different climatic conditions prevail. Tropical climate prevails in plains, sub tropical in lower Palani Hills and Sirumali and temperate climate prevails in Palani Hills. Due to these favourable climates, all kinds of horticultural crops are cultivated in this district. In both plains and hill the minimum temperature prevailing is 9°C and maximum temperature is 36°C. Soil types: loamy soil, clayey soil and alluvial soil, sandy loam and sandy clay soil are the soil types found in the district. Dindigul district has high potential and expanded area for moringa cultivation.

Table 4: Horticulture statistics of the Dindigul District

S.No.	Name of the Crop	Area	Production	Productivity
1	FRUITS	29494	409852	13.90
2	VEGETABLES	15563	293585	18.86
3	PLANTATION CROPS	11000	11181	1.02
4	SPICES & CONDIMENTS	7296	22849	3.13
5	FLOWERS	3499	31822	9.09
6	MEDICINAL & AROMATIC CROPS	1340	2858	2.13
	TOTAL	68192	772147	11.32

Source: DHPC, Agriculture Department, Government of Tamil Nadu

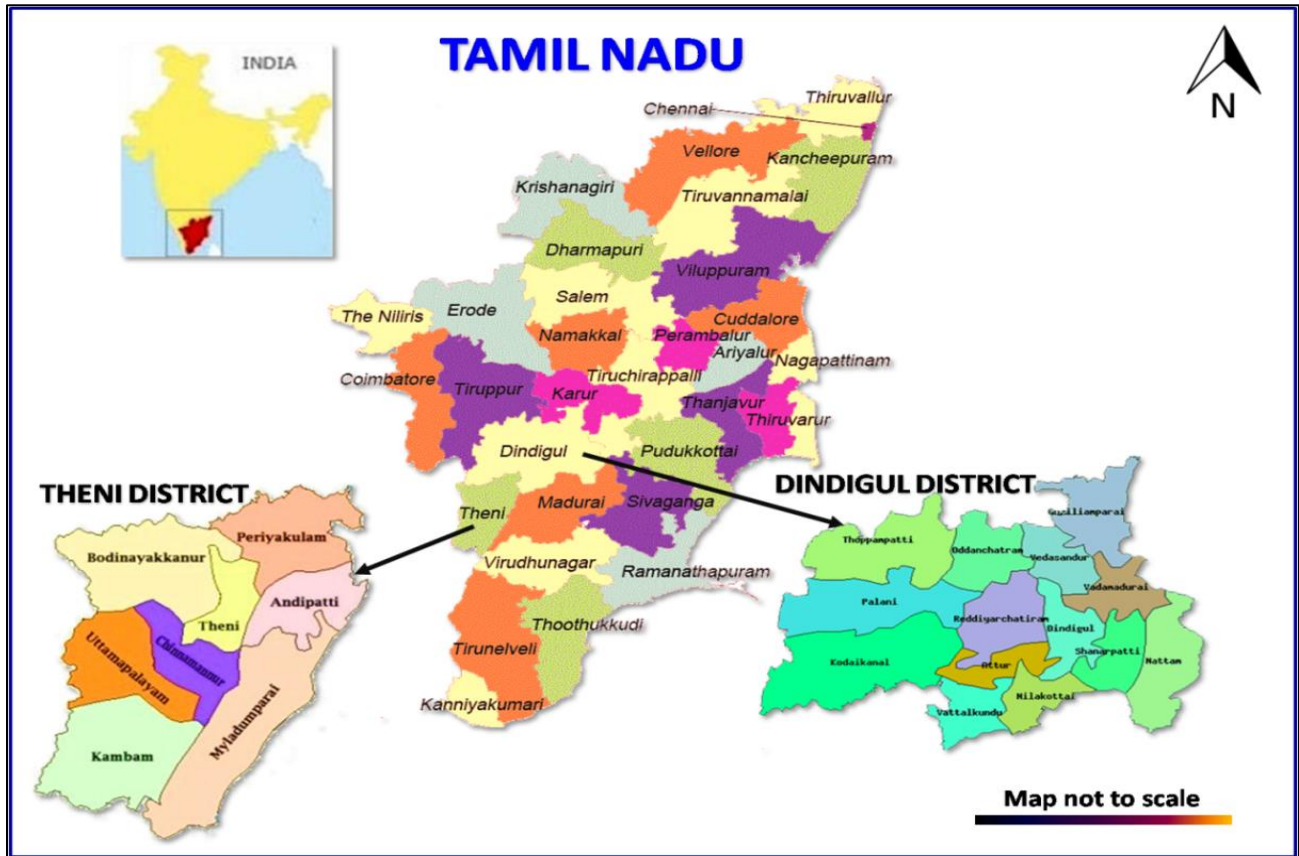


Figure 4: Tamil Nadu District Map

5 Status of Moringa Farmers and Economics of Moringa Production in Theni and Dindigul districts

The information on costs and returns of crops can be useful to assess the economic condition of farming community in terms of employment and wage structure to assess the quality of life of agricultural laborers. Hence, cost of cultivation survey is an important mechanism for data generation on cost and return structure of crops. Accordingly, survey was conducted in this study to collect the relevant information related to socio-economic characteristics, their classification, income pattern, and cost per unit area for the sample moringa growers in the State.

5.1 Socio-economic Characteristics of Moringa Farmers

The important socio economic characteristics of moringa sample farmers are presented in table 5. It is observed from the table that more than 65% of the sample population is educated till primary and high school, 14% of the population are educated till Sr. secondary. Only 5% of the sample population are graduate and above and 33% of the sample population are illiterate. So broadly it could be inferred that more than 65% of the sample population are educated to a level.

The family size is also an indicator of the socio-economic status in addition to land holdings. The average family size of the sample farmers was five to six members per household. Nearly 64% of the family of sample population is nuclear where only two generations of the family and the rest (36%) joint families are where more than two generations of the family are residing in the same household. Years of moringa farming experience is 10 years. As categorical classification is concerned 49% of the sample population is under “Backward Caste” category, 44% of the sample population is under “Most Backward Caste” category and only 7% of the sample population is under “Scheduled Caste” category.

Table 5: Socio Economic Characteristics of Sample Farmers

Particulars	Respondents (n=300)	Percentage to total
1. Educational status		

Illiterate	98	33 %
Literate/primary	96	32%
High school	48	16%
Sr. Secondary	42	14%
Graduate and above	16	5%
2. Average family size	5 to 6	
3. Family Type		
Joint	108	36%
Nuclear	192	64%
4. Years of experience in Moringa farming	10 Years	
5. Categorical classification		
Backward Caste (BC)	147	49%
Most Backward Caste (MBC)	132	44%
Scheduled Caste (SC)	21	7%

5.2 Land Holding and Income of Moringa Farmers

In the present study, 30% of the sample population was constituted by small farmers with average landholding of 1-2 ha, 27% of the sample population are medium farmers with average land holding of 4-10 ha and 24% of the population are semi-medium with average land holding of 2-4 ha. Large farmers are very less in our sample respondent's i.e. only 3% and marginal farmers in the sample population were found 16%.

As for the as the income level is concerned, it was found that marginal farmers are the least earning group among other farmer groups. Average income of the sample farmers calculated is 2.63 Lakhs per annum.

Table 6: Average Annual Income of Sample Farmers

Farmer Category as per landholding	Respondents (n=300)	Percentage to total	Average Income (in INR)
Marginal (below 1 ha)	48	16%	128281
Small (1-2 Ha)	90	30%	213033
Semi medium (2-4 Ha)	72	24%	258085
Medium (4-10 Ha)	81	27%	383889
Large (> 10 Ha)	9	3%	431667

Average Income (INR Lakh)	2.63
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6 Value Chain Analysis-Moringa in Theni and Dindigul

The value chain analysis was conducted by adopting a comprehensive approach in which apart from using secondary information from various sources, primary information was collected through face to face interviews from farmers and various stakeholders in the Value chain. Such data was used for gap analysis, identification of interventions and opportunities for strengthening value chain studies.

Field Survey was conducted for analyzing the moringa value chain to assess its competitiveness and potential across different parts of the country. Theni and Dindigul districts are identified as an important competing district based on the area and the same has been used to benchmark practices.

6.1 Cost of Moringa crop production

In below table per acre costs and returns of moringa cultivation for pod and leaves are presented which is pertaining to the reference year 2016-2017 for the studied in Theni and Dindigul. Out of the total cost major cost items are Cost of weedicides and pesticides which accounts for 17.15%, 13% respectively than leaf production (1.15%) but cost of manures and fertilizers for leaf production is more than the moringa tender pod production. Moringa farmers in the study area got an average of 10t/Acre yield of tender pod.

From the table5 the moringa farms for pod production incurred the expenditure of one rupee could get the profit of about rupees 1.3 being a not economical viable one but pod production ensure the lively hood of farmers by selling pods @10 Rs/Kg in open market or to the traders. But the survey revealed that moringa farms for leaf production is more profitable than the tender pod production because moringa farms for leaf production got an average yield of 30t fresh leaves/acre/year because farmers are taking 7 harvests per year from the table moringa farms for leaves production incurred the expenditure of one rupee could get the profit of about rupees 3.45 being more profitable and economical viable one even when market price of Rs 10 Rs/Kg and in case of dry leaves approximately 3 t dry leaf yield/acre fetching Rs 75-100 in the market giving benefit from rupees 2.59 to 3.45 (price of Rs 225000-300000 total gross income) profit which is more advisable to the farmers to uplift socio-economic status of farmers by promoting and creating the markets for moringa leaf production.

The Average yield calculated from the survey for the year 2016-17 for the district Theni and Dindigul came to 10t/acre in tender pods and 30 t/acre /annum in fresh leaf production.

Table 7: Cost of Cultivation and Return Structure of Moringa production

S.No.	Particulars	Input Cost (INR/Acres) for pod production	Percentage Contribution in pod production	Input Cost (INR/Acres) for leaves production	Percentage Contribution in leaves production
1	Cost of Seed/ Planting material/pitting	750.00	0.97%	7,500.00	8.63%
2	Field preparation	7,000.00	9.10%	7,000.00	8.06%
3	Cost of human labor (sowing to harvesting)	15,000.00	19.49%	1,000.00	1.15%
4	Cost of Manure & Fertilizer	5,000.00	6.50%	20,000.00	23.01%
5	Cost of pesticides	10,000.00	13.00%	1,000.00	1.15%
6	Weedicides (weeding)	13,200.00	17.15%	4,400.00	5.06%
7	Cost of Irrigation, Harvesting	26,000.00	33.79%	46,000.00	52.93%

	& Marketing	0			
8	Cost of Production	76,950.0 0		86,900.00	
9	Yield: a) POD : 10 tonnes / acre/year x Rs. 10/- kg of price b) LEAVES : i) Fresh leaves : 30 tonnes / acre/year x Rs. 10/- kg of price ii) Dry leaves: 3 tonnes / acre/year x Rs.75 to 100/- kg of price	1,00,000. 00		i) Fresh leaves: 3,00,000 ii)Dry leaves: 2,25,000.00 to 3,00,000.00	
10	Cost - Benefit ratio	1:1.3		i) Fresh leaves: 1: 3.45 ii)Dry leaves: 1: 2.59 to 1: 3.45	

Table 8: Farmer's Income from Moringa per year

Farmers Net Income from Moringa Cultivation			
Details	Pod	Leaf	Leaf

		(Fresh)	(Dry)
Average cost of cultivation (Rs/Acre)	76,950	86,900	86,900
Average yield for the year (t/Acre)	10	30	3
Total cost occurred for Moringa (Rs/t)	7695	2896	28967
Net price received by the farmer (Rs./t)	10000	10000	90000
Net profit	2305	7104	61033

6.2 Value chain mapping and actors involved in the Moringa value chain

The value chain analysis is the process of breaking a chain into various components in order to better understand its structure and functioning. This section shows the results from value chain mapping and actors involved in various marketing channels for Moringa in the study area. The value chains of Moringa and Moringa products were organized and presented in a systematic way in the value chain map. Overall, the Moringa value chain mainly comprise of input suppliers, producers (farmers),

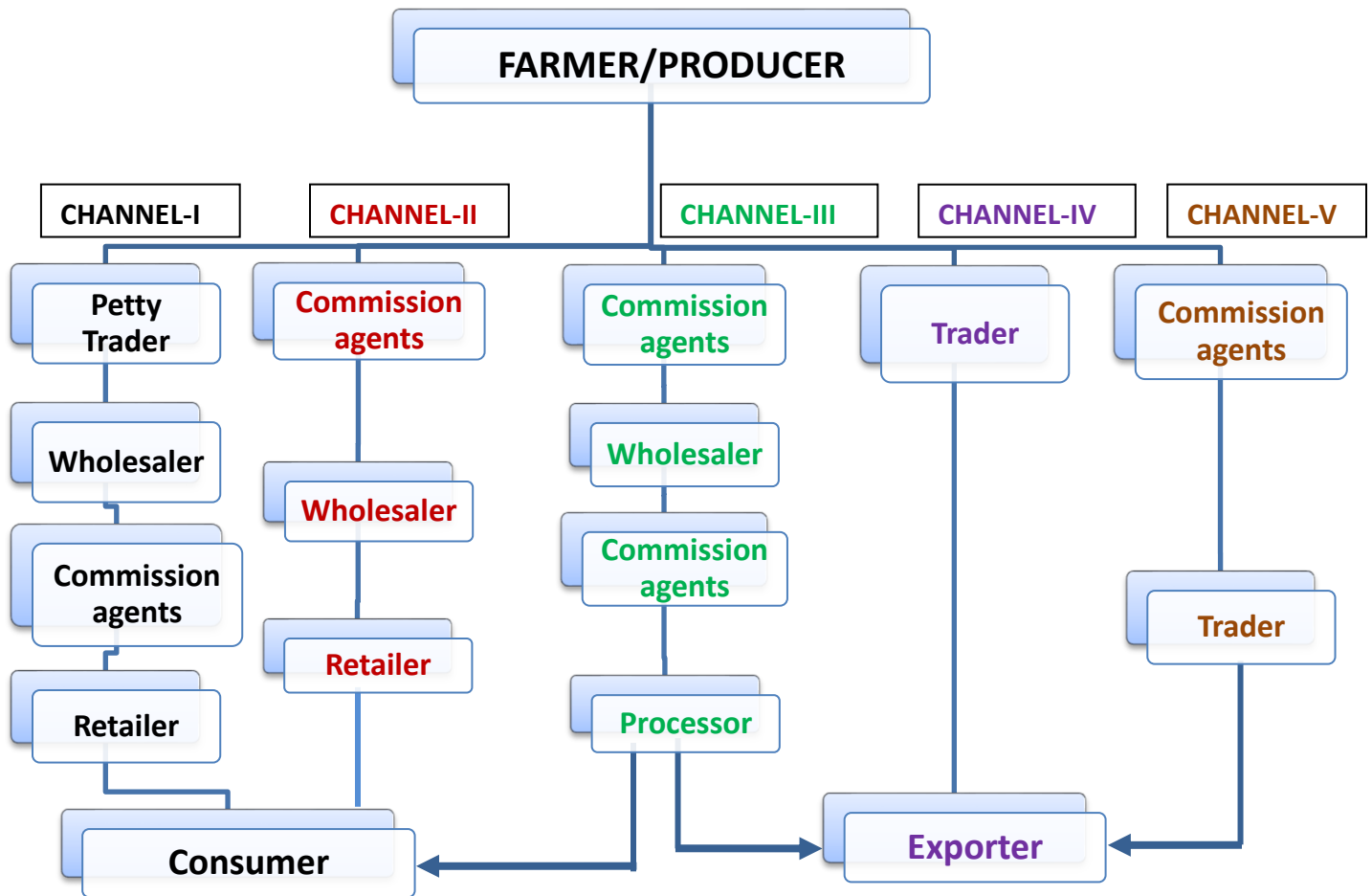


Figure 5: Value chain mapping of Moringa crop

petty trader, commission agents, wholesalers, retailer, processor, exporters and consumers as depicted in the figure. Below we can see all the possible routes through which Moringa can travel from farm to fork. There are mainly five common supply chain of Moringa out of which, channel- II is the most preferred one reported by most of the farmers except marginal group because they mostly prefer channel –I. Since marginal farmers have lower production because of small lands, they are forced to sell their 90% of the produce to traders or wholesalers through commission agents. 5-10% of the

produce is sold directly through the mandi for the immediate cash requirement by the farmers.

6.2.1 Functionaries in the supply chain

6.2.1.1 Farmers

Producers are actual growers of fresh moringa fruits and leaves from different categories of landholdings. They are the most valued actors in the moringa value chain. They generally purchase necessary inputs like seeds, fertilizers, pesticides from agro-dealers. In case of Theni and Dindigul, majority farmers buy and maintain seeds of moringa (peer farmers/Local farmers). The local type Kuchi moringa is reported good variety due good taste and higher demand for International market. According to the survey most of the farmers affected by the middle man who is playing vital role in marketing of moringa thus farmers were getting lower price of their produce. Hence the middle (Commission agent) man makes of more profits. Some farmers connected to the local trader who has processing facility developed and fabricated machines by his own for winnowing, grading, washing and sorting by his own. Farmers harvest pods for human consumption, while they are still young and immature, are less than ½ inch in diameter and easy to snap. Farmers also harvest pods for other uses. When producing seed for planting or for oil extraction, farmers harvest dried and brown pods and store them in well-ventilated sacks in dry, shady places. For either use, family members take on harvest practices themselves.

6.2.1.2 Commission Agents

Commission agents are playing major role in between producer/farmers, Commission agent deal with about 10 concerned shops by assisting the farmers by providing credit facility and make commitment to sell their produce during harvesting period. The financial support given to commission agent by unauthorized money lender and these commission purchase produce from farmer by keeping 10% profit and the produce move to an authorized money lender and he boost the market value of produce by 20% before entering any market.

6.2.1.3 Wholesalers

Wholesalers are the important buyers in the market who generally procure Moringa in larger quantities and supply to retailers (both organized and unorganized), processors and exporters. They usually store the produce for short period and disseminate. Petty traders sell their produce to middle man (wholesaler) at markets such as Andipatti, Themmarasanayakkanur and Koyempedu. Drumsticks also have a large demand in metro cities like Hyderabad, Mumbai, Pune, Nashik or Surat.

6.2.1.4 Retailers

Shop owners scattered across Theni and Dindigul districts often offer Moringa pods for consumption throughout the year, given the importance of Moringa pods in the local diet. Shop owners have different options to get their supply throughout the year; agreements with traders on a commission basis, direct agreement with farmers or

supply through wholesalers. Retailers are the sellers of moringa to the ultimate consumers through multiple channels such as small grocery stores, exclusive fruits and vegetable shops, supermarkets and exporters. They normally buy from wholesalers for 50% margin and sell both fresh moringa and other processed products in smaller quantities with a higher profit margin (80%).

6.2.1.5 Processors

Processors are the secondary processing industries. The moringa processed products manufactured by the trader cum processors include dried leaves, seed oil, press cake, dried leaf powder. Processor usually collects fresh leaves and mature pods from directly from farmers at lower price. Processors who facilitate the sale of moringa and its products from processing area of its own to buyers (wholesalers, retailer, and processor) on open bidding (auction) method to fix prices for the moringa are the secondary processing industries. They usually collect fresh pods from farmers and wholesalers during peak season and glut in market at cheaper prices.

6.2.1.6 Exporters

High quality drumsticks of export quality are available with farmers in Theni and Dindigul in large quantity. The moringa growers in theni and Dindigul are generally having smaller holdings (less than 1 ha) they require to sell their produce to meet out the other domestic commitments. Since they are selling their produce in very nearest market with middle man at lowest price.

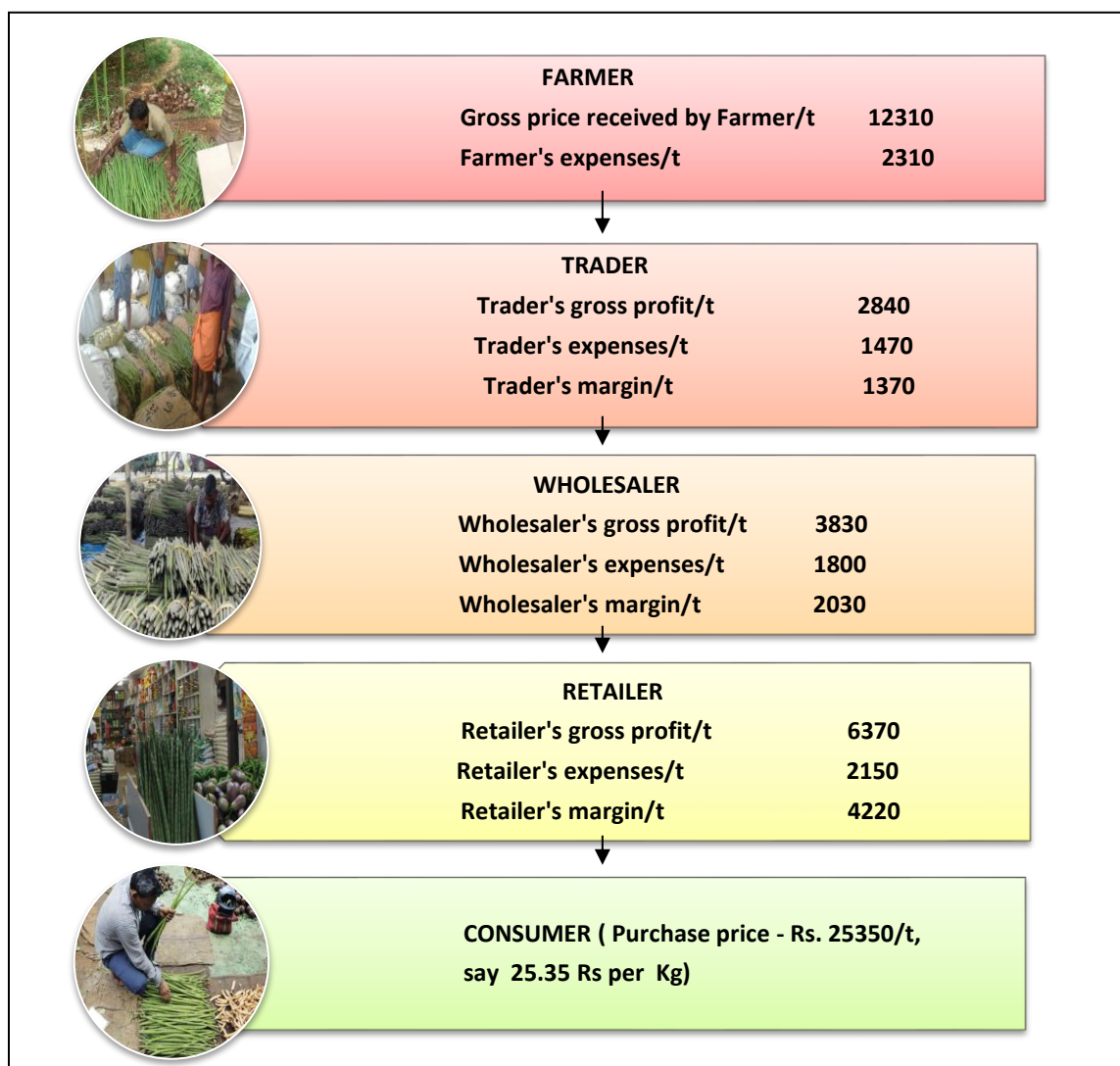
The major local markets in Theni districts are at Andipatti, Themmarasanayakkanur and Koyempedu and Oddanchatram, Vedachanthur & Bangalore are major local markets in Dindigul. The domestic sector represents the largest market for drumsticks. On the other hand, if we look at the potential for export, over the last two years Hong Kong has

imported fresh Indian drumsticks for a total value of almost 100,000 USD and remains on an upward trend. To meet the demand for the export market, processors/exporters pack 20-22 inch drumsticks on 10 kg cartoon boxes. From last three months export is diverted towards Romania from Madurai airport with capacity of 1tones of fresh moringa pods.

7 Cost and Returns of Moringa Value Chain in Theni & Dindigul Districts

The margin for an ownership level is calculated using the values of the buying cost, selling cost, cost of value addition on the date of observation and the loss at that level.

Figure 6: Cost and Returns at Each Stakeholders Level after Harvesting of Moringa (Pod)



Farmer invests in primary grading and transportation of the produce to Theni and Dindigul markets and sells their produce to traders/wholesalers through commission agents. Primary grading is done by the farmers too and then transportation charge is an extra added cost in the case of moringa.

Traders again does the grading and packing as per the demand and quality of export and for national markets. Moringa needs grading and sorting at each level of its value chain.

Wholesaler/traders usually do not store Moringa tender pods and it is the very small period of time and then it is sold to another stakeholder i.e. to retailer.

From the above table it can be noticed that expense in Moringa value chain is higher at each level of stakeholder because there is considerable amount of loss at each level but nevertheless, expenses is highest at farmers level (Rs. 2310/t) followed by retailers (Rs.2150/t), wholesalers (Rs. 1800/t) and traders (Rs. 1470/t). Retailer is seen in taking the highest amount of gross profit and margin and one of the reasons behind highest margin and gross profit at retailer’s level is the higher risk, investment in terms of time and capital is involved.

8 Margin Distribution among stakeholders in total value chain of Moringa

The table given below represents the share of various components of the chain in the total margin along the chain. The margin has been calculated considering the input cost, cost of selling and cost of value addition at that level of ownership and it does not include the various marketing expenses occurred at various levels of the supply chain. Below is the table which is providing detailed breakup of all the costs incurred at each level of the value chain with each stakeholder.

Table 9: Margin distribution of Moringa

Moringa				
Stakeholder		Price realization at different level	Wastage per Kg (in %)	Activity wise cost (Rs/kg)
	Farmer’s profit (Rs/Kg)	2.305		

Farmer	Cost of Cultivation			7.695
	Transportation, loading & unloading cost			1.20
	Cost incurred during cleaning and grading			0.20
	Total Losses (during harvesting, transportation, cleaning & sorting grading)		10.00%	0.91
	Selling Price of farmer (Rs/kg)	12.31		
Traders/Commission agents	Loading and Unloading Charges			0.38
	Packaging material cost			0.46
	Weighing Charges			0.03
	Mandi Fee (0%)	0.00%		0
	Wastage during sorting, cleaning & Transportation (Rs. 350/t)			0.35
	Commission (Rs.250/t)			0.25
	Margin (Average 10%)			1.37
	Selling Price (Rs/kg)	15.15		
Wholesalers	Labour Charges (Loading & Unloading)			0.30
	Packaging material cost			0.30
	Wastage during sorting, cleaning & Transportation		8%	1.20

	and Weight loss			
	Margin (Average margin 12%)			2.03
	Selling Price at commission agent point (Rs/kg)	18.98		
Local /Retailer	Transportation cost			0.90
	loading & unloading cost			0.30
	Loss due to transportation & sorting		5%	0.95
	Margin (20%)			4.22
	Selling Price to the consumer (Rs/kg)	25.35		

From the below table it is clear that the price gap in moringa value chain from producer to end consumer is Rs. 13040/t.

Out of the total margin, retailer's contribution is highest i.e. 55% and wholesaler's contribution is 27% of his total cost. Trader gets 18% of the total cost incurred by him. So overall it can be stated that out of the various stakeholders retailer is the person who earns maximum. There is also maximum risk involved at his level because he is the ultimate source who balances the whole supply and demand of commodity in the consumer market. The wastages and time involved is also high at retailer's level.

Table 10: Price Gap of Moringa

Price gap of Moringa INR/t between producer and end consumer	
Price payable to farmer (Rs/t)	12310

Price payable by end consumer (Rs./t)	25350
Price Gap (Rs/t)	13040

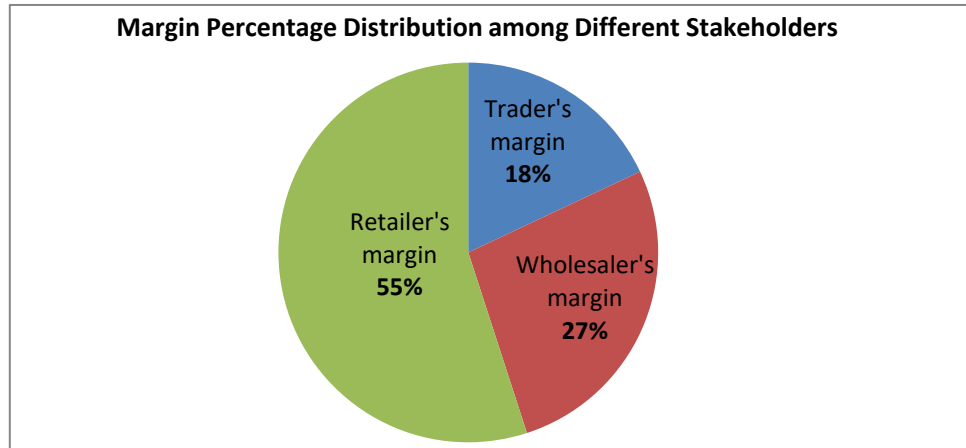


Figure 7: Margin Percentage Distribution among Different Stakeholders

9 Additional Findings from the Survey

9.1 At production level

As per the survey conducted respondent farmers from Theni and Dindigul districts are involved in moringa farming from 7 years on an average. When asked about reason for doing moringa farming 55% of the respondents replied that crop is suitable for geographical condition & available resources and they are getting more revenue than coconut plantations and farm income arises within a year. And moringa farming need the less cost of production under scarce water resources and gaining profit of 50% on production cost by engaging the family members in farming activities by using available resources to secure their livelihood during draught condition.

Moringa leaf production is more profitable and cost incur to the leaf production is less than pod production due less consumption of pesticides. 10% of the respondents told that lower cost of production is the reason behind cultivating moringa for leaf production.

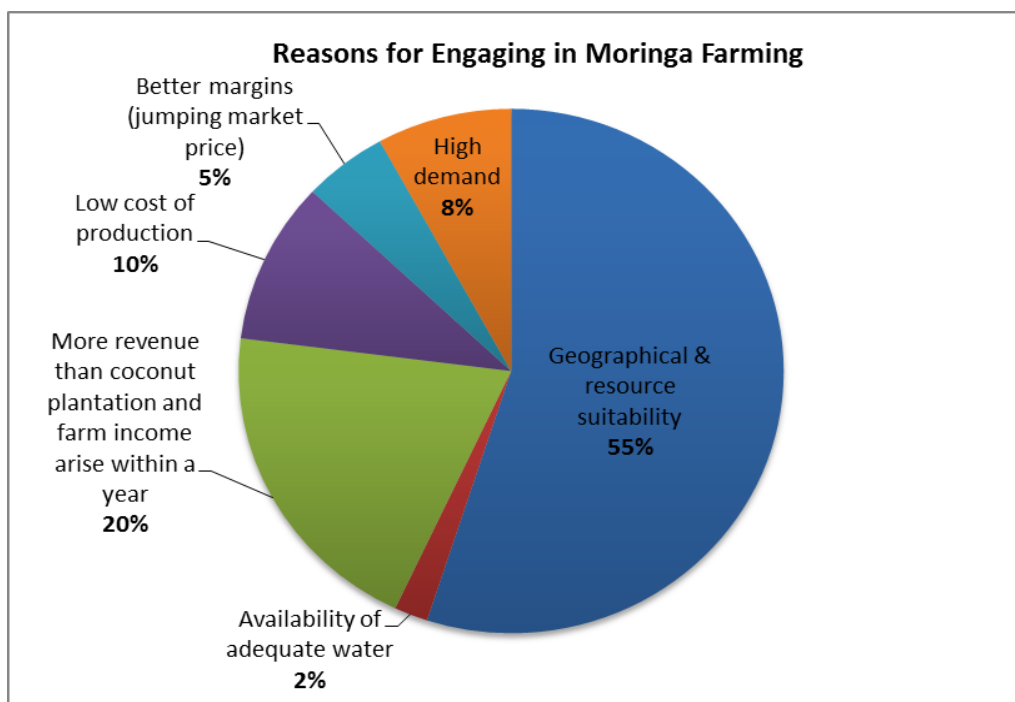


Figure 8: Reasons for Engaging in Moringa Farming

Major varieties and ecotypes grown in the area surveyed: - Major ecotypes grown in the area are tree moringa Vadipatti local (Andipatti regions, 50%), Balamedu moringa (1%) PKM 1 & PKM 2 (60% Oddanchatram Dindigul), Kuchi moringai (Andipatti v1%), karumbu moringa (40% Oddanchatram, Didigul) rest PKM 1 & PKM 2 (60), Valayapatti moringa (1%), Reasons behind choosing these varieties are mentioned are higher yield and easy availability to local and high consumer preference.

9.2 Awareness Level among the Farmers

Out of the total respondents 95% of them replied that they do not use any kind of bio fertilizers and pesticides and they are not aware in moringa cultivation.

And 77% respondents do not have awareness about ratooning in moringa and 98% farmers don't know about central and state Government schemes and 90% farmers do not go for soil testing.

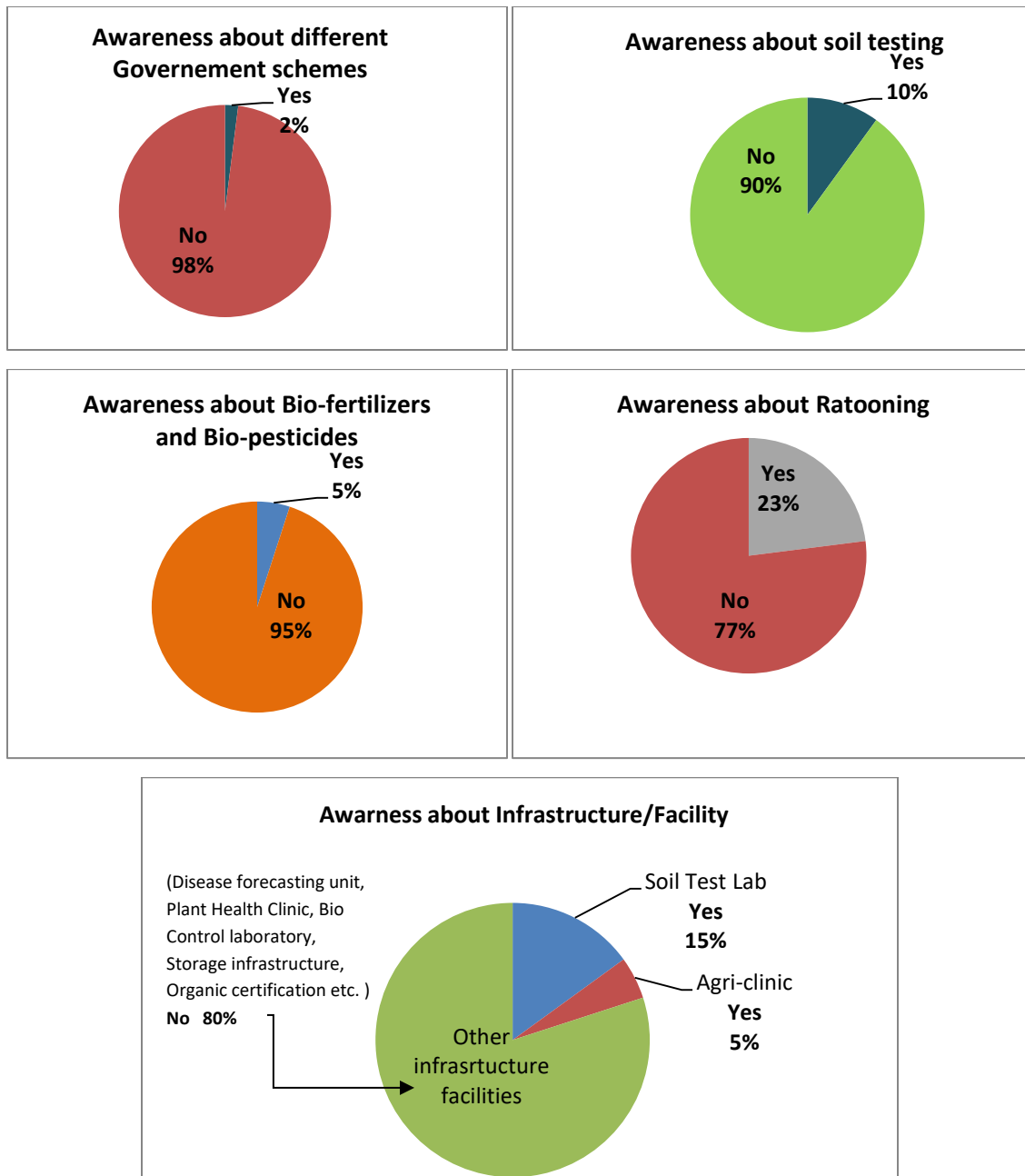
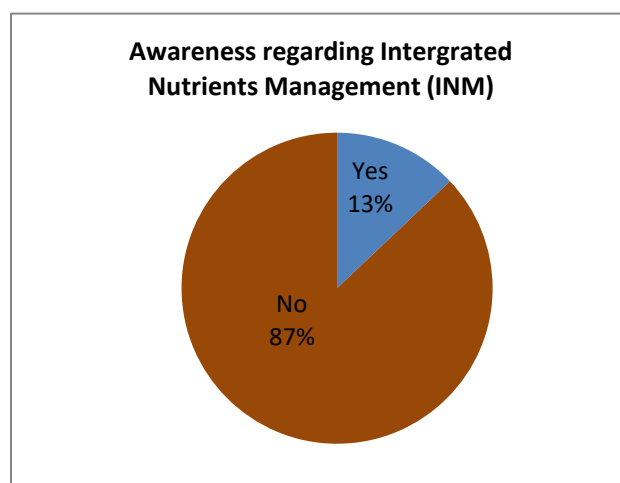
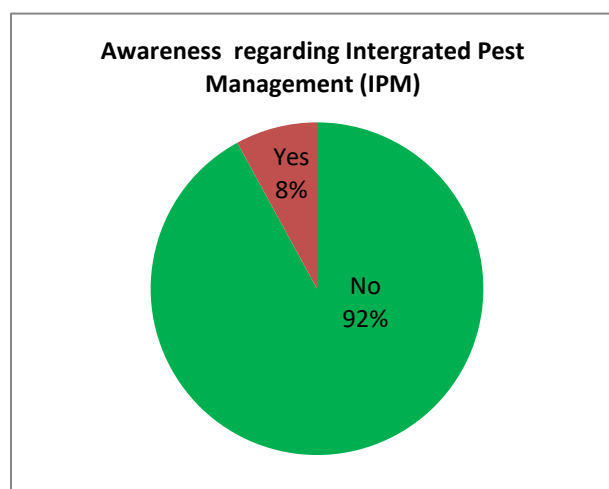


Figure 9: Awareness Level among the Farmers

- When asked to the respondents about Agri clinics only 5% of the respondents replied that they approached agri-clinic centers.

- When asked about soil health card to the respondents 15% of the respondents answered that they know about soil health card its benefit and they regularly do the soil testing for their field.
- When asked about other infrastructure facility such as disease forecasting unit, plant health clinics, bio-control laboratory, storage infrastructure and organic certification 80% of the respondents told a “NO”.
- Out of the total respondents 92% of the respondents were not aware about the integrated pest management (IPM) and 87% of respondents were not aware about integrated nutrient management (INM.)in Theni and Dindigul districts.



9.3 At Post-harvest Level

9.3.1 Sorting, Grading and Packing

During survey about 100% of farmers reported that they undertake preliminary Post-Harvest operations like cleaning, sorting, grading, weighing & packaging in moringa before taking it to the market. All farmers also reported that they also grade their produce by themselves before selling it in the market. During grading based on the length of the pod, color shape, diseased & damaged fruits, maturity and deformed/blemished are the main factors considered by most of the surveyed farmers.

The ideal length and diameter for tender pod market is 25 inch, 4 cm-5 cm. and to attain desirable length and diameter pods should be harvested 60 days after flowering. But According to the some respondents pod should be harvested at little tender stages that is 20 days before maturity for Kolkata market. During sorting red spots on pod should be avoided. Ideal packaging for domestic market is CFB boxes with 24 inch length, 18 inch height and 12 inch width having the capacity of 40 Kg which constitute around 450-500 pods for Kolkata this same box occupy 600 pods per CFB box of above defined measures. For Export 7 ply corrugated boxes with 9 inch height, 6 inch width and 24 inch length contains 100-120 pods are used by farmers.

9.3.2 Post-Harvest losses

Losses are a measurable reduction in foodstuffs and may affect either quantity or quality. They arise from the fact that freshly harvested agricultural produce is a living thing that breathes and undergoes changes during postharvest handling. Postharvest losses are caused by both external and internal factors like mechanical injuries, damage due to insects & pests attacks and physiological deterioration. Losses may occur anywhere from the point where the food has been harvested or gathered up to the point of consumption. Poor handling, unsuitable packaging and improper packing during transportation are the main reason for injury in moringa.

Table 11: Various Losses at Post Harvest Level

S.No.	Post-harvest stages	Percentage loss
1	Harvesting loss	4.80
2	Transportation losses	2.33
3	Cleaning, grading, weighing & Packing losses	6.21

At trader level, average losses reported is 3.4% which is mainly due to handling, weighing, loading and delay in marketing.

At the wholesaler and retailer level, average losses are about 6.89% and 8.63% respectively and the main reasons of the losses is sorting, grading weighing and delay in marketing. Most of the retailers throw all of their poor quality moringa but few of them also reported that they sell 20 to 30 % of their total damaged moringa at lower price.

9.3.3 Moringa Price Seasonality

In Theni and Dindigul peak period of production for moringa is April-May fetch lower price but price fluctuate heavily due to high price in the market during month January-February due to high consumer demand due to festivals and Chaitra masa.

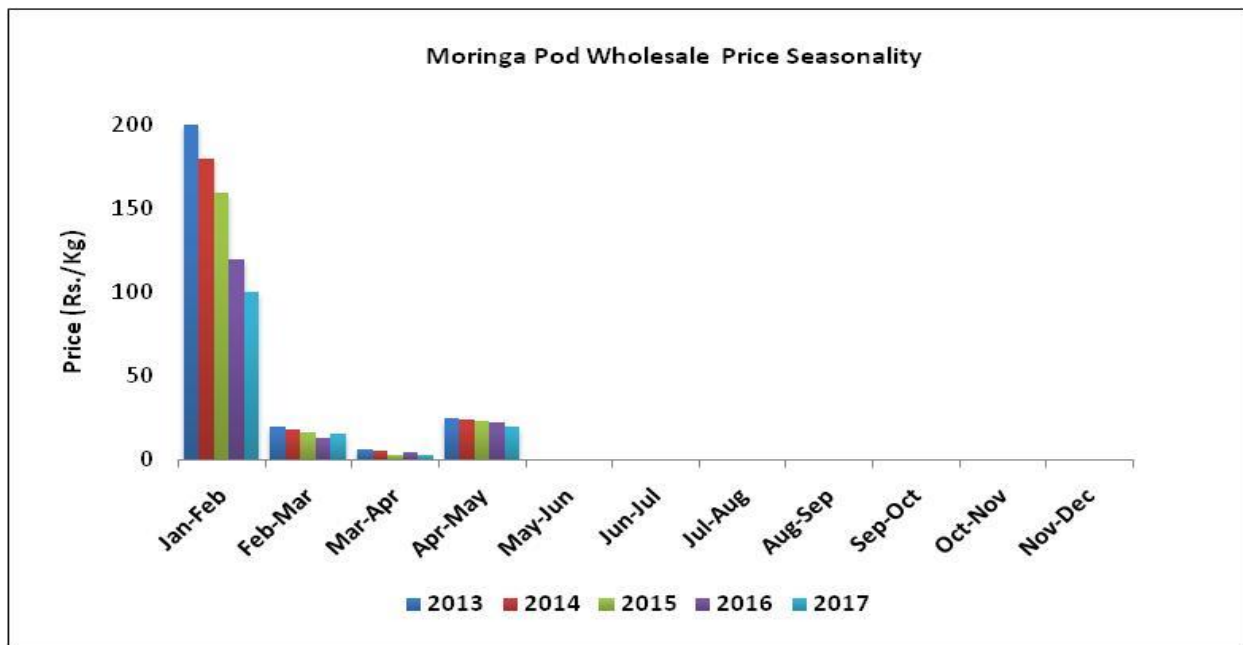


Figure 10: Moringa Pod Wholesale Price Seasonality

9.3.4 FPOs/Cooperative Societies

During survey, about 10% of the respondents replied that they are part of a farmer group and in those 29% respondents, 92% of the respondents were member of cooperative group and other 8% of the respondents were member of groups like Andipatti cooperative society and Sitathaniya Aarvalar Kuzhu, Siradhaniya Aarralar Kulu, and around 20 Co-operative societies are existing in Theni. In group, farmers purchase all inputs for the vegetable cultivation that reduce cost of inputs. They directly sell their produce to the traders in the mandi or at the field. There is no FPO in Theni and Dindigul district.

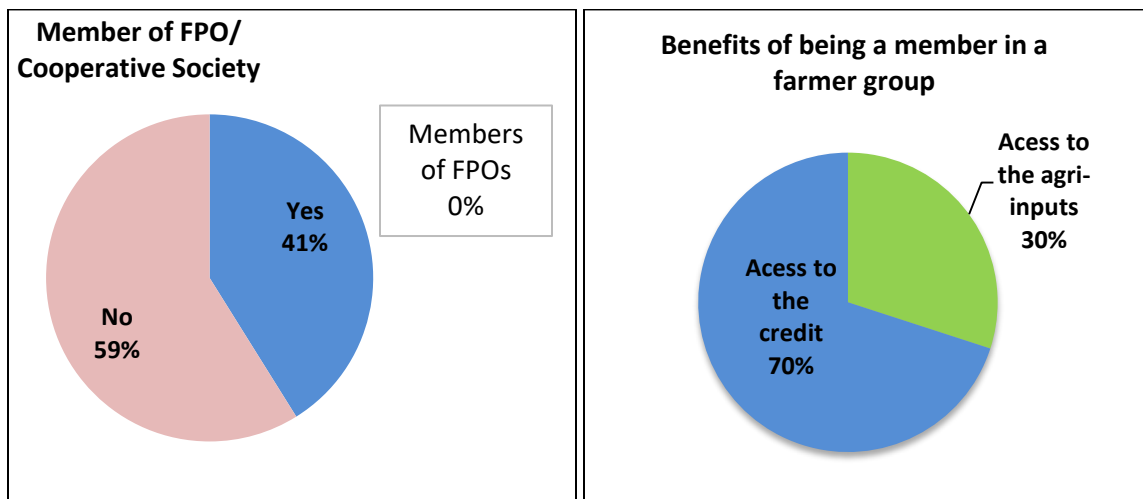


Figure 12: Member of FPO/Cooperatives

Figure 11: Benefit of Farmers Group

10 Identified Gaps/Constraints in Existing Value Chain

10.1 Constraints Identified at Producer Level

10.1.1 Constraints at Production/Farm level

- At Theni and Dindigul district there were 95% of the sample respondents who were buying all seed material from Agriculture department and other 5% of the

respondents had gone for air layering for producing seedlings from existing moringa farm to maintain the stability of the variety characteristics. Reason stated was good seed propagation taking longer duration and not economical. Also more than 95% of the respondents are allowing the trees during glut period for seed production.

- Moringa field is vulnerable to pest and diseases if proper care is not taken. Vulnerable to pest and disease Major pests occurring in the moringa plant in Theni and Dindigul district are Bud worm, Pod fly/fruit fly, Hairy caterpillar, leafy caterpillar and diseases like fruit rot, stem rot powdery mildew, fusarium wilt (die back) and twig canker etc. and when asked about assistance seek for the diseases from the government department, 95% of the respondents spraying more than 5 chemicals recommended by fertilizer dealers and spending Rs 10000/acre only for plant protection chemicals. Only 5% of the sample respondents had some benefit after consulting the horticulture officers regarding their problems and they are following to use bio-control agents and pesticides from botanicals.
- 60% of the respondents are using conventional method of moringa farming under rain fed condition and 40% people using tube well as irrigation source as well as drip irrigation for all the respondents surveyed.
- Respondent farmers were asked about the contract farming agreement, but none of the respondent agreed about any kind of any contract farming agreement.

10.1.2 Constraints in Moringa Production

Below is the table which is representing the farmer's responses to the various problems in post-harvest.

Table 12: Farmer's responses to the various problems in moringa production

Production Practices	Problems	Farmer's Response in Theni	Farmer's Response in Dindigul
On farm Constraints	Lack of seed availability of suitable variety	20%	82%
	Deficient rainfall in rain-fed crop	90%	70%
	Lack of availability of high yield varieties	98%	75%
	Lack of Protective irrigation during the non rainy season	98%	90%
	Moringa crop for the pod production	80% / leaf 60%	2%
	Unavailability of latest agro techniques	90%	90%
	Sowing period not strictly adhere to recommended sowing period	90%	90%
	Fluctuation in sowing period	90%	90%
	Not maintaining the genetic purity of plant type	90%	88%
	Water scarcity	98%	90%
	Weeding problem	95%	90%
	Severe vulnerability to pest and diseases	95%	90%
	Pod blackening harvesting after the August month	10%	10%
	Adaption of new farming practices	100%	98%
	Lack credit support from state and central funding	98%	97%

	schemes		
	Lack of support service	90%	92%
	Lack public extension services or NGO	85%	87%
	Lack of capital to purchase inputs and invest in farm improvement	50%	55%
	Lack of awareness about bio-fertilizers organic manure and bio-pesticides	90%	90%
Harvesting, Grading & Packing	Shortage of labor / Higher labor charges for pod and leaves harvesting and bunch sorting	95%	90%
	Shortage of labor / Higher labor charges & Non availability of infrastructure for grading and sorting	95%	95%
	Non availability of infrastructure for grading and sorting	2%	2%
	No problem	1%	1%
	Moderate quality availability of the packaging system	80%	80%
Storage facility	No storage facility	0%	0%
	No storage facility & Inadequate cold storage facility in the village	2%	2%
Transportation	Poor road and transport	80%	80%
	High transportation cost	70%	70%
	Lack of vehicles	3%	3%
	Vehicles not available in time	3%	3%
	Non availability of reefer transport	3%	2%
	Lack of better connectivity to Mandi	2%	2%
	No problem	80%	80%
	Vehicles not available in time & Lack of better	1%	1%

	connectivity to Mandi		
	Lack of vehicles & Lack of better connectivity to Mandi	2%	2%
Market Intelligence	Lower price afford by the local traders/ less price realization	70%	75%
	Lack of market information	80%	75%
	Lack of access to main market	20%	25%
	Information available for limited markets only inadequate information	20%	20%
	Information available for limited markets only inadequate information & Misleading information	80%	80%
	No problem	85%	80%
Mandi Infrastructure	In-adequate space available in Mandi	2%	2%
	In-adequate space available in Mandi & Non-availability of auction platforms	2%	2%
	Non- availability of auction platforms	0%	0%
	Non- availability of adequate staff for auction	80%	80%
	Non-availability of storage facility in Mandi	1%	1%
	Non- availability of adequate staff for auction & Non-availability of storage facility in Mandi	1%	2%
	No problem	35%	35%
Malpractices in the market	Deduct more charges	80%	83%
	Deduct more charges & Higher commissions	85%	80%
	Deduct more charges, Higher commissions & quote lower price than actual prices	85%	80%
	Higher commissions	85%	80%
	No Problem	65%	65%

Grading and packaging: - In Theni and Dindigul districts respondents had a problem regarding labor availability and its charges. In most of the farms the farmers' family member works in grading and packing it is difficult to get labors because of their high wage add the costs to production of moringa crops. About 36% of the respondents also reported that there is a non-availability of infrastructure, shortage of labor and availability of labor at higher wages is one of the major problem faced by them.

Transportation: - When asked about transportation, 79% of the respondents reported that transportation is not an issue for them if the produce is sold in one time. Sometimes, crop is not sold because of some other issues and then farmer takes his crop back which adds cost to him.

10.1.3 Constraints in Marketing

Farmers are facing mostly with the constraint of market related which also affect their market share concentration.

- Moringa farmers sell their produce usually through a middleman or via a trader at the local or regional mandi. Farmers realize an estimated 30-50% of total value through the supply chain with the remainder being distributed among multiple traders and commission agents. When asked about the understanding of moringa prices before going to the market, all of the respondents replied that they understand the price before going to the mandi but price fluctuates every hour depending on the arrivals in the market, so many a times they end up selling at lower prices than expected.

- In Theni and Dindigul, farmers and middlemen prefer to sell in major markets like Kombai, Thevaram, Andipatti, Chinnamanur, Bodinayakkanur and Chennai rather than to sell to trader cum processors. Prime reason behind this was reported unavailability of any processor in the area surveyed and also heavy competition with Andhra Pradesh moringa and also less price realization, when the produce is sold to the bigger markets due to availability of moringa at lower price from neighboring states in the market. Some traders are receiving better price by purchasing moringa produce from farmer for less price and exporting to Zimbabwe, Nigeria, and Singapore.
- In Theni and Dindigul farmers sell their produce at lower price usually through a local aggregator or via a trader at the local or regional mandi and they don't want to take risk of transport facility to reach the market destinations some traders are collecting by sending the truck to the farmers field and they are selling their produce to the traders without knowing actual market price.

10.1.4 Alternate Marketing System

As per the survey 98% of the respondents had no awareness about alternate marketing system and 2% of the respondents who knew about alternate marketing system they told us that except mandi they sell their moringa and leaves to traders who have made MOU and they sell in other markets like retail markets by motor cycle. And sometime they do direct marketing by selling to consumer at low price than the trader.

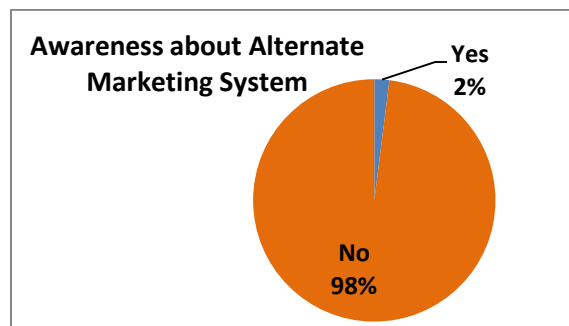


Figure 13: Awareness about Alternate Marketing System

11 Factors that influences price of Moringa in Theni and Dindigul Districts of Tamil Nadu state

11.1 Quality of the moringa pods and products

In Theni and Dindigul districts quality is prime factor for price fluctuation. Short fruits fetch less price in the market and presence of red dots on moringa also one of the influencing factor and reduce the value in the market.

11.2 More arrivals in peak period of production

In Theni and Dindigul districts price is fluctuating due to more arrival of moringa into market from different states like Andhra Pradesh and Vadodara. Moringa fetch low price in Theni and Dindigul districts due to heavy production and more arrival during peak period of production month of mid-April to May because of more flowering in in February to March.

11.3 Gaps at Processing Level

Moringa processing is the best way to protect the crop from peak period of production otherwise due to its perishability loss percentage would always be at higher end. When enquired about processing industries nearby the villages of the respondent villages we came to know that the state does not have any processing centers for moringa crop.

11.4 Pest, diseases and Climate

During survey, it is observed that heavy rain before harvest drain the chlorophyll from leaves fetch lower price and moderate day temperature (30-35°C) is for optimum fruit production. If temperature prevails 40°C all flowers dry and drops which hampers the production this lead to heavy rise in demand for moringa. If night temperature drops below 20°C trees affect with fungus and During December powdery mildew affect the production, and during rainy season yellow vein mosaic virus major threat for leaf

production and cause the heavy demand for leaf production. It is creating situation to import moringa from Vadodara.

11.5 Demand during festive season:

During survey, it is observed that consumer demands increases in Tamil Nadu state during in Chaitra purnami (Chaitra full moon day) and April 14th, **Panguni Uthiram, Ayappa** murugan festival and marriages during November to January are the important occasions for high demand for moringa and fetch more price in the market.

11.6 Maintenance of market time for gambling

Maintenance of time to reach to the market is important and prerequisite to trade the produce at appropriate price. If market time is 5 AM and farmers deliver his produce at 3 PM the farmers gets loss 10 percent of margin in moringa trading.

12 Recommendations

Majority of surveyed farmers favoured growing Moringa on a commercial scale due to its low cost of cultivation and relatively high return especially during festival season, being a multipurpose plant. Cultivation of Moringa is now seen as an innovative enterprise based on the income associated with its production and processing which serve to reduce poverty and enhance the economic status of growers. Before coming to the main recommendations, the points undernoted may be considered having come to light during the present study:

- a. There is a need to create a platform for strong linkage between the plethora of stakeholders. To address the issues related to sustainable development of a strong supply chain and more innovative processing of raw produces, the

horticulture department at the district level can take the necessary initiative in Theni and Dindigul.

- b. There is also a need for different institutes and research organizations to undertake innovative researches on value addition in Moringa.
- c. Most of the farmers mentioned that development a proper and organized marketing system would help the growers in getting a remunerative price for their produce which would make cultivation of Moringa on a commercial scale more attractive. Few of the surveyed farmers were against growing Moringa on a commercial scale because of low demand, rampant price fluctuations and competition with Moringa grown in Andhra Pradesh.
- d. According to present survey, more than 70% of the farmers were small and medium holders and faced various constraints especially on account of their total dependence on farming, poor education and lack of exposure to modern technologies.

In the light of the aforesaid points and the overall study conducted, a few recommendations addressing issues related to the farmers and improvement of the existing value chain are being made:

1) Creation of awareness on the importance of cultivation of Moringa and its impact on the socio-economic status of the farmers.

The present survey revealed that there is an abundance of degraded land on which the farmers can grow Moringa, but the usual practice is that such lands are sold away by farmers on prices that may not be remunerative. In such cases the farmers should be encouraged to utilize the degraded land for cultivation of Moringa which would become a recurring source of income for the farmers as

against one time income if the land is sold. It is important, therefore, that a targeted awareness is created among the farmers to go for Moringa cultivation. MIDH refers to funds that have been set aside for seminars, conferences, workshops, Kisan Melas which should be fully utilized to create awareness among the farmers. Moreover, under MIDH, funding is also being provided for information dissemination through publicity, printed literature etc. which would help the farmers in many ways besides creating awareness. These laudable provisions created under MIDH need to be strengthened and rigorously implemented.

2) Linking market actors and pricing:

Government has to take the initiative for the formation of a task force comprising the elite progressive Moringa growers and researchers to deal with market problems. Producers (households that cultivate Moringa both in rural and urban areas) and processors should be linked through contractual agreement. The linkage between the two parties can be facilitated through Horticulture department or Agricultural office and Public administration office. It is heartening to note that under MIDH, elaborate provisions have been made for the establishment of marketing infrastructure (rural market, retail markets and vending carts). These facilities need to be extended to the districts of Theni and Dindigul with specific relevance to marketing of Moringa.

3) Providing hands-on training to the Moringa growers for production and processing of export quality Moringa products:

There is a large and flourishing international market for Moringa products especially the green leaves, leaf powder, pods, seeds and seed oil. Theni produces 5% of Moringa grown in India. Unfortunately the growers of this district

are deprived of the huge profits being made by the intermediaries and the traders. It is important, therefore, that the farmers are included in the mainstream of Moringa exports. Through workshops, facilitated under grants from MIDH, farmers should be provided hands-on training for production and processing of export quality Moringa products. Special emphasis needs to be laid upon sorting, grading and packaging, features which determine the exportability of the produce.

4) Development of Functional Infrastructure:

Good Agricultural Practices (GAP) are applicable to Moringa as in any other agricultural produce with respect to harvesting, sorting, grading and packaging keeping in view the destination market. Special attention is required with regard to the drying of Moringa leaves for which there is a huge demand in the international market. Farmers need to be sensitized about the quality parameters of dried leaves which must be bright green and disease-free. The usual practice found was that the leaves were dried in the open which often led to leaves turning black and getting diseased. The farmers need to be advised to use solar dryers for this purpose keeping always in mind the consumer preferences.

5) Reefer vans transport facility:

Fresh Moringa leaves have a good international market. But, in the absence of a cool supply chain, suffer heavy post-harvest losses. On an average, about one to ten hours are lost in transit of leaves from the farm to the aircraft. If reefer vans

are put into service for transport of leaves from the farm to the airport, the losses due to desiccation can be minimized.

6) Setting up of Moringa processing Units:

Setting up of processing units based on the raw material strength (Moringa leaves and pod) of Theni and Dindigul districts is one of the effective solutions to reduce the losses. MIDH liberally supports food processing.

7) Promotion of the different products of Moringa:

The Moringa plant is known worldwide for its nutritional and medicinal benefits and industrial use. Almost every part of Moringa plant has nutritional value. Dried leaf powder can be added to any kind of meal as nutritional supplement. Compared to the leaves, Moringa pods are lower in nutritional quality yet they constitute a useful source of nutrients in the daily diet. Thus, Moringa leaf, pod, seed and oil provide the necessary nutrients and contribute to nutritional security. The various parts of Moringa used as sources of nutrient can be further upgraded by value addition for which suitable machines are required. It is, therefore, essential that suitable machines for extraction of oil and drying of pods and leaves are set up in each village/cluster of villages.

8) Identifying suitable postharvest methods to increase the shelf life of Moringa pods and leaves:

It has been estimated that about one-fourth of all produce harvested is spoiled before consumption. Moringa pods and leaves have a short shelf-life of maximum 3 days at ambient conditions with reference to qualities like freshness, firmness and retention of nutrition. Suitable interventions are available for cool storage of

fresh horticultural commodities and it is possible to extend the shelf-life through use of Pusa Zero Energy Cool Chamber (ZECC).

9) Infrastructural development (Processing centers):-

In Moringa there is a dire need of primary (washing, clipping leaves and pods, sorting and grading) and secondary processing facility/industry (drying and making value added products from leaves and tender pods) in adjoining areas of the producing districts. In the studied area we were not able to find a single processing unit for Moringa which fetches more income if the shelf-life of the fresh produce is enhanced and it is converted into a value added product. It is also a fact that processing is the only option for a better price realization for Moringa tender pods particularly in a glut situation. Drawing upon the fact that MIDH has made ample provisions for Integrated Post Harvest Management and Food Processing, these facilities need to be extended to Theni and Dindigul districts and fully dedicated to Moringa which would not only improve the economic status of the farmers dramatically, but would also generate ample scope for employment of rural and urban youth.

10) Reduction in Cost of Production:

Reduction in the cost of production would also be necessary if more farmers are to profitably and sustainably produce Moringa. The cost can be reduced if the use of pesticides is minimal which can be achieved by use of pest and disease resistant varieties and application of suitable biocontrol methods. Similarly the cost of fertilizers can be drastically reduced if customized fertilizers are used instead of dumping NPK mindlessly without soil testing.

11) Promotion of farmer groups:

Isolated farmers, if they belong to marginal, small or medium category, have to face many adversities in respect to selling their produce at a profitable price. To ameliorate the maladies which afflict the smallholders, MIDH comprehensively provides for promotion of Farmer Producers Organization (FPO), Farmer Interest Groups (FIG) of 15-20 famers/20 ha, Growers Association, tying them up with Financial Institution. Wherever such famers groups have been formed they are undoubtedly functioning very well. The need is that all famers/growers of Moringa in Theni and Dindigul must come within the ambit of one of the groups. These groups may be strengthened further by organizing workshops, hands-on trainings and demonstrations on areas like Integrated Nutrient Management, Integrated Pest Management, Integrated Post Harvest Management, Biofertilizers, Biocontrol of Pests and Diseases, Importance of soil Testing, Minimal and Semi- Processing, Marketing, Financial Planning etc. Farmers should further be advised to use organized financial channels for loans and avoid, at all cost, the private money lenders.

- 12) As of now only drip irrigation subsidy is given to farmers. They can be assisted by frequent trainings and demonstrations.
- 13) To reduce post harvest losses, Moringa packing materials may be supplied to farmers as subsidized cost.
- 14) A special marketing centre with market information facilities may exclusively be created for Moringa at Theni.
- 15) The Organic cultivation methods may be evolved to improve the Moringa leaf production to meet out the processing quality and export market.

- 16) The suitable IPM and INM methods may be evolved and implemented for the leaf and pod production of Moringa to minimize the cost of production and also to meet the market demand.

- 17) Indian Institute of Food Processing Technology, Tanjore may be involved to invent and disseminate the new and economically viable value addition technologies in Moringa.

The total value chain in Moringa has been presented in Fig. 14.

Figure 14: Technological flow chart of total value chain of Moringa in Theni and Dindigul Districts



ANNEXURE

Surveyed Drumstick Farmers Details		
S.No.	Name of the Farmer, Address	Mobile No.
1	Jeganathan s/o muthusamy, T. Bomminayakkanpatti	9791447134
2	Booranachandran s/o nadaraj, T. subbulapuram	9787244767
3	Regupathi s/o ramasamy, T. Bomminayakkanpatti	9787244767
4	P. Manojkumar, Valauthapuram	
5	Mokkaraj s/o Duraipandi, T. Perumalpatti	9626464994
6	K.V Palraj, Ettapparajapuram	9943160552
7	Mani s/o Duraipandi, T. Perumalpatti	9047462205
8	S. Krishnan, Ettapparajapuram	9786747838
9	Perumaldevar s/o Penyarasudevar, T. Perumalpatti	9751480407
10	M. Tharmaraj, Ananagar	7639690910
11	Gopierkanna s/o perumaldevar, T. Perumalpatti	9786321123
12	T. Nadaraj, Valauthapuram	
13	K. Kanakaraj, Ananagar	9092998448
14	Paulsamy s/o pethasamynayudu, T. Bomminayakkanpatti	9629129150
15	V. Surullivel, Kandamanur	9626765027
16	M. Murugasan, Kandamanur	9095031883
17	Manickam s/o pethasamynayudu, T. Bomminayakkanpatti	9600449340
18	Prabu, Kandamanur	
19	Ramajayam s/o alagarsamy, T. Bomminayakkanpatti	9003525564
20	P. Easwaran, Kandamanur	
21	Manikandan s/o orkalagonar, Thimmarasanayakkanur	9976339202
22	N. Vijayalakshmi, Ettapparajapuram	9790350578
23	Rengasamy s/o balusamy, T.subbulapuram	9047873137

24	M. Ravi, Ananagar	8608795620
25	Paramam s/o mattayan, Thimmarasanayakkanur	8098594885
26	N. Sandrayan, Ananagar	8608447243
27	Thiruvengadasamy s/o pappusamy, T.subbulapuram	9994258616
28	R. Manikandan, Ananagar	7687423820
29	Manivannan s/o balusamy, T.subbulapuram	9750904310
30	P. Mahalashmi, Ananagar	9159976279
31	Murugan s/o perumal, T.subbulapuram	9787858925
32	K. Muthusamy, Kandamanur	8056698772
33	Alagarasamy s/o gurusamy, T. Bomminayakkanpatti	9047657908
34	S. Velmurugan, Kandamanur	7092827142
35	Kannan s/o madasamy, T. Bomminayakkanpatti	9790691152
36	P. Sivabharathi, Valauthapuram	
37	Selvaraj s/o venkatraman, T. Bomminayakkanpatti	9790691152
38	K. Sawntharapandi, Kandamanur	
39	Perumal s/o orasoasari, T. Bomminayakkanpatti	9842429579
40	M. Pandiyan, Ananagar	9751133094
41	Paramasivam s/o ramar, T. Bomminayakkanpatti	8973905211
42	Rasu, Valauthapuram	
43	Perumal s/o varatharaj, Thimmarasanayakkanur	9842429579
44	S. Lingusamy, Valauthapuram	
45	Annamalai s/o subramani, T. Bomminayakkanpatti	9500272493
46	K. Ayyappan, Ananagar	9159494209
47	Ramalingam s/o alagumalai, T.subbulapuram	9865756320
48	V. Mani, Valauthapuram	
49	Lakshmi s/o thavamani, T. Perumalpatti	8344952935

50	G. Kanakaraj, Ettapparajapuram	9786320977
51	Ayyamperumal s/o jeyaraman, T. Bomminayakkanpatti	9500906881
52	M. Seenamurugan, Kandamanur	
53	Suruli s/o kandasamy, T.subbulapuram	9787849456
54	A. Aananthan, Ettapparajapuram	8883663745
55	Kannusamy s/o kattapinnadevar, T. Anaikaraipatti	7708785032
56	S. Thuraikannu, Valauthapuram	
57	Kavery rengasamy s/o rengasamy, T.subbulapuram	9360848000
58	N. Thamarai, Ananagar	9688488801
59	Ravi s/o suruligounder, T.subbulapuram	9787886197
60	S. Ramar, Ananagar	9566340084
61	Alagarsamy s/o thiruvengadasamy, T. Bomminayakkanpatti	9965681935
62	K. Valusamy, Valauthapuram	
63	Rajaram s/o thiruvengadasamy, T. Bomminayakkanpatti	9500201948
64	M. Bose, Ananagar	8124369046
65	Gurusamy s/o ramasamy,T.subbulapuram	9786682305
66	V.R. Palraj, Ettapparajapuram	9843190881
67	Alagarraja s/o ramanathan, T. Bomminayakkanpatti	9976139570
68	P. Vambuthurai, Kandamanur	
69	Raja s/o pavun, , T. Bomminayakkanpatti	9790255820
70	R. Thamocharan, Ettapparajapuram	8124617989
71	Pattani s/o subramani, T. Bomminayakkanpatti	9677883167
72	N. Rathinasamy, Ananagar	8428886169
73	Ramaiya s/o subramani, T. Bomminayakkanpatti	8608898643
74	R. Easwaran, Kandamanur	
75	Archunan s/o periyamayadevar, T.Perumalpatti	9659551847

76	P.K.G. Laksmanan, Ettapparajapuram	9159768056
77	Bose s/o periyakaruppadevar, T.Perumalpatti	9751613840
78	P. Thavadass, Ettapparajapuram	9092433176
79	Duraipandi s/o veeranamoopar, Thimmarasanayakkanur	8508563237
80	P. Rangammal, Ettapparajapuram	9944530273
81	Paramasivam s/o pandaram, Thimmarasanayakkanur	9659487101
82	R. Sumathi, Ananagar	9786156756
83	Kathirvel s/o subburaj, T.subbulapuram	9655169897
84	K. Subramani, Kandamanur	
85	Jeyam s/o penyakaruppadevar, T.Perumalpatti	9788840409
86	R. Valmurugan, Ananagar	8124163016
87	Kasthuri s/o ramasubbu	9715996060
88	M. Karupaya, Ananagar	909764762
89	Jayaram s/o subbanayudu, Thimmarasanayakkanur	9952766463
90	P.K.G. Valraj, Ettapparajapuram	9597405344
91	Sureshkumar s/o kandasamy, Jakkampatti Aundipatti	9047533333
92	G. Rathakrishnan, Ettapparajapuram	9943453163
93	A. Rajagopal, Ettapparajapuram	7373672974
94	Sethupathi s/o ponnayadevar	9865760030
95	R. Navaneethan, Ettapparajapuram	9790350578
96	Selavam s/o mottaiyandi, Thimmarasanayakkanur	9092503706
97	G.K. Seenivasan, Ettapparajapuram	9843947988
98	Rajaram s/o muthukamu, T. Bomminayakkanpatti	9677726845
99	M. Ayyapan, Ettapparajapuram	9965022112
100	Durairaj s/o raj, T.subbulapuram	9524875439
101	Seeni s/o muthkamu, T. Bomminayakkanpatti	7502645916

102	P.K.G. Rajentheran, Ettapparajapuram	9486163664
103	Karuppaiah s/o chinnakalai, T. Bomminayakkanpatti	9994544929
104	V.G Seenivasan, Ettapparajapuram	9787859211
105	Rajapandi s/o ramasubbu,T. Bomminayakkanpatti	9566774524
106	G. Rajagopal, Ettapparajapuram	8608521260
107	Ramasamy s/o Arasappan,Thimmarasanayakkanur	9578902473
108	L. Seenivasan, Ettapparajapuram	9843583552
109	Navanitham s/o kalimuthu,Thimmarasanayakkanur	9578458571
110	T. Cindarasu, Valauthapuram	
111	Rajaram s/o subburaj, T.subbulapuram	9698034002
112	M. Krishnasamy, Ananagar	9629246611
113	Thiruvengadasamy s/o subbuanayudu, T.subbulapuram	9865426601
114	S. Palamurukan, Ananagar	9489009553
115	Pommaiyasamy s/o lingasamy, T.Malliyapuram	8012911580
116	A. Rajkumar, Ettapparajapuram	9965195134
117	Sekar s/o ponnusamy,T. Bomminayakkanpatti	8608415859
118	L. Vijayakumar, Ettapparajapuram	9842032900
119	Rathinasamy s/o ponnusamy,T. Bomminayakkanpatti	9790576149
120	R. Rajeshwari, Ettapparajapuram	9787849664
121	N. Prema, Ettapparajapuram	9047083297
122	Ammavasi s/o velusamy, T.subbulapuram	9786457958
123	K. Veerasamy, Ettapparajapuram	9600399181
124	Rengasamy s/o nagarsamy,T. Bomminayakkanpatti	7708795685
125	T.P. Thiyakarajan, Ettapparajapuram	9751613531
126	Kanimozhi w/o muniyandi,T. Bomminayakkanpatti	8098129900
127	K. Navaneethan, Ettapparajapuram	9787683558

128	Selvakumar s/o pethusamy, Thimmarasanayakkanur	9095725247
129	V.G . Valraj, Ettapparajapuram	9655582719
130	Subburaj s/o baluchamy, T.subbulapuram	9994778029
131	R. Rangaraj, Ettapparajapuram	9787849664
132	Rajaiah s/o kannasamy,T. Bomminayakkanpatti	9442889190
133	K.V. Krishnaramanujam, Ettapparajapuram	9442326316
134	Chinnavel s/o periyarakkan, T. Bomminayakkanpatti	8124270141
135	K. Seenivasan, Ettapparajapuram	9791808686
136	Muthupappa w/o selvaraj,Thimmarasanayakkanur	8870683187
137	K. Muniyappan, Kandamanur	
138	Subburaj s/o sangarapandiyan,T. Bomminayakkanpatti	8344494002
139	A. Valappan, Ettapparajapuram	9965037204
140	Nagaraj s/o Thavasishevar, T.Perumalpatti	9626407033
141	K. Muthusamy, Kandamanur	
142	Vengadachalapathi s/o pethusami,T.subbulapuram	9791880906
143	V. Parumalsamy, Kandamanur	
144	Kannan s/o kannasamy, T.Pillaimugampatti	9994526695
145	P. Raju, Ettapparajapuram	8637690024
146	Kannasamy s/o subramai,T. Bomminayakkanpatti	9944849711
147	K.subburaj, Kandamanur	
148	Ramachandran s/o sevvanam, T.Pillaimugampatti	9585040911
149	P. Josaph, Kandamanur	8508086618
150	Jeyaram s/o ramasamy,T. Bomminayakkanpatti	9894251044
151	A. Veerasamy, Ettapparajapuram	9655459124
152	Thiunavukarasu s/o arunachaiam,T. Bomminayakkanpatti	8526465764
153	L. Velmurugan, Kandamanur	7598575339

154	Ponnuraman s/o bomminaickar, T.Malliyapuram	9940967226
155	M. Selvakumar, Ananagar	9786160859
156	Chandran s/o krishnasamy, Thimmarasanayakkanur	9843673772
157	K. Rajapandi, Kandamanur	
158	Kasiraja s/o suppanayudu, T.subbulapuram	9688130783
159	R. Murugan, Ananagar	9442773638
160	Ammavasi s/o sangili, T. Bomminayakkanpatti	9092127700
161	C. Suryavell, Ananagar	9943770855
162	Kaliyappan s/o perumal,T. Bomminayakkanpatti	9788968745
163	M. Palusamy, Kandamanur	7871709480
164	Chinnasamy s/o mayandidevai, Southmoonandipatti	8148623634
165	M. Kuruprasath, Kandamanur	9566382832
166	Perumal s/o kannasamy, Thimmarasanayakkanur	8883026362
167	K. Adaikalam, Kandamanur	
168	Pavun s/o gurusamy,T. Bomminayakkanpatti	8870724420
169	M. Pariyakaruppan, Kandamanur	
170	Civannammal w/o chinnasamy, T.Pudhur	9688626149
171	K. Suntharajan, Ettapparajapuram	9626557790
172	Alagarsamy s/o jeyaramasamy, T.subbulapuram	9944257881
173	C.Balamurugan, Kandamanur	
174	Kalimuthu s/o subbaiah,T. Bomminayakkanpatti	8682965928
175	S. Rajeshwari, Kandamanur	8220127261
176	Nagaraj s/o duraisingam,T. Bomminayakkanpatti	9944814933
177	P. Laksumanan, Kandamanur	8056698772
178	Perumalsamy s/o rengasamy,T.subbulapuram	9843750750
179	P. Chantharasakar, Kandamanur	

180	Chandran s/o thiruvegadasamy, T.subbulapuram	9698117870
181	K. Balakrishnan, Kandamanur	
182	Saminatham s/o balusamy,Thimmarasanayakkanur	8124595446
183	G. Satheesh, Ettapparajapuram	9941214426
184	Krishnasamy s/o kaverinaidu, T.subbulapuram	9655805321
185	K. Vellsamy, Kandamanur	
186	Vengatasalabathi s/o narayanasamy,T.subbulapuram	8675249377
187	N. Mahalingam, Kandamanur	
188	Ramakrishnan s/o muthu, Pillaimugampatti	9750011526
189	P. Seeniammal, Ettapparajapuram	9944530273
190	Ayyapparaj s/o ayyapparaj, T.subbulapuram	9943551728
191	A. Kumaravel, Kandamanur	
192	Paulpandiyan s/o rengasamy,T.subbulapuram	9047301644
193	S. Muniappan, Kandamanur	
194	Narayanasamy s/o rengasamy,T.subbulapuram	9787883502
195	A. Balaya, Kandamanur	
196	Alagarsamy s/o rengasamy	9865670350
197	N. Amutha, Ettapparajapuram	8760025461
198	Ayyapparaj s/o rengasamy,T.subbulapuram	9787883501
199	S. Mahalakshmi, Ettapparajapuram	8681066860
200	Eswari w/o chinnadurai	9487002759
201	R. Rajentheran, Kandamanur	8056698772
202	Alagarsamy s/o alagumalai, Thimmarasanayakkanur	9976624573
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204	Chellapandi s/o pandaram,Thimmarasanayakkanur	9787858936
205	A. Mayakrishnan, Ananagar	9786446686

206	Maharajan s/o pandaram,Thimmarasanayakkanur	9787858936
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211	T. Pandiyan, Ananagar	9585144561
212	Rakkammal w/o periyarakkan,T. Bomminayakkanpatti	9791310459
213	R. Muthukalai, Ananagar	8098789038
214	Subbaiya s/o patani,T. Bomminayakkanpatti	9751151028
215	R. Palanisamy, Ananagar	9840036970
216	Sivan s/o balusamy,T. Bomminayakkanpatti	9787858924
217	A.Ganakaraj, Ananagar	9585198130
218	Mayavu s/o alagar,T.subbulapuram	9843290458
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220	Ayyanar s/o muthaiya,T.subbulapuram	9047396340
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226	Maharajan s/o karuppanan,T.subbulapuram	8012614307
227	K. Pakiyaraj, Kandamanur	8489653613
228	Ramachandran s/o kamaiya,T. Bomminayakkanpatti	9626873805
229	P. Sathyaseelan, Kandamanur	8438299634
230	Pitchaiyammai w/o kasimayan,T.Pudhur	8344000512
231	Palaya, Kandamanur	

232	Pethusamy s/o palpandi,T.subbulapuram	9865509496
233	S. Samaanan, Kandamanur	7598195586
234	Chinnan s/o periyakaruppadevar, Kondamanayakkanpatti	9787739322
235	T. Ramasamy, Valauthapuram	
236	Balamurugan s/o kamaraj	9626406977
237	T. Palpandi, Valauthapuram	
238	Seenivasagan s/o subbanayudu,Thimmarasanayakkanur	9655115895
239	S. Narayanadhoss, Kandamanur	8056698772
240	pethusamy s/o suppanayudu,T.subbulapuram	9786682297
241	C. Balamurugan, Kandamanur	
242	Madathi w/o paraman,T. Bomminayakkanpatti	9790126635
243	V. Cindarasu, Valauthapuram	
244	Amaravathi w/o ramaraj, railway feeder road, Andipatti	9786458668
245	P. Subramani, Ananagar	9087835517
246	Madasamy s/o kannasamy,T. Bomminayakkanpatti	9944787586
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248	Kanagalakshmi w/o muthusamy, T. Bomminayakkanpatti	8940185442
249	K. Raja, Ananagar	9047436743
250	Jayaram s/o rengasamy, Thimmarasanayakkanur	9585985027
251	R. Manikam, Valauthapuram	
252	Muthuveeran s/o saravanan,T. Bomminayakkanpatti	8940185442
253	R. Surulipandi, Valauthapuram	
254	L. Thangasamy, Valauthapuram	
255	S. Palpandi, Valauthapuram	
256	T. Ramasamy, Ananagar	8098965428
257	K. Raja, Ananagar	9159976069

258	K. Manikandan, Ananagar	9600608157
259	A. Bose, Ananagar	9003815311
260	P. Kanakaraj, Valauthapuram	
261	R. Karmagam, Ananagar	8098965428
262	M. Anuthiyappan, Ananagar	9488845060
263	K. Gopalsamy, Ananagar	7449138790
264	T. Ponusamy, Valauthapuram	
265	S. Elangovun, Valauthapuram	
266	L. Suruli, Valauthapuram	
267	J. Andivell, Valauthapuram	
268	P. Cinisamy, Valauthapuram	
269	K. Pandiyan, Ananagar	8608118912
270	S. Senthamillan, Ananagar	9159236980

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