



Cluster Diagnostic Report

TC, Imphal

Technology Cluster Manager

Technology Center Systems Program (TCSP)

Office of DC MSME, Ministry of MSME

15th December, 2019

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1. Executive Summary

Manipur is famous for its rich diversity of flora and fauna. Manipur has a total land area of around 22,000 sq. Km out of which around 17,000 sq. Km is forest. Around 78% of the total land area in Manipur is tropical evergreen forest. The weather in Manipur is perfect for the growth of aromatic and medicinal plants making Manipur a hotspot for the establishment of Flavour & Fragrance sector.

To prepare this DSR, an extensive exercise was conducted to understand the challenges being faced by the cluster. Also, the existing as well as proposed services being offered by the Technology Center in Imphal were reviewed cautiously. This report is a result of a detailed assessment conducted with an objective to understand the requirements of the cluster. Cluster requirements for production, training and consulting were mapped with TC's existing and proposed infrastructure to recommend necessary interventions.

Apart from understanding the needs and challenges being faced by the Imphal TC, an excessive focus was given to understand the two prioritised clusters i.e. Aromatic plants cluster and Medicinal plants cluster in and around Imphal. The idea of this exercise was to map the existing and proposed TC services with the cluster requirements and accordingly recommend solutions for the transformation of TC's business avenues. Some of the key observations from the study are as below:

- The training infrastructure in terms of productivity enhancement and quality control is limited.
- TC is establishing a state-of-the-art testing facility for the cluster.
- Most industries lack sophisticated steam distillation, solvent extraction and fractionation unit.
- There is no marketing research facility in the cluster that can help in the analysis of the market potential and connect the manufacturers with prospective buyers.
- TC Imphal intends to start informative camps in the village and special courses excessively focusing on medicinal plants.
- Information asymmetry is an issue at the cluster level. Most of the producers and the manufacturers aren't aware about the government schemes and initiatives.

Recommendations have been provided in myriad domains like reducing the skill gap of the workers, resolving the technological backwardness and reducing the information asymmetry. Some of the key recommendations are:

- Focus on skill development in the cluster and by setting up of a training facility. This recommendation comes in the wake of lack of proper training avenues for the workforce at the cluster level.
- The TC is marked with an impeccable challenge of lack of technological interventions. The report lays the foundation for conceptualization of a processing and value addition facility.
- Lack of Marketing at the TC level is one of the important bottlenecks being faced by the TC. This report lays down the foundation for setting up of Market Support Labs.
- Conceptualization of Entrepreneurs facilitation cells (EFC) and development of a framework to establish organized clusters are a few recommendations on which the report arrives upon only after a comprehensive survey of the cluster and the challenges being faced by it.

2. Introduction

Fragrance industry and the use of fragrance in India can be traced back to the Indus Valley civilization i.e. 2600 BC. Ayurveda and the use of fragrances to purify the mind and the soul are closely associated. The word Attar meaning perfume has also been mentioned in the 7th century AD, ancient text Harshacharitra¹.

India currently boasts of one of the largest fragrance industries in terms of production and consumption.² Fragrances, Essential oil's, Special aromatic chemicals and Flavours form the bedrock of the Fragrance and Flavour (F&F) industry. India is undergoing massive development activities coupled with rampant urbanization and an increase in the disposable income, hence there is an ever-increasing demand for beverages, cosmetics, care products & confectionary items in the country. Indian Flavour market is now estimated to be more than \$300 million and is growing at an average of 10% every year³.

Medicinal plants form an important part of the Fragrances and Flavors (F&F) sector. Our ancestors didn't have the finesse of modern machinery to process medicinal plants and could rely only on their senses to test these plants for medicinal purposes. Ancient relics and fossils have indicated the use of medicinal and aromatic plants to reap benefits such as food flavoring, medicines, preservatives, decoration, beauty and personal pleasure. Medicinal and aromatic plants were also used to overcome many diseases like cough, cold etc. Some medicinal and aromatic plant origins of Asia are used extensively around the world because of their benefits on mind and the body. Medicinal plants are known to consist of varied ingredients like:

1. Absolutes
2. Oleoresins
3. Isolates
4. Essential oils
5. Aroma chemicals
6. Special aroma ingredients.

In the current scenario, plant extracts have huge demand across the supply chain. India still has a massive potential to develop its F&F sector as she has access to its 15 Geo-climatic zones which gives her an opportunity to access fragrant raw materials. Manipur is known across the globe for its aromatic and medicinal plants. This North-eastern state of India is blessed with numerous varieties of indigenous plants. Imphal west is particularly known for its high-quality lemon grass, turmeric, peppermint, stevia, citronella etc. Thus, the flora and fauna of this region has a vast unexplored resource of medicinal plants and floral aromatic species which offers a promising scope for being used as special ingredients in the fragrance and supplements industry.

The demand for aromatic and medicinal plants products is very high in the domestic and global market. The state of Manipur has a geographical advantage which manifests itself into diversified products and product categories which an industry can harness easily. Favorable agroclimatic conditions in Manipur help agriculturalists produce more per acre than the national average. Manipur

¹ Flavour and Fragrance Market in India, The Takasago Times

² Ministry of Micro, Small and Medium Enterprises.

³ Anurag More, Managing Director, Takasago International Pvt. Limited

also provides an access to a vast set of unexplored Flora and fauna which can be of immense medicinal and aromatic importance for the F&F sector. F&F sector is bound to benefit immensely from TC Imphal because of its potential to offer diversified products and product categories. Also, various scientific journals have pointed out that the main aromatic ingredients from the local crops in Manipur are way higher than those cultivated across the country.

3. Aromatic Industry in Manipur

Manipur and its neighboring states have a rich diversity of flora and fauna that makes them resource rich as far as the raw material for the flavor and fragrance industry is concerned. Because of this, a growing number of farmers are taking up cultivation to harness the hidden potential of this area. Lemon grass and citronella are the most common materials that are grown and cultivated in the region. Based on the interactions with associations, farmers groups and regional/community-based groups, it was identified that there are a range of needs that are expected to be fulfilled by the technology center. These needs vary from getting required technical support to identification of new markets for supporting commercial ventures in the distilled essential oil business.

In contrast to the Kannauj cluster (mainly attar), Manipur region has diversified products and product categories – specialty species of aromatic plants like sugand mantri, rose geranium, agarwood, patchouli, citronella and lemon grass. The content of main aromatic ingredients (Citral, Rhodinol, Citronellol, Geraneol, etc.) in the local crops are reported to be higher than those cultivated across India.

Farmers in Manipur have ventured into stevia, black ginger, black turmeric, tinospora cordifolia, etc.

This indicates a competitive and assured potential for essential oils and its value-added products. Apart from this, the flora and fauna of this region also have a vast unexplored resource of medicinal plants and floral aromatic species that offer promising scope for geographically special ingredients for fragrance and supplements industry. Therefore, farmers should be encouraged in growing aromatic and medicinal crop, extraction of these products, analysis of purity of component and creation of raw materials and other materials like cosmetics through the remaining by products. The various by products that can be created through this for food and cosmetic industry are: Hydrosols, Powders, Colours, fatty acids, exfoliators, taste enhancers and several other raw materials.

4. Approach and Methodology

A multi-step approach was followed to comprehensively cover the issues, demands and needs of the TC. As a part of the process, TCM's part time key expert, Dr. R.S. Ragavan- Fragrant Material and Herbal Extracts expert along with Ms. Shikha Sen, support consultant, Kannauj conducted a desk review and undertook in-person industry consultations for the preparation of diagnostic study report (DSR). Cluster Development Expert Mr. KP Lal played a pivotal role in shaping the study with his timely advice. Dr. Sinam Yoirentomba, Project Coordinator TC Imphal played an important role in the development of the DSR by accompanying TCM team during the cluster visits. A summarized set of process followed during the preparation of the DSR is given in Figure 1.



Figure 1: Steps followed for DSR creation

Step 1: Desk review of the DPR, Cluster needs and the F&F sector

A detailed desk review of the DPR along with cluster needs and the basic requirements of F&F sector was conducted. As a part of this exercise a secondary research was conducted to understand the major aromatic and medicinal plants available in Manipur and which can help promote F&F sector in Manipur.

The exercise also tried to identify the current requirements and upcoming trends in essential oil extraction techniques with a special focus on understanding the field distillation process. As a part of desk research, a secondary research was carried out to understand the market needs by reviewing the annual and market insights report of FFDC Kannauj. Apart from the secondary research, the expert also conducted detailed discussions with Dr. Nadeem Akhbar, Dy. Director FFDC, Kannauj to receive his inputs.

Step 2: Identification of Key Stakeholders

To validate the preliminary findings from the desk review, a sample of key stakeholders was prepared that ensured the representation from industry associations, MSMEs, farmers, governmental bodies and local leaders. While preparing the list of key stakeholders, heterogeneity of thought process and complexity of the information being sought were two important parameters considered.

Step 3: Stakeholder Consultation

To understand the business requirements, issues and challenges being faced by the Manipur industry in F&F sector and to develop an understanding on how TC can resolve these issues, a stakeholder consultation with 40+ actors selected from a variety of domains was conducted by the team. Industry associations, manufacturers and suppliers were contacted to get a complete view of the expectations of the industry from the technology center. Apart from this, it was also ensured that the final list of stakeholders had a good mix of those that were contacted during DPR preparation and new stakeholders.

The focus of the stakeholder consultation was to identify key challenges being faced by the manufacturers and to suggest innovative interventions which can be taken by the TC. As a part of these consultations, inputs were sought around different domains like marketing, financing, manufacturing and training.

One to one interaction with stakeholders such as manufacturers, buyers, sellers, government officials etc. were also conducted to understand Imphal's industrial ecosystem and identify major bottlenecks in their growth. A consensus in terms of the overall strategy and way forward was conceptualized.

Step 4: Analysis and Recommendations

Inputs and feedback received from all the stakeholders were analyzed carefully by a team of experts. Stakeholder inputs and recommendations were then framed into a set of recommendations which were discussed with the TC representatives.

5. Imphal Technology Center – An Overview

TC Imphal was setup under the direction & guidance of the O/o Development Commissioner (MSME), Ministry of MSME, Govt of India, New Delhi. Fragrance & Flavor Development center, Kannauj has played an important role in establishing the Imphal TC by being the mentor Technology Center for Imphal TC. The role of FFDC has been immense in providing:

- Technical support

- Preparation of detailed project reports
- Selection and finalization specific machineries and equipments
- Providing value addition, testing and training services

TC Imphal has been conceptualized to realize the following objectives:

- Facilitate access to certified planting materials for the farmers.
- Aid MSMEs in processing of aromatic crops to produce essential oils.
- Serve, sustain and upgrade status of farmers.
- Inculcate a spirit of entrepreneurship.
- Make the industry compete at the national and international level.
- Assist farmers in the adoption of advanced cultivation techniques and agro-technology for improving yields.
- Provide guidance on post-harvest loss reduction, storage, packaging, sampling and marketing.
- Providing access to equipment for processing and value addition such as distillation, fractionation, etc.
- Long term and short-term training programmes on cultivation, processing, quality assurance and marketing of medicinal and aromatic plants and essential oils.

Imphal TC aims to encourage the farmers to grow aromatic and medicinal crops and help the manufacturers in extraction, analysis and quality assessment of the produced crops. The proposed TC in Imphal is trying to address challenges and improve efficiency across the value chain of aromatic & medicinal plants extraction & its value chain. The TC will focus on providing training, infrastructure and consultancy on methods of cultivation and extraction of essential oils from aromatic and medicinal plants and the application of these plants in the sector of raw material and cosmetic formulation creation.

Innovation and Development	Processing and Value Addition	Testing and Quality Assessment	Post-Production Services	Training
Cultivation Support	Distillation	Essential Oil Content	Packaging	Cultivation and Process Marketing
Herbal Extraction	Solvent Extraction	Physical Analysis	Certification	Value Addition
Tissue Culture	Fractionation	Chemical Analysis	Marketing	Quality Assurance
Process Advisory	Stevia Processing	Instrumental Analysis		Entrepreneurship Development
Business Incubation		Other Analysis		CAD/CAM
Consultancy Services				

Figure 2: TC Imphal- Key Focus Areas (Reproduced from Imphal TC DPR)

6. Key Stakeholders and Institutional Framework

Industry associations, leading manufacturers, training institutes, applied research institutes, academicians, thought leaders from the sector, MSMEs and the cultivators would all play an important role in guiding the TC on key aspects like technological advancement, improvement in design parameters, required skillset etc. Key stakeholders for Imphal TC include:

- i. Governmental and Regulatory bodies
- ii. Industry associations
- iii. Manufacturers
- iv. Suppliers
- v. Financial institutions
- vi. Applied research institutes

The stakeholders concerning Imphal TC are present in the catchment area as well as have a presence across India. The catchment area of the Imphal includes other districts of Manipur and all the areas in the North Eastern region. A detailed list of stakeholders concerning Imphal TC is shown in the figure 3.

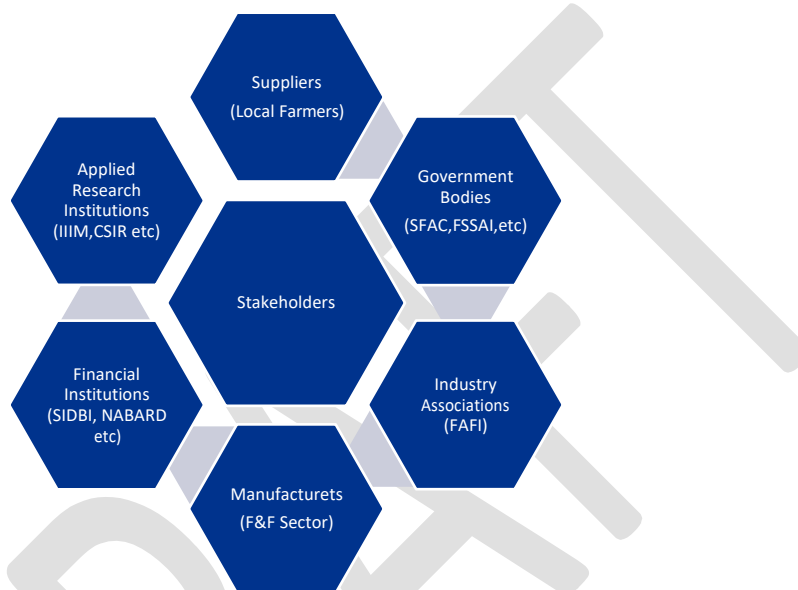


Figure 3: Major cluster stakeholders

1) Government Institutions:

Government acts as a major enabler in the market. It is very difficult to bring about social transformation and planning in a developing nation like India without governments active participation. Indian government along with Manipur state government has supported F&F segment immensely over the years. A lot of developmental schemes bringing industries under the paternal watch of the government have been launched over the years. There are certain institutions in place which ensure that the developmental activities being carried out by the government reach at the grassroots level. These institutions are the executing arm of the government. Some of the major government institutions that concern Imphal TC immensely are:

- a. **Manipur State Industrial Development Corporation Limited** : MANIDCO was formerly known as the Manipur Small Industries Corporation Limited (MSIC) and was incorporated under the Companies Act, 1956 in the year 1969. IDBI is one of the major shareholders in MANIDCO. MANIDCO can be perceived as a multi functionary company with the following functions:
 - I. MANIDCO acts as a State Financial Corporation (SFC) and plays an instrumental role in providing financial assistance to the small-scale industries.
 - II. MANIDCO also acts as a State Industrial Development Corporation (SIDC) and helps financing multiple industrial projects in the region.

III. Role of State Infrastructure Development Corporation has also been bestowed upon MANIDCO which helps in financing various infrastructural projects around the state of Manipur.⁴

Imphal TCs vision of converting Manipur and eventually North East into a full-fledged industrial cluster can be realized with the help of MANIDCO.

b. **Department of Commerce and Industries, Manipur:** The Department of Commerce and Industries is instrumental in ensuring subsistence of village and small enterprises, promote trade and commerce, promote mineral development and administer various acts under the Government of India⁵. Imphal TC's aim of promoting trade and commerce along with the idea of increasing MSME's presence in the business world comes in direct consonance with Department of Commerce and Industries mandate.

c. **Ministry of Development of North Eastern Region (DoNER):** All the matters concerning the planning, execution and monitoring of development schemes in the north east region are a mandate of the DoNER⁶.

All the activities undertaken by Imphal TC will fall within the mandate of DoNER, Imphal TC can always seek benefits under the existing schemes and plans of Ministry of DoNER.

d. **Manipur Small Farmers Agri-Business Consortium (SFAC):** An autonomous body under the aegis of Government of India, SFAC has a vision of catalyzing agro based industrial growth by removing the bottlenecks in the entire agricultural supply chain⁷. SFAC can help Imphal TC in understanding the aspirations of the local farmers and remove the bottlenecks being faced by them. SFAC can also help Imphal TC impart training to farmers to make their farming more remunerative.

e. **National Medicinal Plants Board (NMPB):** NMPB was established by the Government of India under the ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homeopathy (AYUSH) to coordinate all the matters concerning medicinal plants. All the matters concerning growth of trade and promotion of export form the mandate of the board⁸.

Manipur's medicinal plants form the basis of establishing F&F sector in the region. NMPB can help Imphal TC realize the joint vision of increasing the trade, export and cultivation of the medicinal plant.

f. **Manipur Food Industries Corporation Limited (MFICL):** Manipur Food Industries Corporation Limited is a Government of Manipur undertaking. MFICL is currently establishing a Food Park in Imphal, to provide basic infrastructural facilities such as land, building, cold storage, power, water supply and marketing facilities for the identified industrial units to be established by the selected entrepreneurs in the food park.

Imphal TC can have a detailed insight in packaging and reducing post-harvest losses from MFICL.

g. **Food Safety and Standards Authority of India (FSSAI):** The Food Safety and Standards Authority of India (FSSAI) is an agency under the aegis of the Ministry of Health & Family Welfare, Government of India. The FSSAI is responsible for protecting and promoting public health through regulation and supervision of food safety. The FSSAI has been established under the Food Safety

⁴ www.manidco.in

⁵ <https://dcimanipur.gov.in>

⁶ <https://mdoner.gov.in>

⁷ <http://manipursfac.com>

⁸ <https://www.nmpb.nic.in>

and Standards Act, 2006 which is a consolidating statute related to food safety and regulations in India⁹. FSSAI standards must be followed pan India, Imphal TC can secure a detailed Information, Education and communication (IEC) session on food safety and standards with FSSAI.

2) Industry Associations and NGO's:

Industry Associations and NGO's play a crucial role in industrial development. Associations make sure that there is a close coordination between the government and various other stakeholders concerning the industry.

Associations generally use the medium of talk shows, seminars, webinars, award shows, technical paper presentations, quiz etc to disseminate knowledge and promote the exchange of best practices amongst the leaders in an industry. Industry associations act as an important medium to convey industrial grievances and concerns to the government especially during crucial times for e.g. one month before budget session of the parliament.

Important industry associations concerning F&F sector are:

- a. **Fragrance and Flavours Association of India (FAFai):** FAFai came into being in 1949 as a fraternity with a motive of promoting flavors and fragrances in India. The association has played a pivotal role in representing the grievances of its members to various government bodies in the matters relating to Import and Export Policy, Excise Duty, Sales Tax, PFA Rules and Regulations, etc.¹⁰ Imphal TC can benefit immensely with the network and depth of an association like FAFai. FAFai can guide Imphal TC significantly on any matter concerning F&F sector.
- b. **Essential Oil Association of India (EOAI):** EOAI was founded in 1956 as a premier organization of scientists, researchers, industrialists, traders, manufacturers, exporters, importers and farmers in the field of essential oils. The foremost aim of the Association is to promote advancement in the knowledge of science and technology of essential oils and allied products and to help in production and marketing of standard quality products¹¹. Imphal TC can directly gauge the intellectual mentorship of EOAI in advancing the knowledge of science and technology in production of essential oils. The association of Imphal TC with EOAI can immensely help the industries in and around Manipur striving to establish a mark in the essential oil industry.
- c. **Manipur State Young Farmers Association (MSYFA):** Manipur State Young Farmers Association is an NGO which aims to co-ordinate and utilize the creative activities of rural youth for improvement of community life and agriculture. This involves organizing local clubs of rural boys and girls and to help them to adopt methods to improve farming and home making through specific programmes which will develop leadership, healthy, competition and cooperative spirit in work and re-creation.
MSYFA can help Imphal TC connect efficiently with the farmers and help disseminate knowledge on sustainable farming practices to boost productivity. MSYFA can help farmers form Farmer Produce Organization and strike effective contracts with F&F sectors for their produce.

3) Financial Institutions:

- a. **Small Industries Development Bank of India (SIDBI):** SIDBI was set up on 2nd of April 1990 with an aim to promote, finance and develop the MSME sector. SIDBI ensures that

⁹ <https://www.fssai.gov.in>

¹⁰ <https://www.fafai.org>

¹¹ <https://www.eoai.co.in/>

there is a proper credit flow to the MSMEs and the developmental as well as financial gaps are met successfully¹².

- b. National Bank for Agriculture and Rural Development (NABARD):** NABARD ensures access to institutional credit in rural economy and came into existence on 12th of July 1982 after the agricultural credit functions of the RBI were transferred¹³.
- c. North Eastern Development Finance Corporation (NEDFi):** NEDFi provides financial assistance to MSME for setting up of various agricultural allied, industrial and infrastructural projects in the North Eastern region of India¹⁴.
- d. Manipur Small Farmers Agri-Business Consortium (SFAC):** SFAC was setup in 1994 under the Indian Societies registration act, 1860, it ensures multidisciplinary agro-based industrial growth by eradicating the issues in the forward and backward agricultural linkages¹⁵.
- e. Manipur Rural Bank (MRB):** MRB was institutionalized on 28th of May 1981 with an objective to accelerate economic development for the rural people by participating in different poverty alleviation programmes of the central and state governments¹⁶.

4) Academic, Research and Skilling Institutes

Amongst Academic and Research institutes that concern the Imphal TC, Fragrance and Flavor Development Center (FFDC) assumes utmost importance. FFDC was established in the year 1991 and aims to act as interface between F&F sector and R&D institutions. FFDC strives hard to ensure that the farmers and industry engaged in F&F sector has access to modern tools and machinery to be competitive in the local and the global market¹⁷. FFDC will act as a perfect friend, philosopher and a guide for the Imphal TC.

Apart from FFDC, some other institutions that are major stakeholders for Imphal TC are:

- a. National Botanical Research Institute (NBRI):** NBRI is a premier research institute of the country under the aegis of the Council of Scientific and Industrial Research (CSIR) conducting top notch research in the fields of plant diversity, plant ecology, genetics and molecular biology¹⁸.
- b. Central Council for Research in Ayurvedic Sciences (CCRAS):** CCRAS is an autonomous body and comes under the mandate of AYUSH (Ayurveda, Yoga, Naturopathy, Unani, Siddha and Homeopathy), Government of India¹⁹. TC Imphal can benefit immensely from research inputs being generated by CCRAS in Ayurveda.

¹² <https://sidbi.in/en>

¹³ <https://www.nabard.org>

¹⁴ <https://www.nedfi.com/>

¹⁵ <http://manipursfac.com>

¹⁶ <http://www.manipurruralbank.com/manipur-rural-bank/>

¹⁷ <http://www.ffdcindia.org/>

¹⁸ <https://nbri.res.in>

¹⁹ <http://www.ccras.nic.in/>

c. **Indian Institute of Integrative Medicines (IIIM):** IIIM was earlier known as Regional Research Laboratory (RRL) and is in Jammu. It is one of the regional institutes of the CSIR with a primary focus on medicinal plants and microbial species²⁰. Imphal TC can make use of the innovative research being undertaken in the domain of medicinal plants by IIIM.

d. **Indian Institute of Packaging (IIP):** IIP was established in 1966 by the packaging and allied industries and the Ministry of Commerce, Government of India, with the specific objective of improving the packaging standards in the country. The Institute is an autonomous body working under the administrative control of the Ministry of Commerce²¹. Imphal TC can understand innovative solutions regarding packaging and reducing wastage from IIP.

5) Raw Material Producers and Manufacturers

Manipur offers a huge potential for the development of aromatic and medicinal plant-based industry. However, as per our findings there is an immense overlap amongst producers and manufacturers as most of the manufacturers are producing the raw materials themselves. The list of major raw material producers and the final product they are mentioned in the below table.

S. No	Producers	Raw Material	Final Product
1.	M/s Thangching Herbals Enterprises Mr. Siam Laingek	<ul style="list-style-type: none"> Lemongrass Citronella 	<ul style="list-style-type: none"> Essential oils
2.	M/s Loi's Essentials Mr. L. Romeo	<ul style="list-style-type: none"> Lemongrass Jasmine Yiang Pachouli 	<ul style="list-style-type: none"> Hair oil Cough Syrup for chickens
3.	Rehhal Perfumes Md Hussain Ahamad Choudhury	<ul style="list-style-type: none"> Agarwood 	<ul style="list-style-type: none"> Essential oils Perfume Dhoopbatti Hair Oil
4.	Mr. David	<ul style="list-style-type: none"> Lemongrass 	<ul style="list-style-type: none"> Essential Oil
7	M/s L.L. Agrotech & Hotnajamal Bishnupur Mr. W. Lamnganba Meitei	<ul style="list-style-type: none"> Black Ginger Black Turmeric Sugnandh Mantri 	N/A
8	RAPA Mr. L. Subashchnadra	<ul style="list-style-type: none"> Black Ginger Black Turmeric Agarwood 	N/A
9	Center for Advance Agro-Technology Mr L. Bisheswor	<ul style="list-style-type: none"> Lemongrass Citronella Stevia Sugandh Mantri Pachouli Sangbrei 	<ul style="list-style-type: none"> Stevia Dry Leaves Essential Oil Vermicompost
10	Green Growers Manipur Mr. P Surjit	<ul style="list-style-type: none"> Lemongrass Citronella 	<ul style="list-style-type: none"> Essential Oil
11	Midas Touch Mr. Rajkumar Tomba	<ul style="list-style-type: none"> Lemongrass 	N/A
12	M/s Namponliu Associates Mr Jurist Abonmei	<ul style="list-style-type: none"> Marigold 	<ul style="list-style-type: none"> Marigold Oil

Table 1: Major Raw material producers of the Cluster

²⁰ <https://www.iiim.res.in/>

²¹ <https://www.iip-in.com>

7. Overview of Imphal Aromatic and Medicinal Plants Clusters

Manipur shares its domestic border with Nagaland and Mizoram while international border with Myanmar. The total geographical area of Manipur is 22,327 square kilometers. Manipur is a hub for medicinal & aromatic plants like sugandh mantri, agarwood, black ginger, black turmeric, stevia, lemongrass, citronella and other indigenous plants. Most of the farmers, locals and manufacturers are involved in creating value from these medicinal and aromatic plants. Most of the manufacturing units in Manipur are involved in the distillation of lemongrass and citronella while most of the farmers are busy with farming of these medicinal plants. This region still possesses huge potential for its medicinal and aromatic plants to be explored and offers a promising scope for generating special ingredients for the fragments and supplements industry.

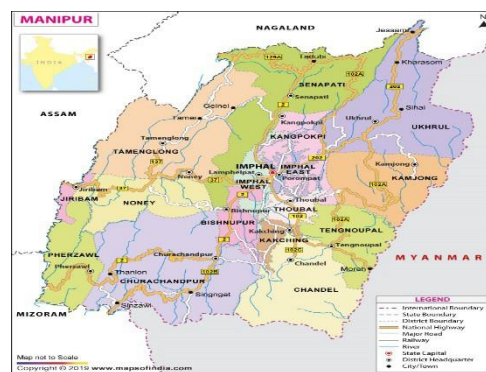


Figure 4: Map of Manipur

A] Aromatic Plants and Products cluster

Aromatic plants and products cluster primarily comprises of farmers and essential oil manufacturers. Lemongrass, citronella, Sugandh Mantri, marigold, agarwood etc. are the plants usually cultivated in this cluster. The cluster forms the part of existing F&F sector infrastructure in Imphal.

A few units are also engaged in adding value to essential oils by converting:

- a) Essential oils into hair oil, perfumes, cleaning agents.
- b) Residue into vermin-compost.

After a detailed interaction with the stakeholders and field visits to the cluster it has been found that the distillation infrastructure is a bit obsolete. The technology used by the distillation units is old and the fuel consumed by these units is excessive. It also came to our notice many manufacturers don't even have a distillation mechanism in place and rely heavily on other manufacturers for their distillation activities.

B] Medicinal Plants and Products Cluster

Imphal is blessed with a vast variety of medicinal plants. A lot of indigenous herbal plants unknown to people and having a very high value in the market are found in Imphal. Farmers in the West Imphal district cultivate stevia, black ginger, black turmeric, vetiver, Japanese mint, menthol mint, etc.

At present, there has been no attempt to institutionalise the process of extraction and distillation of medicinal plants. However, the producers in and around the cluster are engaged in harnessing the potential of these medicinal plants by using traditional methods like drying of leaves and roots to produce medicinal powders.

The potential for extraction, processing and value addition in this cluster is immense and Imphal TC can play an important role in harnessing this potential.

7.1 Understanding of the Cluster - SWOT Analysis

Strengths	Opportunities
<ul style="list-style-type: none"> • Local farmers and people are willing to learn new techniques to increase production and storage capabilities. • Players are engaged in the process of adding value to the aromatic and medicinal plants. • Imphal TC is willing to capitalise upon regular avenues to participate in trade exhibitions and international fairs. • Some of the manufacturers already have international linkages and are selling their produce in the international market like Kuwait and China. • There is an abundance of raw material (Aroma and Medicinal plants) for F&F sector. • North East is presently on the developmental agenda of the Government of India. Imphal TC can garner immense support from Ministry for Development of North East Region (DoNER) along with the necessary support from various government institutions like NEDFi, SFAC and MRB. 	<ul style="list-style-type: none"> • There is an abundant availability of Government's financial packages and Governmental schemes to promote local industry in the North East region. • Cluster has the potential to be converted into an Internationally recognized hub for processing of aromatic and medicinal herbs. • With the institutionalisation of a formal industrial setup in Manipur there will be an increase in the job availability and skill development avenues for the youth of the state. • There is a huge potential for exploration and R&D as most of the indigenous varieties of plants haven't been explored.
Weaknesses	Threats
<ul style="list-style-type: none"> • Farmers and workforce working in and around Imphal is unskilled and require professional skilling. • Infrastructure is a massive roadblock as there is poor road and train connectivity. • Low penetration of technology in and around the cluster. • Limited knowledge dissemination and sharing of advanced manufacturing process despite presence abundance of aromatic and medicinal plants in the region. • At present, the access to market is highly localised and there are limited national and international linkages for the manufacturers. • Retail market in the region is mostly negligible. 	<ul style="list-style-type: none"> • Prevailing political instability in the region can lead to less interest being shown by the private players to invest in the region.

Table 2: SWOT Analysis of Cluster

7.2 Cluster Needs Assessment – Key Issues and Challenges

The focus of the cluster diagnostic report is to identify the major challenges impacting the Fragrance & Flavour (F&F) value chain in Imphal. As mentioned in the methodology, to translate this focus into

reality, our team conducted one to one discussions and interactions with major stakeholders including MSMEs, technical experts, industry associations, financial institutions and business development service providers.

Based on the interactions with different stakeholders we have tried to project the issues being faced by the industrial units in the cluster. The challenges which have been identified within the cluster have been mapped with the potential TC offerings which has helped us to draft the potential areas of improvement that will foster a collaborative relationship between the TC's and industrial units.

The following table provides challenges in the cluster which have been mapped with the cluster service offerings:

Cluster Challenges	Description of the Cluster Challenge	TC Offerings that can mitigate cluster challenges	TC service offerings –Cluster applicability
Unskilled Workforce	<ul style="list-style-type: none"> ▪ Farmers have a very limited knowledge of <ul style="list-style-type: none"> ○ Tools and techniques which can be used to increase the productivity. ○ Processing, value addition and cropping patterns. ○ Aromatic ingredients, quality control required for an aromatic crop, how to create value from waste and herbal cosmetics. ▪ The training infrastructure in terms of productivity enhancement and quality control is limited. 	<p>Yes (Activities to be offered)</p>	<ul style="list-style-type: none"> ▪ TC Imphal is organizing trainings to boost productivity under the mandate provided by the National SC-ST Hub. Some of the trainings being provided are in the field of: <ul style="list-style-type: none"> i. Aromatic plants cultivation and harvesting
Technological Backwardness	<ul style="list-style-type: none"> ▪ Cluster has access to a very primitive machinery, for example our ground research has shown the prevalence of substandard machinery being used for the distillation process. ▪ Most industries lack sophisticated steam distillation, solvent 	<p>Yes (Activities to be offered)</p>	<ul style="list-style-type: none"> ▪ TC Imphal is currently providing effective consulting to the manufacturers on moving ahead with a technologically advanced infrastructure. ▪ TC Imphal is organising seminars and training programs

Cluster Challenges	Description of the Cluster Challenge	TC Offerings that can mitigate cluster challenges	TC service offerings –Cluster applicability
	<p>extraction and fractionation unit.</p> <ul style="list-style-type: none"> ▪ No facilities for conducting trial production of new products. ▪ Limited awareness around modern machineries which can be used to boost production. ▪ Limited technological use in sowing and harvesting. Leading to limited production, low value addition and high post-harvest losses. ▪ Low focus on Research and Development (R&D) and linkages with F&F sector related government institutions like CSIR-CMAP, IIIM Palampur etc. 		<p>in collaboration with government institutions like CSIR exclusively for farmers on access to technology.</p> <ul style="list-style-type: none"> ▪ An outreach mechanism was drafted by TC Imphal to bring lemongrass and citronella growers on a common platform and impart necessary technological insights amongst them.
<p>Access to Market</p>	<ul style="list-style-type: none"> ▪ Limited access to local and national markets for selling their products. ▪ There is no marketing research facility in the cluster that can help in the analysis of the market potential and connect the manufacturers with prospective buyers. ▪ Limited exposure to international market. ▪ Low focus on Industrial Interactions, through Buyer’s-Seller’s meet, Export oriented workshops and 	<p>No</p>	<ul style="list-style-type: none"> ▪ TC Imphal is currently engaging the services of FFDC Kannauj to frame linkages for the producers. ▪ Supporting units in getting access to market is not in mandate of TC Imphal, however it will offer support MSME DI in creating a market

Cluster Challenges	Description of the Cluster Challenge	TC Offerings that can mitigate cluster challenges	TC service offerings –Cluster applicability
	<p>participation in the trade fairs.</p> <ul style="list-style-type: none"> The entire medicinal plants cluster is highly dependent on a very limited local market and a few fairs organized by NSIC. 		
Availability of Raw Materials	<ul style="list-style-type: none"> The raw material supply chain is fragmented and scattered, making the availability of raw materials limited. 	No	
Quality Testing and standards	<ul style="list-style-type: none"> Without any prevailing guidelines or standards on how to carry out manufacturing the quality of products is a disputed territory. On top of this, there is no proper Quality testing center in the region. There are no instruments lab, application lab and microbiology lab to foster quality. 	Yes (Activities to be offered)	<ul style="list-style-type: none"> TC is establishing a state-of-the-art testing facility for the cluster. Some of the proposed tests in TC service offerings are as below: <ul style="list-style-type: none"> GC test (Gas liquid chromatography) GC -MS (Gas chromatography-Mass spectrography) HPLC (High Performance Liquid Chromatography)
Information Asymmetry	<ul style="list-style-type: none"> Information asymmetry is a huge issue at the cluster level. Most of the producers and the manufacturers aren't aware about the government schemes and initiatives. There is a lack of a mechanism which facilitates Agricultural 	Yes (Activities to be offered)	<ul style="list-style-type: none"> Entrepreneurship Facilitation cell (EFC) has been planned to be set up at the TC. A workshop on government schemes and initiatives has been organized by the TC. TC Imphal is striving hard to increase the

Cluster Challenges	Description of the Cluster Challenge	TC Offerings that can mitigate cluster challenges	TC service offerings –Cluster applicability
	and training support. There is no institution or an individual on the ground to help the producers with agricultural field inspection. <ul style="list-style-type: none"> ▪ Information gap exists vis-à-vis suitable harvesting methods and post- harvest processing especially for medicinal plants. ▪ The manufacturers as well as the service providers aren't present on a single platform. There is lack of a compendium like Directory of Manufacturers' and Business Development Services. 		knowledge base of the producers by providing consultancy to the agriculturists who visit the center.

Table 3: Challenges of Medicinal Plants and Products Cluster

8. Recommendations

After an enriching experience on the ground and stimulating discussions with different stakeholders like government officers, farmers and manufacturers, TCM found that TC Imphal is heading in a direction to create a success story. However, there are certain loose ends which need to be tied down to make Imphal TC a successful social impact and business case study. Some of these recommendations are discussed as follows:

8.1 Skill Development and Training Facility

Unskilled workforce has been one of the major cluster level challenges that has been witnessed on the ground. Based on the interactions with the cluster level stakeholders it has been found that there is a massive need for capacity building workshops in specific technical domains concerning aromatic and medicinal plants. TCM recommends certain new training programmes that can help Imphal TC inculcate standards, quality assessment, value addition and knowledge base amongst MSMEs existing in the cluster. A list of trainings which can be conceptualized to mark the beginning of skill transformation journey at Imphal TC are given as follows:

New Training Programs	Trainers Required	Duration	Tentative Fee to be charged	Candidate's minimum qualification
Improvise commercial Cultivation and standardization of aromatic ingredients	1	2 weeks	30,000	SSC
Processing and Quality assessment of aromatic crops and essential oils	1	2 weeks	30,000	HSSC
Creation of Value-added products from the primary produce and waste materials	1	2 weeks	40,000	HSSC and Above
Course on herbal cosmetics	1	2 weeks	30,000	HSSC

Table 4: New Training Programs

Apart from the above-mentioned trainings, TC Imphal can also provide support for agricultural activities, such as:

- Field inspection (terrain, soil, irrigation, QC analysis of available species, exploring possibilities of inter-cropping – For example: vanilla beans, etc.)
- Suggest the crops, supply quality planting materials and depute field inspectors to provide initial guidance.
- Training to identify, test (olfactory) and ensure basic specifications. (For Example: how to differentiate LG from citronella & Java citronella)
- Use the information from database to monitor yields, assay of EO / phytochemical in the crop (it could be more than standard), physical specifications, etc.
- Training in the harvesting methods to reduce losses, post-harvest processing especially for medicinal plants and post-harvest loss reduction.

8.2 Technological Upgradation

Technological backwardness is one of the major revelations that have come out as a finding from stakeholder consultation, field visits and desk review. TCM believes that there is an immediate need to upgrade the technology by setting up two basic facilities:

- Processing and Value Addition Facility
- Testing and Quality Assessment Facility

8.2.1 Processing and Value Addition Facility

TCM proposes to install the following facilities in the TC for processing and value addition:

- A production facility for trial production of new products to fix SOPs and technology transfer to the aspirant.
- To facilitate the production of essential oil, resonates, oleo-resins and concrete, TCM proposes advanced machinery to be installed in Imphal TC. Details of the equipment are given in the table 5:

Sr. No	Equipment	Qty.
1	Rotary Extractor - 3000 litres capacity	1
2	Vertical Extractors - 3000 litres capacity	2
3	Vertical Extractors - 200 litres capacity	2

Sr. No	Equipment	Qty.
4	EO Distillation vessels - 3000 litres capacity	1
5	EO Distillation vessels - 500 litres capacity	1
6	SS Storage tanks – 3000 litres capacity	6
7	SS Vacuum receiver - 500 litres capacity	2
8	Online extract filters - 50 litres capacity	2
9	Condensers	4
10	Cooling tower - 150 TR	1
11	Vacuum Pumps water ring	1
12	SS transfer pumps	4
13	Centrifuge 36" - four point	1
14	Raw herb Milling system & accessories	1
15	Material handling equipment	1
16	Fresh solvent storage – vertical tanks	2
17	Raising film evaporator (RFE) & accessories	1
18	Rotary vacuum paddle drier 500 litres volume	1
19	SS (pharma model) Multi mill	1
20	Vibro sifters & extra meshes	2
21	Octagonal blender 1000 litres	1
22	De-humidifiers (SD & Pharma)	4
23	Micro-bio sterilization system with accessories (ETO)	1
24	Digital platform Weighing scales	2
25	Spray drier & accessories 50 kg/hour evaporation	1
26	Steam Boiler 2 ton/hr	1
27	FDUs installed in farms for job-work	5
28	DM Water Plant and Softner plan	1
29	RO Plant	1
30	Maintenance room and tools (grind, drill, welding and cutting)	1
31	Pulvarizer	1
32	Dryers	1
33	Spray Dryers	1
34	Mechanical Sieves	1
35	Roller Mills/Ball Mills	1

Table 5: Equipment required Production and value addition facility

A product development facility with pilot-scale equipment for training, trials, samples generation, research and new-product innovation. This is linked to technical consultancy service to entrepreneurs who do not have research infrastructure. As a part of the pilot plant, TC Imphal proposes the following machinery:

S. No	Equipment	Qty.
1	SS 100 litres vessel with agitator, reflux, distillation assembly	1
2	SS 100 litres fractionation assembly (with glass condenser & receivers)	1
3	SCFE unit 60 litres X 3 cylinders with co-solvent system	1
4	SS 100 litres vertical extraction unit (for training & customer samples)	1
5	Vacuum filter, on-line filter, pumps, etc.	1
6	Ultrasonic Distillation Unit (Batch/Continuous – 100 litres/hr)	1
7	Maceration vessels – 250 Kgs	1
8	Rotary evaporators – 238 lbs.	2
9	Water Distillation - 50 lts	1

Table 6: Equipment required for a product development facility

- As a part of the production facility, TCM also proposes to install 5 field distillation units (FDU) for farm work which would enable TC to expand its service portfolio and would help in taking its services to the fields. TCs can plan following activities using the FDUs:

- Demonstration/training of FDU operation, SOPs, critical control parameters, hazard & safety instructions, recording and review of all batch data.
- Design of FDUs at the TC, and arrangement with reliable & competent fabricator for regular supply & installation of FDUs at the farm at a reasonable cost. (We could see identical sub-standard FDUs at Imphal, reported to be not cost-efficient)
- Creating farmers' groups to centrally operate a co-operative FDU equipment.
- Buy some of the essential oil from farmers which can be fractionated by TC as a value-added product. (Asean Aromatics Pvt Ltd., Chennai has a turn-over of INR 10 crores / annum only in the fractionated products – Citral, Eugenol, Geraniol, Triterpenes from Orange peel oil)

TCM believes that by setting up of processing and value addition facility along with pilot TC Imphal can offer numerous production services through this division like:

- Essential oils and their value-added derivatives
- Spice oils (food/flavour EO)
- Solvent Extracts – Turmeric, pine gum, Sugandh mantri, Cinnamon, champaka, Ginger (black) & many more aromatic and medicinal plants.
- Aqueous Extracts – Tribulus Terrestris,
- Steviosides (Stevia)
- Oleo Resins of Pepper, Chili, Ginger, Turmeric, etc.
- Floral Extracts (Concretes) of Champaka, Tuberose, rose, lotus, or any exotic flower fragrance.
- Ingredients for Ayurveda formulations, cosmetic formulations & nutraceuticals
- Utilize bye products like the water left out after separation of oil (hydrosols) as a raw material for the food and cosmetic industry. Simultaneously the prospects of creating colours for food and cosmetic industry can also be evaluated with these machines

8.2.2 Testing and Quality Assessment Facility

TC Imphal, at present is dependent immensely over its mentor FFDC Kannauj for carrying out testing and quality assurance.

TCM proposes setting up of four labs at TC Imphal which will aim at providing most of the testing and quality assessment services including GC, GC-MS and HPLC. Following are the four different labs envisaged by the TCM:

S. No	Lab	Function
1	Instruments Lab	It is planned to comprise of GC, GC-MS, HPLC, UV Spectrophotometer, and other instruments that require dry and conditioned workstation
2	Wet Lab	It is planned to be a flame-proof designed laboratory for desk-top glassware equipment, TLC, titrations, volumetric analysis, gravimetric analysis, fume cup-board, etc.
3	Application Lab	It is planned with a motive to impart technical training on creation and application of the ingredients being processed. The lab would focus on providing technical training program for the application including the use of the aromatic and medicinal flora. General farmers and females in the area can be trained through these training programs.
4	Tissue culture lab	It is intended to facilitate the use of biotechnology to improve cultivation and thereby enable artificial growth of rare high value aromatic and medicinal crops which can be sold to farmers.

Table 7: Labs as envisioned by TCM

To translate the vision of establishing a training and quality assessment facility into reality following machinery would be required:

S. No	Machine	Qty.
1	HPLC (PDA detector)	1
2	G.C. with auto sampler with head space accessory	1
3	UV spectrophotometer	1
4	Analytical Balance, glassware, reagents, consumables	1
5	Micro Biology lab laminar flow table, BOD incubators, Oven, Auto clave, reference standard stains, reagents, colony counter, microscope, clean room accessories as per compliance	1
6	Wet Analysis lab & Samples lab – Buchi Rotavapor, 5lt, 10 lt reaction cum distillation assembly, vacuum pump, Miscellaneous glassware, reagents, solvents	1
7	Stirrer	6
8	Homogenizers (Application Lab)	4
9	Rectangular shaped Hot Plates (Application Lab)	4
10	PH Meter (Application Lab)	1
11	Viscometer (Application Lab)	1
12	Rheometer (Application Lab)	1
13	Centrifuge (Application Lab)	1
14	Furnace GMP Model (Application Lab)	1
15	Stability Chamber (Application Lab)	1
16	Refrigerator (Application Lab)	1

Table 8: Equipment required for setting up of training and quality assessment facility

8.3 Other Recommendations for Cluster

8.3.1 Market Support Lab

A market support lab can be also constructed which would help in evaluation of market potential of the created material and connect them with the prospective buyers. Market support lab in the TC can support the DIC and MSME DI in setting up buyer seller meets in the cluster

8.3.2 Entrepreneurs' Facilitation Cell (EFC)

Entrepreneurs' Facilitation Cell can be established at TC Imphal to bridge the information gap and provide services like consultancy on cultivation of various aromatic and medicinal plants

Through EFC, TC Imphal can help to MSMEs in:

- Basic documentation for UAM, GST
- Import /Export Registration
- Loan processing
- Digital learning
- E-marketing
- Providing information regarding government schemes,
- Information on how to setup new enterprise,
- Preparation of proposal for large OEMs.

8.3.3 Collaboration with other Institutions

TC Imphal has the potential of becoming country's only institute specializing in aromatic and medicinal plants. To create a niche for itself in the market the TC should interact with organizations namely – CSIR, NBRI, CIMAP, IIM, IHBT, Central council of Ayurveda, Siddha Research Institute (Chennai) and try to:

- Update the current trends in natural products demand and application
- Organize seminars and stake holders' forum jointly with these institutions
- Supply of medicinal plants / extracts to these institutions

- Take saplings / planting materials of high-yielding species for local farmers
- Get technologies from them for extraction of specific compounds (IHBT)
- Get farming devices developed by them (CIMAP) and supply to local farmers

TC Imphal can also collaborate with leading corporates like Dabur, Medimix, Himalaya etc. for striking market linkages with them.

TC Imphal can organize separate trainings for faculties in recognized institutions and aid students undergoing field related visits for their research projects.

8.3.4 Organized Clusters

Manipur being a new entrant in the aromatic and herbal industry has representation from a very few manufacturers and business players. All the major manufacturing units are scattered geographically in different districts.

TC Imphal with the support from MSME-DI, NSIC and DIC can take the initiative to divide the region of the state based on the type of crop being produced in the region. Classifying the state into organized clusters based on the type of crops being produced in the region will help in:

- Reducing the cost of transportation.
- Ensure easy access to raw materials.
- Reduce the post harvesting losses significantly.
- Demarcate the business areas and opportunities sector wise.

8.3.5 Global Exposure Visits coupled with Buyer Seller Meets and Participation in Trade Fairs

It is highly recommended that Imphal TC supports MSME DI and DIC to organise buyer-seller meets for a greater outreach for Manipur's industry. Buyer-seller meets gain prominence in the backdrop of transportation issues. These meets can help significantly in the creation of market linkages. These meets can be organized at the regional, state and national level.

Organizing exposure visits to MSMEs doing great in F&F sector will make the manufacturers aware about the prevailing trends and the modern machinery. This exposure can help both TC Imphal and manufacturers to benefit immensely from the existing setup across the F&F sector.

8.3.6 Value addition to the generated waste

Given the nature of proposed TC and the industries which are going to be covered under the TC, it becomes imperative to plan about value addition to the waste which will be generated after processes like distillation. Innovative procedures like conversion of waste into vermicompost and biofuels can be conceptualised.

Interventions	Implementing Agency	Planned Activities
Entrepreneurs' Facilitation Cell	<ul style="list-style-type: none"> ● TC Imphal ● MSME DI 	<ul style="list-style-type: none"> ● Create awareness around different government schemes. ● Knowledge sharing on registration process for different programs of the government. ● Provide consultancy services.
Collaboration with other Institutions	<ul style="list-style-type: none"> ● TC Imphal 	<ul style="list-style-type: none"> ● Get an update on the current trends in the F&F sector. ● Organise seminars and stakeholder's forum for effective knowledge dissemination.

Interventions	Implementing Agency	Planned Activities
		<ul style="list-style-type: none"> • Securing technological interventions like high yielding varieties of plants, procedure for extraction of specific compounds (IHBT) etc from these institutions. • Understand the requirements of producers (Farmers) and try to devise innovative machinery with the help of CIMAP to streamline production process.
Man-made Clusters	<ul style="list-style-type: none"> • MSME DI • DIC • Industry Associations 	<ul style="list-style-type: none"> • Creation of clusters according to the crop yield and the region where this crop is being produced.
Global Exposure Visits coupled with Buyer Seller Meets and Participation in Trade Fairs	<ul style="list-style-type: none"> • MSME DI • DIC • Industry Associations 	<ul style="list-style-type: none"> • Preparation of a calendar consisting of major national and international trade fairs. • Devising a shortlisting criterion for units to participate in trade fairs. • Shortlisting of units for participation in trade fairs. • Devising a framework to follow-up with the units that participated in the trade fairs.

Table 9: Other Recommendations

Annexures

1. Detailed Listing of TC Challenges

1.1 Unskilled Workforce

Manufacturing, essentially F&F sector is at a very nascent stage in Manipur. There are a very few manufacturers who are working on the value-addition of essential oils as most of them are confined to production along with distillation.

Our field visits have highlighted the people's desire and passion to learn about new processing techniques. Producers are passionate to increase their knowledge of tools and techniques. Manufacturers too desire to know more about processing, cropping patterns, value addition, quality control and productivity enhancement.

There is a tremendous potential for Imphal TC and the manufacturers of Manipur to garner maximum from the opportunity being thrown out at them in the F&F sector. This opportunity can be harnessed on with the help of proper trainings and guidance.

Challenges	Medicinal Cluster	Aromatic Cluster
Unskilled Workforce related Challenges	High	High

1.2 Technological Backwardness

Technological backwardness is an issue that impacts the Manipur's industry considerably as numerous plants have a very ordinary distillation unit. Most of the plants lack sophisticated steam distillation, solvent extraction and fractionation units. Lack of technology as an issue is made more complex by lack of efficient quality and standards being witnessed in the cluster.

Existence of a Field distillation unit has almost become a trend in the essential oil extraction industry, However the existence of FDU's is largely absent in the Manipur cluster. Some of the key observations from the visit which feed into the issue of technological backwardness are:

- Presence of obsolete equipment's.
- Lack of facility which can conduct trial production of new products.
- Lack of access to latest manufacturing technologies.
- Harvesting and production of crops which ensures continued supply of raw materials is least technology intensive.
- Use of conventional farming and harvesting techniques lead to reduced produce, higher investment of time, energy and labour.

Challenges	Medicinal Cluster	Aromatic Cluster
Access to Latest Technology	High	High

1.3 Access to Market

Lack of proper transportation avenues, prevalence of several intermediaries and the fact that the manufacturers in Manipur do not have a proper marketing plan in place makes access to market a huge challenge.

Cluster has a very limited access to local and national markets for selling their products. There is no marketing research facility in the cluster that can help in the analysis of the market potential and connect the manufacturers with prospective buyers. Also, there is no exposure for the manufacturers to the international market and no attempt at harnessing the market through marketing, Industrial

Interactions, Buyer's-Seller's meet, Export oriented workshops and participation in the trade fairs. A clear strategy on Vendor development is also missing at the cluster level.

The things are worse when it comes to use of internet for marketing as there is no instance of e-marketing being witnessed on the ground.

Challenges	Medicinal Cluster	Aromatic Cluster
Access to Market	High	Medium

1.4 Quality Testing and Standards

Without any prevailing guidelines or standards on how to carry out manufacturing the quality of products is a disputed territory. On top of this, there is no proper Quality testing center in the region. There is a lack of Instruments lab, application lab and microbiology lab to foster quality and training assessments.

Challenges	Medicinal Cluster	Aromatic Cluster
Testing & Certification	High	High

1.5 Availability of Raw Materials

We have discussed in detail on the variety of herbs which are present in Manipur and the scope of translating this potential into an epitope of industrial revolution in F&F sector. It was however found out from our reporting on the ground that the production of herbs is taking place at a very small scale except for lemongrass and citronella. Potential indigenous herbs which can transform the F&F sector are either being produced at a very small scale or the producers have no knowledge of how to produce them. This lack of knowledge coupled with limited production leads to a huge crunch of raw materials for the industry. Herbal raw materials in the F&F industry are largely dependent on the farm produce but limited technological interventions in the domain and information asymmetry manifests itself in poor yield thus impacting availability and remuneration for the producers.

Challenges	Medicinal Cluster	Aromatic Cluster
Raw Materials Shortage	High	High

2. Stakeholders Contacted

Sr.No.	Stakeholder	No. of Stakeholders
1	Micro, Small & Medium Enterprises (MSMEs)	14
2	Industrial Associations (IAs)	2
3	Financial Institutions (FIs)	1
4	Other Stakeholders (BDS, Government Institutions)	5

2.1 List of Stakeholders Contacted

S.no	Name	Designation	Organization
1	Mr. S.Rishi Kumar	President	All Manipur Entrepreneurs Association (AMEA)
2	Mr. M. S. Khaidem	Project Coordinator	Manipur Small Farmers Agri-Business Consortium (MSFAC)
3	Mr. P. Loken	Chairman	Manipur Industrial Development Council (MIDC)
4	Mr. S.I. Sharma	Managing Director	Manipur Industrial Development Corporation Limited (MANIDCO) erstwhile Manipur Small Industries Corporation (MSIC)
5	Mr. Peter Salam	Managing Director	Manipur Food Industries Corporation Limited (MFICL)
6	Mr. P. Devakanta	President	All Manipur Trained Medicinal and Aromatic Plants Promoters Consortium
7	Mr. W. Lamnganba Meitei	Owner	M/s L.L. Agrotech & Hotnajamal Bishnupur
8	Mr. L. Romeo	Managing Director	M/s Loi's Essentials
9	Mr. S. Ingomacha Singh	Managing Director	M/s MIDC Enterprises
10	Mr Jurist Abonmei	Chairman	M/s Namponliu Associates
11	Mr T. Nehminthang Haokip	Owner	M/s Mollou Essentials
12	Mr Siam Laingek	Managing Director	M/s Thangching Herbals Enterprises
13	Mr L. Bisheswor	Owner	Center for Advance Agro-Technology
14	Md Hussain Ahamad Choudhury	Owner	Rehhall Perfumes
15	Mr. Rajkumar Tomba	Sr Advisor	Midas Touch
16	Mr. L. Subashchnadra	Secretary	RAPA
17	Mr. P. Surjit	Owner	Green Growers Manipur

S.no	Name	Designation	Organization
18	Mr. Taliwati Longchar	MSME-DI, Imphal	Director I/c
19	Ms. L Ibetombi Devi	NSIC, Imphal	Manager I/C
20	Mr. G Kahmei	Trade, Commerce and Industry	OSD MSME
21	Mr. Hriinii Poumai	SBI, Imphal	Lead District Manager
22	Mr. Th Kiran	NABARD	DDM

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3. List of Medicinal Plants Cultivated in Manipur

S. No.	Botanical name	Common Name	Part Used	Products
1	<i>Abroma augusta</i> Linn. F.	Ulat kambal	Root, Fruits	Powder
2	<i>Aconitum nageense</i> Stapf	Vatsnabh/ Vish	Root	Powder
3	<i>Acorus calamus</i> Linn.	Bach, Sweet flag	Rhizome	Powder
4	<i>Aegle marmelos</i> Corr.ex Roxb.	Bel/ Bilva	Fruit/ Leaves	Juice
5	<i>Aloe barbadensis</i> Mill.	Ghrit Kumari/ Aloevera	Leaves	Powder
6	<i>Aquilaria agallocha</i> Roxb.	Agar	Wood	Powder
7	<i>Asparagus racemosus</i> Willd.	Satavari	Tuber	Powder
8	<i>Azadirachta indica</i> A.Juss.	Neem	Stem Bark, Leaves, Fruit, Oil	Powder, oil
9	<i>Bacopa monnieri</i> (Linn.) Penn.	Brahmi	Whole plant	Powder/Syrup
10	<i>Bixa oreilana</i> Linn.	Sinduri/ Annto	Fruit, Flowers	Syrup
11	<i>Coptis teeta</i> Wall.	Mamira	Root	Powder
12	<i>Dioscorea bulbifera</i> Linn.	Varahi	Corm	Powder
13	<i>Embelia ribes</i> Burm. F.	Vai Vidang	Fruits	Juice
14	<i>Gloriosa superba</i> Linn.	Kalihari	Tuber	Powder
15	<i>Glycyrrhiza glabra</i> Linn.	Mulet hi	Rhizome	Powder
16	<i>Homomelia ipecacuanha</i>	Ipecac	Root	Powder
17	<i>Panax pseudoginseng</i> Wall..	Ginseng	Whole plant	Powder
18	<i>Phyllanthus emblica</i> Linn. Syn. <i>Emblica officinalis</i> Gaertn.	Amla	Fruit	Powder/juice/murabba
19	<i>Picrorhiza kurroa</i> Benth.ex Royle	Kutki	Root	Powder
20	<i>Piper griffithii</i>	Long Pepper	Fruit	Powder
21	<i>Piper longum</i> Linn.	Pippali	Fruit Root	Powder
22	<i>Podophyllum hexandrum</i> Royle	Bankakri	Root	Powder
23	<i>Rauvolfia serpentina</i> Bent h.ex Kurz	Sarpagandha	Root	Powder
24	<i>Stevia rebaudiana</i> (Bert.) Bertoni	Stevia	Leaves	Tea
25	<i>Swertia chirayita</i> Buch-Ham	Chirat a, Charayat ah	Whole plant	Powder
26	<i>Taxus wallichiana</i> Linn.	Talishpatra	Leaves	Powder
27	<i>Terminalia chebula</i> Retz.	Haritaki	Fruits	Powder

S. No.	Botanical name	Common Name	Part Used	Products
28	<i>Tinospora cordifolia</i> (Willd.) Miers ex Hook.f. & Thoms.	Guduchi	Stem	Powder
29	<i>Withania somnifera</i> Dunal	Ashwagandha	Root	Powder

4. List of Aromatic Plants Cultivated in Manipur

Sl. No.	Botanical name	Family	Common Name & Local Name	Medicinal uses
1	<i>Cinnamomum verum</i> J. Presl	Lauraceae	Cinnamon Ushingsha	Flavour, digestion, diabetics, flu remedies, relax muscle
2	<i>C. camphora</i> (L.) J. Presl	Lauraceae	Camphor Karpoor	Cough, diarrhea, dysentery
3	<i>C. tamala</i> (Buch.-Ham.)	Lauraceae	Bayleaf Tejpata	Antifungal, throat, headache, diarrhea, vomiting, excessive
4	<i>Magnolia champaca</i> (L.) Baill.	Magnoliaceae	Fragrant Champaca Leihao	Perfumery, antibacterial
5	<i>Myristica fragrans</i> Houtt.	Myristicaceae	Nutmeg Jayphal	Antifungal, aphrodisiac, digestive, toothache, skin problems
6	<i>Eucalyptus tereticornis</i> Sm.	Myrtaceae	Eucalyptus Nashik	Aromatherapy & sinusitis
7	<i>Pinus kesiya</i> var. <i>kesiya</i>	Pinaceae	Baguio Pine Uchan	Arthritic pains, antibacterial,
8	<i>Zanthoxylum armatum</i> DC.	Rutaceae	Toothache Tree Muthrubi	Rheumatism, fever, hypertension, purification of blood
9	<i>Z. acanthopodium</i> DC.	Rutaceae	Prickly Ash Muthrubitingkhangpanbi	Antimicrobial
10	<i>Z. rhetsa</i> (Roxb.) DC	Rutaceae	Indian Pepper Ngang	Astringent, digestive, flavor, anti-
11	<i>Citrus aurantiifolia</i> Christm.	Rutaceae	Mexican Lime Champra	Astringent, tonic, bronchitis, asthma, disinfectant, cool fevers, sore throats
12	<i>C. hystrix</i> DC.	Rutaceae	Khasi Papeda Heiribop	Hair lotion, purify blood, flavouring
13	<i>C. maxima</i> (Burm. f.) Merr.	Rutaceae	Pomelo Nobap	Cold, influenza, hemorrhoids
14	<i>C. reticulata</i> Blanco	Rutaceae	Orange Komla	Hypertension, coughs, arthritis

15	Santalum album L.	Santalaceae	Sandalwood Chandan	Cha-	Coughs, dry eczema, irritability, sedative,
16	Aquilaria malaccensis Lam.	Thymalaeaceae	Eagle wood Agor		Dyspepsia, cough, skin disease, arthritis, kidney disease
17	Artabotrys hexapetalus (L. f.)	Annonaceae	Tail Grape Champa	Chini	Aromatherapy, perfume
18	Artemisia nilagarica L.	Asteraceae	Indian Worm Wood Laibakngou		Hair lotion, tonic, antiseptic, analgesic,
19	A. maritima L.	Asteraceae	Old Woman Laibakngou	Ching	Flavouring, fevers, stomachic, antispasmodic, tonic,
20	Cannabis sativa L.	Cannabaceae	Marijuana Ganja		Indigestion, wounds, tonic, sedative, anodyne
21	Ocimum tenuiflorum L.	Lamiaceae	Holy Basil Tulsi		Stomachic, bronchitis, expectorant, analgesic, hypertension, diarrhoea
22	O. kilimandscharicum Baker	Lamiaceae	Camphor Tulashi amuba	Basil	Insecticide, cough, flavouring
23	Jasminum nitidum Skan	Oleaceae	Angelwing Warakundo	Jasmine	Diabetes, headaches, insomnia, gallstones, fracture, muscle pain,
24	Nyctanthes arbor-tristis L.	Oleaceae	Coral Singarei	Jasmine	Fevers, cough, gout, astringent, carminative, rheumatism, skin
25	Pandanus foetidus Roxb.	Pandanaceae	Ketukee		Leprosy, small pox, syphilis, scabies, diabetes, heart & brain
26	Gardenia jasminoides J.Ellis	Rubiaceae	Cape Kaboklei	Jasmine	Jaundice
27	Murraya paniculata (L.) Jack	Rutaceae	Orange Kamini kusum	Jasmine	Diarrhea, dysentery, abortive, joint pain, body aches, anti-
28	Acorus calamus L.	Acoraceae	Sweet Flag Ok-Hidak		Asthma, rheumatism, epilepsy, dyspepsia, skin ailments,
29	Eryngium foetidum L.	Apiaceae	Coriander Awaphadigom		Hypertension, fevers, epilepsy, constipation, stomachache, asthma,
30	Foeniculum vulgare Mill	Apiaceae	Fennel Hop		Flavoring, breath freshener, menstrual pain, digestion

31	Blumea densiflora (Wall.) DC.	Asteraceae	Sambong Karpoor	Hair lotion, flavoring, fevers, kidney stones, insomnia, hypertension,
32	Ocimum basilicum L.	Lamiaceae	Sweet Basil Naoseklei	Skin diseases, cough, digestive, antispasmodic,
33	O. americanum L.	Lamiaceae	Hoary basil Mayangba	Flavoring, epilepsy, diabetic
34	Mentha arvensis L.	Lamiaceae	Wild Mint Nungshihidak	Fever, headache, vomiting, antispasmodic,
35	Elsholtzia ciliata (Thunb.) Hyl.	Lamiaceae	Crested Mint Tekta	Stomach disorder, antibacterial, antiviral, antiinflammatory
36	Elsholtzia blanda Benth.	Lamiaceae	Lomba	Cough, sore throat
37	Cymbopogon citratus (DC.) Stapf	Poaceae	Lemon Grass Haona	Diuretic, tonic, digestive, carminative, antifungal, rheumatic
38	Alpinia galanga (L.) Willd.	Zingiberaceae	Greater Galangal Kanghoo	Rheumatism, fever, dysentery, skin diseases, respiratory
39	Curcuma angustifolia Roxb.	Zingiberaceae	East Indian Arrow Root Yaipan	Antifungal, antibacterial, bronchitis, coughs, dyspepsia, diarrhea,
40	C. aromatica Salisb.	Zingiberaceae	Wild Turmeric Lam- Yaingang	Antibiotic, cancer, tonic, antidote to snake bite, indigestion,
41	C. caesia Roxb.	Zingiberaceae	Black Turmeric Yaimu	Dysentery, cough, tumours, diarrhea, asthma, epilepsy,
42	Hedychium coronarium J.König	Zingiberaceae	White Ginger Lily Takhellei Angouba	Headache, arthritis, antifungal, antimicrobial activities
43	Hedychium flavum Roxb.	Zingiberaceae	Yellow Ginger Loklei	Flavouring, bronchitis, tonsillitis
44	Zingiber officinale Roscoe	Zingiberaceae	Ginger Sing	Antiemetic, anti-inflammatory, rheumatism, coughing,

5. Cluster Prioritization Matrix

List of Clusters Prioritized for TCSP													
No	Cluster	Characteristics Sector/subsectors, type of enterprises, relevant for TC services	Number Of Enterprises (Approx.)	No of Associations/ MSOs Name of Main/Active Association	Presence of Engineering, Technical, Skill Development institutions, DPS Providers	Other support Institutions	Previous cluster development interventions (Name of the agency and year)	Common Facility Centre SPU if any	Relevant for Agri and Rural Technology	Existing Linkages with TC	Geographical Proximity	TC's qualitative Feedback	Remarks
1	Aromatic Plants and Products Cluster, Imphal East	Farmers, Processing unit, Packaging, Plant and Machinery	15-20	All Manipur Entrepreneurs Association (AMEA)	TC Imphal	GMDC, NSIC & MSME-DI, Manipur	NA	TC Imphal	Yes	Moderate	1-40 Kms	Lot of Scope in Training, Testing, Design Improvement and Standardization of products	Based on inputs from various stakeholders
2	Medicinal Plants and Products cluster, Imphal West	Farmers, Processing unit, Packaging, Plant and Machinery	15-20	All Manipur Entrepreneurs Association (AMEA)	TC Imphal	GMDC, NSIC & MSME-DI, Manipur	NA	TC Imphal	Yes	Moderate	1-40 Kms	Lot of Scope in Training, Testing, Design Improvement and Standardization of products	Based on inputs from various stakeholders
3	Handloom Cluster	Thread, weaving machines, charkha	50-60	Manipur State Handloom Weavers Co-operative Society	IE Guwahati	GMDC, NSIC & MSME-DI, Manipur	NA	NA	Yes	Moderate	1-15 Kms	TC do not have any expertise in this sector	http://dosome.gov.in/ANNUAL_REPORT_2016_17/ANNUAL%20REPORT%202016-17-Imphal.pdf
3	Greater Imphal weavary cluster, Imphal East	beedi, thread, pearl, stone etc.	30-40	India Bullion and Jewellers Association Ltd.	NI, Assamdist and IE Guwahati	GMDC, NSIC & MSME-DI, Manipur	NA	NA	Yes	Low	1-40 Kms	TC do not have any expertise in this sector	http://dosome.gov.in/ANNUAL_REPORT_2016_17/ANNUAL%20REPORT%202016-17-Imphal.pdf
4	Spice and Food Processing Cluster, Churachandpur	Rose Oil, Rose Water	15-20	Distress Women's Lifeline Sociey, Manipur	IE Guwahati	GMDC, NSIC & MSME-DI, Manipur	NA	NA	Yes	Low	1-40 Kms	TC do not have any expertise in this sector	http://dosome.gov.in/ANNUAL_REPORT_2016_17/ANNUAL%20REPORT%202016-17-Imphal.pdf
5	Wood Carpentry, Churachandpur	Mint Oil	20-30	Self Employment Voluntary Association	IE Guwahati	GMDC, NSIC & MSME-DI, Manipur	NA	NA	Yes	Low	1-40 Kms	TC do not have any expertise in this sector	http://dosome.gov.in/ANNUAL_REPORT_2016_17/ANNUAL%20REPORT%202016-17-Imphal.pdf

Note: There are many national and international institutions which are supporting to clusters. But in matrix only local supporting institutions have been taken.

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