



Comprehensive Master Plan for Tapping The Export Potential of North Eastern States

**Submitted to
Agricultural & Processed Food Products
Export Development Authority**

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Executive Summary

Given the different comparative advantages, the North East Region of India offers an immense potential to be converted as a hub for international trade, despite its current challenges

The North East Region (NER) of India, comprising of 'Seven Sister' states namely the states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura along with Sikkim is an ocean of opportunity, resources and unexplored potential when it comes to agriculture. The region possesses several comparative advantages like fertile soils, favorable climatic conditions, rich biodiversity, forest wealth, educated manpower as well as a geographically strategic location acting as a gateway to the South East Asian countries and China. Given these comparative advantages, NER has all the potential to actively contribute to the betterment of farm incomes, reduce poverty and speedup the overall economic growth of the region. However, due to multitude of challenges at several levels, the true potential of the region is not getting harnessed and the region has not grown on par with the rest of the regions in the country. Realizing the same, Agricultural & Processed Food Products Export Development Authority (APEDA) floated this study to understand in detail the bottlenecks that are hindering the progress of NER and thereby prepare a comprehensive and actionable road map for tapping the export potential of the region.

Top ten products in NER which possess maximum potential for exports for APEDA to focus upon

Sathguru has identified ten products for exports which offer huge potential for growth. The products are identified based on a robust '**Ranking Matrix**' that was developed, reflecting the region's strengths with respect to supply of the produce and the demand for the product in the international markets.

Top ten products in NER for APEDA to focus upon	
• Orange	• Lemon
• Pineapple	• Kiwi
• Rice	• Banana
• Chilli	• Cut flowers
• Ginger	• Jackfruit

These products have an optimal scale of production at present leading to availability of marketable surplus, having high demand in export markets as well as having the ability to garner a premium position in the market owing to organic proposition.

In addition to these, other products relevant to the NER with eminent scope in the future were also identified.

Upcoming products in NER	
• Buckwheat	• Litchi
• Honey	• Bamboo Shoot
• Passion Fruit	

Currently the production of these products is not well captured. However they possess significant merits and demerits on both supply as well as demand side.

Strengthening of value chains from producer till consumer is the need of the hour in NER for boosting exports from the region

The agricultural/ horticultural produce value chains in the NER are marred by several challenges ranging from inadequacy of infrastructure, unavailability of processing industries, production and aggregation issues etc. To counter these challenges and to promote exports from the region, the value chains need to be strengthened adequately by understanding the inherent strengths and weaknesses of them. A framework is developed for the same and is based on 5 enabling pillars which are as follows:

For leveraging the organic potential of the region, Sathguru emphasized on the need for making the NER an organic hub of India and utilizing its strength to the fullest. This involves identifying and focusing on specific crops to be marketed for a premium, awareness creation for organic farming, capacity building and a plan to bring on board a reputed certifying agency. Development of infrastructure and supply chain separately for organic combined with awareness creation, mass communication and branding is of vital importance.

To **enhance efficiency of rural supply chains**, Sathguru highlighted the need for improving procurement processes and infrastructure in the region so as to facilitate and link the farmers with the market and thereby boosting their income. For this, Sathguru suggested a '**Hub and Spoke**' model involving farmers, collection centers and packaging 'hubs' at critical junctions in each state, thus creating a network to offer seamless transit for subsequent exports. Equal emphasis needs to be laid on post-harvest handling by promotion of pack houses, grading lines, cold storages, processing facilities, transportation infrastructure and marketing linkages which will go a long way in reduction of food losses and development of trade.

To **optimally utilize huge marketable surplus**, Sathguru charted out a portfolio of processed products by identifying specific value added products which deliver best returns on investment that is to be made in establishing infrastructure for processing. Given the absence of existing manufacturing capabilities in the region, ease of manufacturing is also considered as another factor in shortlisting the portfolio of processed products to focus upon.

Also, **improving quality and reaching to international markets** is vital so as to fetch premium prices for the products of NER. For the same, Sathguru analyzed the current export/import scenario from India as well as from other countries to the world market, identified target markets for products from the NER, and mapped the sanitary and phytosanitary requirements of the target countries.

Investments into **capacity building and skill development** is critical as a large part of success of the suggested action plan depends upon the technical and management skills of the personnel involved. The region has an abundant labor pool who is well versed with English and seeking employment as well. Imparting them with skills necessary for the industry will certainly help in development of an industry friendly ecosystem.

Apart from these, Sathguru also mentioned the need for seamless coordination between central and state level actors who need to come together in synergy so as to put strategies in place and plans in action. With optimal policy boost, development of infrastructure and improvement in trade links between NER and rest of the world the horticulture potential of the region is waiting to be suitably utilized in the future. Sathguru hopes that this study gives a clear indication of progression in this direction by laying out a vivid blue print which identifies potential products, viable markets, achievable targets and realistic strategies.

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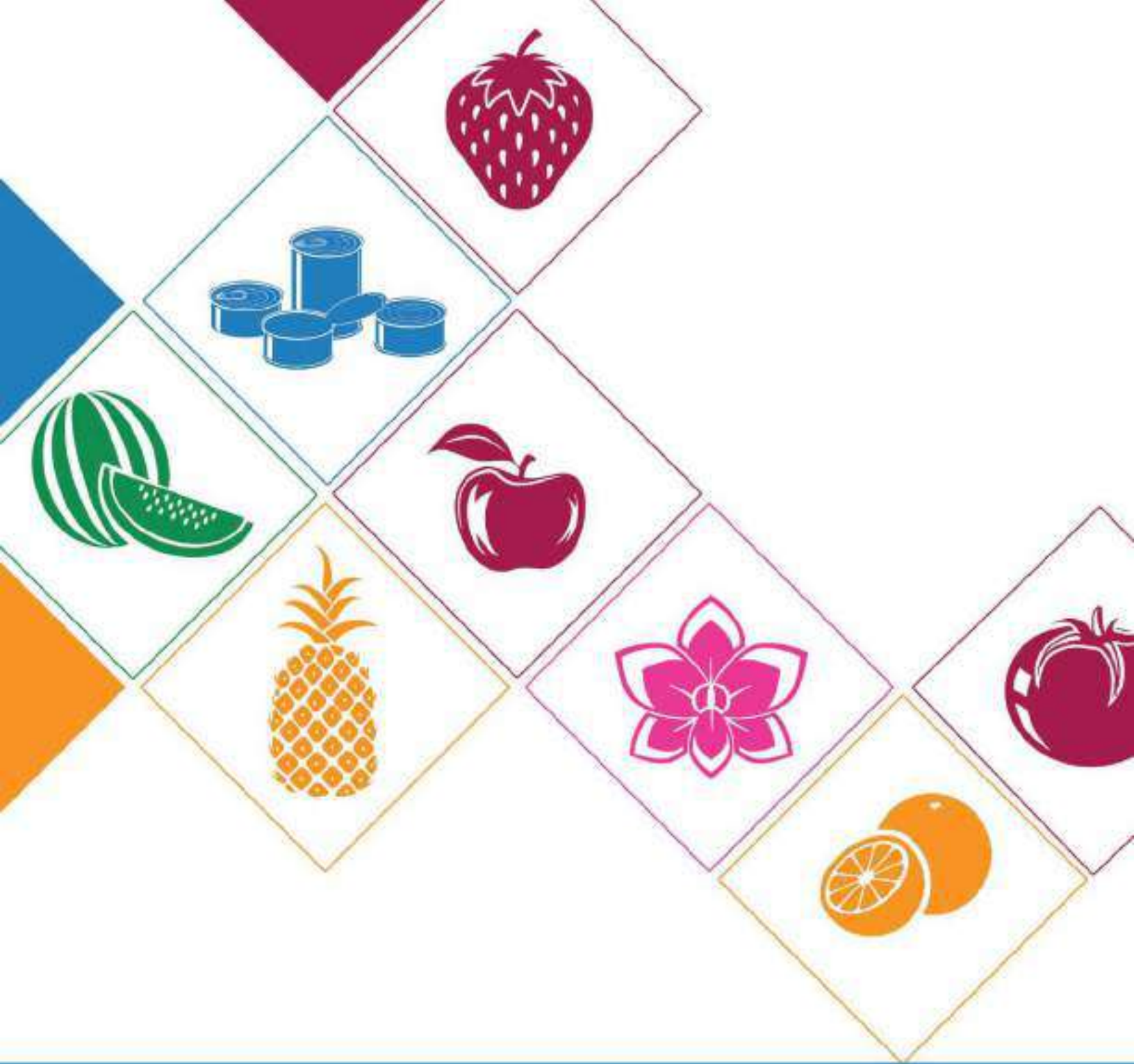
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List of Acronyms

AAU	Assam Agricultural University	HMNEH	Horticulture Mission for North East & Himalayan States
AFSEZ	Agro and Food processing Special Economic zone	ICAR	Indian Council of Agricultural Research
AIDC	Assam Industrial Development Corporation	ICD	Inland Container Depot
AMIGS	Agricultural Marketing Infrastructure, Grading and Standardization	ICP	Integrated Check Post
APEDA	Agricultural & Processed Food Products Export Development Authority	IICPT	Indian Institute of Crop Processing Technology
APEIDA	Arunachal Pradesh Export Infrastructures Development Agency	IIE	Indian Institute of Entrepreneurship
APHPM&PB	Arunachal Pradesh Horticulture Produce Marketing & Processing Board	IIT	Indian Institute of Technology
ASAMB	Assam State Agricultural Marketing Board	INM	Integrated Nutrient Management
ASEAN	Association of Southeast Asian Nations	INR	Indian Rupee
ATIF	Agri-Tech Infrastructure Fund	IPM	Integrated Pest Management
ATMA	Agriculture Technology Management Agency	IQF	Individual Quick Frozen
BBIN	Bangladesh, Bhutan, India, Nepal	ISAM	Integrated Scheme for Agricultural Marketing
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation	ITC	International Trade Center
BRAP	Business Reform Action Plan	ITI	Industrial Training Institute
CA/MA	Controlled Atmosphere/ Modified Atmosphere	IWAI	Inland Waterways Authority of India
CDB	Coconut Development Board	IWT	Inland Water Transport
CFTRI	Central Food Technological Research Institute	JAS	Japan Agricultural Standards
CIH	Central Institute of Horticulture	JICA	Japan International Cooperation Agency
DAC	Department of Agriculture and Cooperation & Farmers Welfare	km	Kilometers
DAHD&F	Department of Animal Husbandry, Dairying & Fisheries	LCS	Land Customs Stations
DARE	Department of Agricultural Research and Education	LOT	Lease, Operate and Transfer
DIPP	Department of Industrial Policy and Promotion	MBDA	Meghalaya Basin Development Authority
EU	European Union	MDoNER	Ministry of Development of the Northeastern Region
FAO	Food and Agricultural Organization	MGC	Mekong- Ganga Cooperation
FFS	Form Fill and Seal	MHLW	Ministry of Health, Labor and Welfare
FIEO	Federation of Indian Export Organizations	MIDH	Mission for Integrated Development of Horticulture
FPO	Farmer Producer Organization	MoFPI	Ministry of Food Processing Industries
FSMA	Food Safety Modernization Act	MOMA	Manipur Organic Mission Agency
FSSAI	Food Safety Standards Authority of India	NAB	National Accreditation Body
GI	Geographical Indication	NABARD	National Bank for Agricultural and Rural Development
GM	Genetically Modified	NABL	National Accreditation Board for Testing and Calibration Laboratories
GSDP	Gross State Domestic Product	NBM	National Bamboo Mission

List of Acronyms

NCDC	National Co-operative Development Corporation	NWDPRA	National Watershed Development Project for Rain fed Areas
NEC	North Eastern Council	OECD	Organization of Economic Co-operation and Development
NEDFi	North Eastern Development Finance Corporation Limited	PCQI	Preventive Controls Qualified Individual
NEHHDC	North Eastern Handicrafts and Handlooms Development Corporation	PPP	Public Private Partnership
NEIIPP	North-East Industrial and Investment Promotion Policy	PPQ	Plant Protection and Quarantine
NER	North East Region	PSU	Public Sector Unit
NERAMAC	North Eastern Regional Agricultural Marketing Corporation Limited	ROI	Return on Investment
NGO	Non-Governmental Organization	SARDP	Special Accelerated Road Development Program
NHB	National Horticulture Board	SFAC	Small Farmers Agribusiness Consortium
NHIDCL	National Highways and Infrastructure Development Corporation Ltd.	SH	State Highway
NHM	National Horticulture Mission	SHG	Self Help Groups
NIB	New Land Use Policy Implementation Board	SIDF	Social and Infrastructure Development Fund
NIDC	Nagaland Industrial Development Corporation	SIMFED	Sikkim State Co-operative Supply and Marketing Federation Ltd
NIFTEM	National Institute of Food Technology, Entrepreneurship and Management	SPV	Special Purpose Vehicle
NLCPR	Non Lapsable Central Pool of Resources	SSOCA	Sikkim State Organic Certification Agency
NMSA	National Mission for Sustainable Agriculture	TIDC	Tripura Industrial Development Corporation Ltd.
NPOP	National Programme of Organic Production	UAE	United Arab Emirates
NRCP	National Research Center on Pig	US/ USA	United States/ United States of America
NSDP	Net State Domestic Product	USFDA	US Food and Drug Administration
NSOP	National Standard for Organic Production	VGF	Viability Gap Funding
NW	National Waterways		



INTRODUCTION



1. Introduction

1.1 Northeast Region – An Overview

India's North East region (NER) comprising of 8 states (7 sister states of Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland & Tripura and Sikkim) and separated marginally by the 27 kilometer 'Chicken's Neck' Siliguri corridor of West Bengal is a treasure trove waiting to be explored. The region constitutes to 7.9% of the country's geographical area but only to 4% of its population. 66% of the total area is covered under forests and only 18% of the total area is under cultivation. Also around 84% of the population in the region is rural.

The region possesses several comparative advantages. The region contains most fertile soils with high organic matter. The region also has favorable climate which is suitable for cultivation of a wide variety of exotic crops. The region is one of the richest biodiversity zones in the country and is also one of the most ethnically, linguistically and culturally diverse regions in the country. The region is also a true frontier region with lucrative international borders stretching to over 4500 kilometers with neighboring countries namely China (Southern Tibet) in the north, Myanmar in the east, Bangladesh in the southwest, Nepal in the west and Bhutan to the northwest. It is also rich in natural resources, covered with dense forests and receives highest rainfall in the country. It is served by the mighty Brahmaputra & Barak Rivers and their tributaries which are the lifelines of the region offering immense irrigation, hydropower as well as inland waterways prospects. The region boasts of a high literacy rate (over 70%) and large number of people fluent in English. The region is supported by the central government in the form of a number of fiscal packages and incentives. A Non Lapsable Central Pool of Resources (NLCPR) was created for NER where several central ministries/ departments earmark 10% of their annual budget for expenditure in NER.

Comparative Advantages of NER



Fertile Soils



Favorable Climate



Bio-diversity



Frontier region



Natural resources



Opportunities-
Hydro power



High Literacy



Fiscal packages
and incentives

1.2 Policy Support for the region

The region also has been at the center of a number of policies specifically designed for the region. This territory of India poses challenges which are considerably different from the rest of the nation and hence necessitates interventions and policies which are customized and suited to the needs and issues of the region. Since independence, various governments have adopted varying strategies and plans to cater to the development of this region.

One such major policy is the **"Look East Policy"** which was introduced way back in 1991 with an objective to cultivate extensive economic and strategic relations with Southeast Asian and East Asian nations and

thereby counter the strategic influence of China on these nations. NER was envisaged as the gateway for the implementation of the policy and trade in agricultural commodities was envisaged as the starting point. With the new government coming in 2014, the focus of the look east policy has been realigned to give advent to **“Act East Policy”**. Abiding by the agenda, NER became a thrust for the eastward thrust and assumed a role of bridging the space between mainland India and Southeast Asian Nations. As a result recently there has been an increased emphasis on development of infrastructure in the region, development of roads, expansion of air connectivity, opening of new trade routes with the neighboring countries etc. The increased trade activity as a result of the emphasis is expected to transform the region and place it on par with other regions of the country. However care should be taken that the economic development thus achieved should be inclusive to all.

One of the other major breakthroughs was the formation of a dedicated Central Ministry of Development of the Northeastern Region (MDoNER) in 2001 (granted status of fully-fledged ministry in 2004). MDoNER was created for the purpose of facilitating the relations and the work between the Central Ministries and Departments and the State Governments of the NER mainly with regard to economic development. The key activities handled by the ministry include:

- Monitoring and management of Non Lapsable Central Pool of Resources (NLCPR) which is intended to ensure speedy development of infrastructure in NER
- Coordination and monitoring of externally aided projects like ADB road project, World Bank livelihood project etc.
- Management of Social and Infrastructure Development Fund (SIDF) and
- Management of associate organizations like
 - North Eastern Council (NEC) – a statutory body for regional planning and development of the North Eastern Region
 - North Eastern Regional Agricultural Marketing Corporation Limited (NERAMAC) – a Public Sector Unit (PSU) under MDoNER created for providing marketing support to farmers/ producers of the region
 - North Eastern Development Finance Corporation Limited (NEDFi) – a public limited company. It provides financial assistance to enterprises for setting up of industrial infrastructure and agri allied projects in NER.
 - North Eastern Handicrafts and Handlooms Development Corporation (NEHHDC) – a Government of India enterprise that is entrusted with the development and promotion of indigenous crafts of NER by connecting craftsmen to prospective markets.
- Hill Area Development Programme and Border Areas Development Programme in the NER

On the industrialization front, the North-East Industrial and Investment Promotion Policy (NEIIPP) came into effect in 2007 and tried to create a spur in the industrial activity in the region by offering fiscal subsidies and incentives.

Despite these significant efforts, the region still lags behind the rest of the country on most of the socio economic development indicators and is also one of the least industrially developed regions in the country. This shows the need for understanding in detail the lacunae in policy framing as well as implementation through NER lens and plugging them.

1.3 Economic Situation of NER

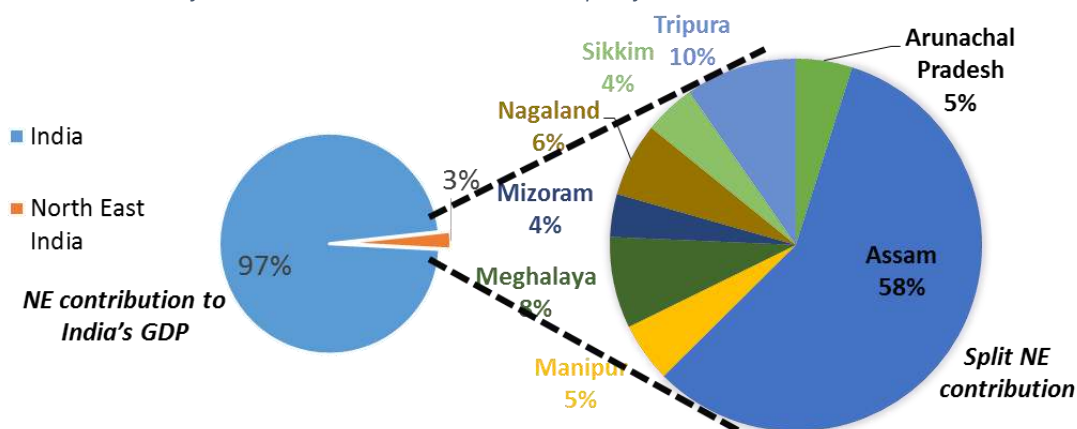
Gross State Domestic Product (GSDP)

The economy of the region is primarily rural and agrarian. Agriculture provides livelihood to 65%¹ of the region's population. Apart from this, handicrafts, handloom, construction, tourism and mining offer other opportunities for employment in the region. The area also boasts of huge land reserves as well as mineral deposits such as uranium, coal and natural gas. Industrialization in the region has not developed successfully and even small-scale industries have not been feasible due to lack of adequate economic infrastructure like transportation, communications, and market accessibility. Added to this, with the lack of definite private sector investment in the region (except Assam), the other states have lagged behind when it comes to contributing to the overall economy of the state as well as the country significantly. The region has also seen the emergence of a disproportionate service sector which is less productive and limited.

The region's economy faces low per-capita income, low incoming capital, inadequate infrastructure facilities, geographical isolation and communication gaps, hydro power potential, forests etc., low progress in the industrial field, lack of private and foreign direct investment and high un-employment rate among the literate people.

The chart below shows the contribution of NER to the country's GDP and the state wise split of the contribution.

Exhibit 1: Contribution of NER to India's GDP and the state wise split of NER contribution



Source: Sathguru Analysis, Niti Aayog data

From the above chart, it is observed that Assam is the major contributor to the NER economy contributing to around 58% of the region's contribution while the contribution from the rest of the states respectively is in single digits. These states also rank at the bottom when compared along with other states and union territories in the country. Even if the whole region is compared to the other states and union territories, the region will stand at 16th position which shows the backwardness of the economies. The following table shows the rankings of NE states as per their GSDP.

¹ NEDFi Databank

Exhibit 2: Ranking of NE states as per GSDP

State	Rank	State	Rank
Arunachal Pradesh	30	Mizoram	32
Assam	19	Nagaland	28
Manipur	29	Sikkim	31
Meghalaya	26	Tripura	25

Source: Sathguru Analysis, Niti Aayog data

Per Capita Income

The following table shows the per capita incomes of Northeastern states expressed as per capita Net State Domestic Product (NSDP). While the national per capita income stood at INR 74,380 only 4 out of the 8 states in NER have per capita income more than that of the national average. Only Sikkim has a 6 digit per capita income. However, it is observed that about 90% of the population of the region falls in the states with per capita less than that of national average which shows the economic conditions in these states.

Exhibit 3: Per capita income of NE states expressed as per capita NSDP

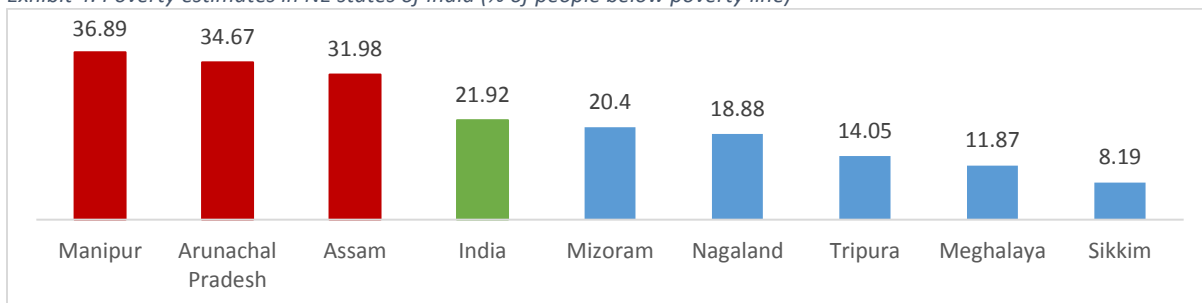
State	NSDP per capita (INR)	State	NSDP per capita (INR)
Arunachal Pradesh	85,468	Mizoram	76,120
Assam	44,263	Nagaland	77,529
Manipur	41,573	Sikkim	176,491
Meghalaya	61,548	Tripura	69,705
All India			74,380

Source: Sathguru Analysis & Department of economics and statistics of states

Poverty

Despite being one of the fastest growing large economies of India, poverty is still an important issue in the country. More than 11.6 million people in NER are living below the poverty line. While the national average stood at 21.92%, poverty in the states of Assam, Arunachal Pradesh and Manipur are around 31.98%, 34.67%, and 36.89% respectively. The states of Sikkim, Meghalaya, and Tripura fared well on poverty eradication parameters with the percentage of people living below the poverty line in these states being 8.19%, 11.87%, and 14.05%. The following chart shows the estimates on poverty in NE states.

Exhibit 4: Poverty estimates in NE states of India (% of people below poverty line)



Source: Sathguru Analysis & Press note on Poverty Estimates, Planning Commission, Government of India

Unemployment

Due to limited number of micro, small and medium enterprises, which are the employment generators in India, unemployment levels are high in the region. It is mostly either the government organizations or the educational institutions that the youth in the region are left with to seek a job. With limited options, the job versus population ratio is abysmally low in the other sectors. Simultaneously increase in degree holding unemployed youth is leading to brain drain. A large chunk of the population in the region is opting to move out of the region for studies as well as in search of employment. This also shows the need for the development of entrepreneurship in the region and thereby promote employment in the region. The following table shows the unemployment rate expressed as a percentage of labor force that is unemployed in the NE states.

Exhibit 5: Unemployment rate in the NE states of India

State	Unemployment Rate (%)	State	Unemployment Rate (%)
Arunachal Pradesh	8.9	Mizoram	3.0
Assam	6.1	Nagaland	8.5
Manipur	5.7	Sikkim	18.1
Meghalaya	4.8	Tripura	19.7
All India			5.0

Source: Sathguru Analysis & Report on Fifth Annual Employment-Unemployment Survey (2015-16)

All the above macroeconomic indicators point towards the glaring gap between the northeastern states and the rest of the country. The same is the case with respect to industrialization.

1.4 Industrialization in NER

Industrialization in the region has not been developed successfully and the presence of even small and micro scale units in the region is limited. The theories of industrial location suggest that the scale of industrialization depends upon a number of factors like

- Availability of efficient and economic labour as well as management personnel
- Availability of raw materials and their proximity
- Cheap and quick credit supply
- A network of good transport systems
- Marketing facilities
- Conducive natural and economic climate
- Presence of scientific and technical know how
- Stable political atmosphere
- Existence of complementary industries etc.

While the above list is exhaustive, usually all of these factors are not available at a single location and all these factors might not be equally important for each and every industry. In case of NER, the main strength of the region is the rich natural resource base while the main deterrent being transport and marketing bottlenecks. As the region lagged behind the country in the economic development for decades, the local

market hasn't developed and to look for markets beyond the region, weak connectivity to rest of the country as well as to the neighboring nations is a serious deterrent.

Contribution of manufacturing to state's GDP

The following table shows the contribution of manufacturing to the respective state's GSDP. While the national average stood at 12.89% for the year 2013-14 at current prices, except for the state of Sikkim where the contribution stood 39.6%, rest of the seven sister states fared poorly. These are the numbers that are observed despite the constant promotion by the central government by according special status to these states and providing several incentives for establishing industries which shows the seriousness of the problem.

Exhibit 6: Contribution of manufacturing to state's GSDP²

State	NSDP Manufacturing as % GSDP	State	NSDP Manufacturing as % GSDP
Arunachal Pradesh	1.8	Mizoram	1.1
Assam	8.1	Nagaland	1.9
Manipur	4.7	Sikkim	39.6
Meghalaya	6.7	Tripura	2.7
All India			12.9

Source: Sathguru Analysis & Ministry of Statistics and Programme Implementation

Gross Fixed Capital Formation

Gross fixed capital formation is a measure for net increase in the fixed capital. It includes spending on land improvements, purchase of plant, machinery/ equipment, construction of roads, railways, private dwellings, commercial and industrial buildings etc. Disposal of fixed assets is deducted from the total. It in a way represents the amount that is kept for value addition. The following table shows the Gross Fixed Capital Formation for the year 2013-14 in the NE states. From the table, it is observed that all the NE states fared poorly on GFCF parameter.

Exhibit 7: Gross Fixed Capital Formation in NE States (2013-14)

State	GFCF (INR million)	State	GFCF (INR million)
Arunachal Pradesh	-	Mizoram	-
Assam	19,188.7	Nagaland	47.6
Manipur	79.8	Sikkim	1041.2
Meghalaya	2629.5	Tripura	422.1

Source: Sathguru Analysis & Annual Survey of Industries, Ministry of Statistics and Programme Implementation

Ease of Doing Business:

The Department of Industrial Policy and Promotion (DIPP) in partnership with World Bank Group conducted an assessment of state implementation of business reforms. The assessment studied the extent to which the states implemented DIPP's 340 point Business Reform Action Plan (BRAP). While the

² For the year 2013-14 at current prices

national implementation average stood at 48.93% all the NE states scored much lower than the national average and occupied the bottom most ranks. Following table shows the ranks as well as the scores of the NE states.

Exhibit 8: Ease of doing business rankings of NE states (2016)

State	Score (%)	Rank	State	Score (%)	Rank
Arunachal Pradesh	0.30	31	Mizoram	0.89	29
Assam	14.29	24	Nagaland	1.49	26
Manipur	1.19	28	Sikkim	0.60	30
Meghalaya	0.30	31	Tripura	16.67	22

Source: Sathguru Analysis & Annual Survey of Industries, Ministry of Statistics and Programme Implementation

1.5 Overall connectivity status in the region

Roads and Railways

The Northeast region of India has certainly lagged behind the rest of the country in terms of connectivity and infrastructure. Different factors like undulating terrain, forest areas, civil, political and border conflicts contributed for the lag. However, with the recent interventions of the government, efforts as well as investments are on to improve the overall connectivity in the region.

The region has a total length of 411,913 kilometers of roads which covers all kinds of roads including surfaced and non-surfaced. The total length of surfaced state highways (SH) comes to 7697 km while the national highways amount to 9,525 km. In end of 2015, resources under Special Accelerated Road Development Program (SARDP) were pledged for the construction of 4,844 km of roads and highways in the region over the next few years. Subsequently, five major projects were started by National Highways and Infrastructure Development Corporation Ltd. (NHIDCL) in the state of Arunachal Pradesh. Another 18 projects were identified in the states of Tripura, Meghalaya and Arunachal Pradesh. Further with the assistance of Japan International Cooperation Agency (JICA) plans are on to build durable and environmentally sustainable roads in the states of Mizoram and Meghalaya.

On the railways front, massive push to railway infrastructure underway in the region. The railways ministry envisages to connect all the state capitals in the region by 2020 and also plans to significantly improve the intra-region rail connectivity. While rail connectivity already exists for capital cities of Guwahati, Agartala, and Itanagar, work has already started on four corridors to connect states of Meghalaya, Nagaland, Mizoram, and Manipur. Railways is also constructing a rail line to Sikkim. The major railway hubs in the region include Guwahati, Dimapur, Dibrugarh, Silchar, Tezpur, Lumding, and Jorhat. Naharlagun in Arunachal Pradesh, Bairabi Sairang in Mizoram and Jiribam in Manipur have just been connected to the national railway grid. The future looks bright as the railways have given a massive push to the development of the railway infrastructure in the North east. At present, 19 construction projects, viz. 12 new lines, 3 gauge conversions and 4 doubling projects are being executed in the NE Region at a total anticipated cost of INR 53,890 crore. These projects are posed to change the entire transport and in turn; the supply chain scene in the region thereby providing diversified opportunities to agri-stakeholders for transport and dissemination of produce and equipment.

Following table shows the details of road and railway connectivity in NER. More details about the upcoming road and railway projects are discussed in **Annexure H**.

Exhibit 9: Details of road and railway connectivity in NER

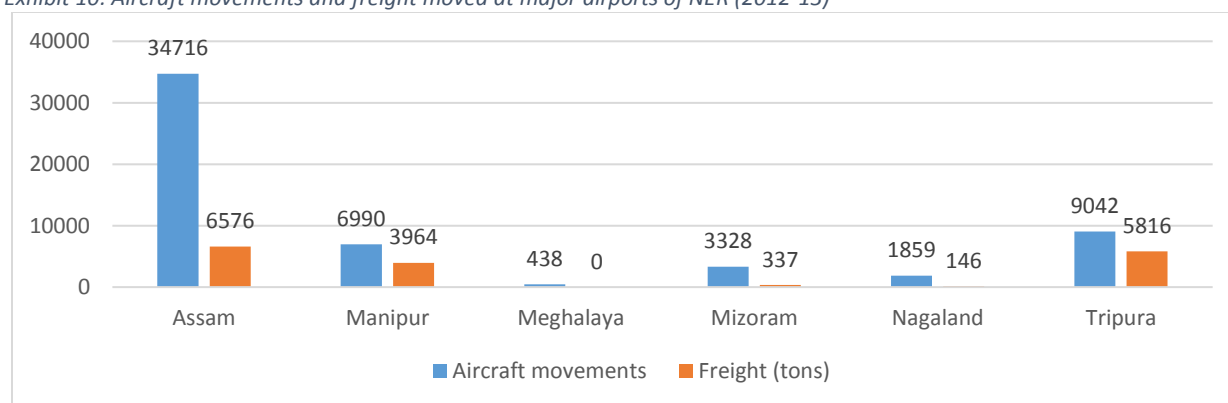
Particulars	Details
Total Road network – Includes surfaced roads (in km)	411,913
National Highways (in km)	9,525
Rail network (in km)	2,602
Broad gauge (in km)	1,454
Meter gauge (in km)	1,148

Source: Sathguru Analysis & Ministry of Development of North Eastern Region

Airways

The aviation scenario has improved tremendously in the NER, giving options for quick travel between states which used to take days before, by roads and limited railway connectivity. In total, 11 airports are currently operating from NER of which 2 (Guwahati and Imphal) have international connectivity. Guwahati is directly connected to Suvarnabhumi Airport of Bangkok and Paro airport of Bhutan while Imphal is directly connected to Mandalay International Airport of Malaysia. A new green field airport is coming up at Pakyong in Sikkim. As of now, Sikkim is catered to by Bagdogra Airport in West Bengal. All major commercial airlines operate out of the NER with Guwahati being the busiest airport of the lot. Guwahati Airport (and Kolkata in West Bengal) has a perishable cargo facility in this part of the country. NEC has shown intent to launch a dedicated airline connecting the capitals of all the states in the NER which will be jointly operated by the NEC and Pawan Hans Helicopters Limited. A brief summary of the air traffic and freight carried in the NER is depicted below:

Exhibit 10: Aircraft movements and freight moved at major airports of NER (2012-13)



Source: Sathguru Analysis & Ministry of Development of North Eastern Region

Inland Waterways

Northeast India has many large and small rivers providing facilities for water transport, especially in their plains sections. From the ancient period until roads were constructed, the Brahmaputra and Barak rivers were commonly used as the medium of transport. It is estimated that the NER has about 1,800 kilometers of river routes that can be used by steamers and large country boats. The Brahmaputra has several small

ports for transfer of passengers and cargo. In Arunachal Pradesh, the rivers Lohit, Subansiri, Burhi Dihing, Noa Dihing, and Tirap are used for navigation by small country boats in those stretches where there are no rapids. The rivers Dhaleshwari, Sonai, Tuilianpui, and Chintuipui in Mizoram are also used for navigation with small country boats in convenient stretches. Similarly, in Manipur, the Manipur River, along with its three main tributaries, the Iril, Imphal, and Thoubal, is used for transporting small quantities of merchandise by country boats.

Out of the 5 National Waterways (NW) of India, the Brahmaputra section from Dhubri to Sadiya has been designated as NW 2. River Barak in Assam (for a length of 121 km) is also expected to be declared as National Waterway after the Bill is passed in the Parliament. This can contribute immensely to carrying cargo to and from the region. The Inland Waterways Authority of India (IWAI) is emphasizing on Inland Water Transport (IWT) as it is operationally cheaper (Water transportation cost INR 0.5/km in comparison to INR 1 by railways and INR 1.5/km through road), high in fuel efficiency and environmentally friendly. Our neighbor, China undertakes 40% of its transportation through inland waterways while the rate in India stands at 6% as of July 2016. The IWT Action Plan as per the NER Vision 2020 has identified the following waterways:

Exhibit 11: Waterways identified by MDoNER for action plan in NER 2020

S.No	Name of the river	State	Navigable Length (km)
1	Buridhing	Assam	161
2	Disang	Assam	129
3	Gangadhar	Assam	113
4	Subansiri	Assam, Arunachal Pradesh	143
5	Kopili	Meghalaya, Assam	103
6	Kolodyne	Mizoram	112
7	Kolong	Assam	121
8	Katakhal	Assam	161
9	Panchas	NA	105
10	Gumti, Haora	Tripura	-
11	Loktak Lake	Manipur	-

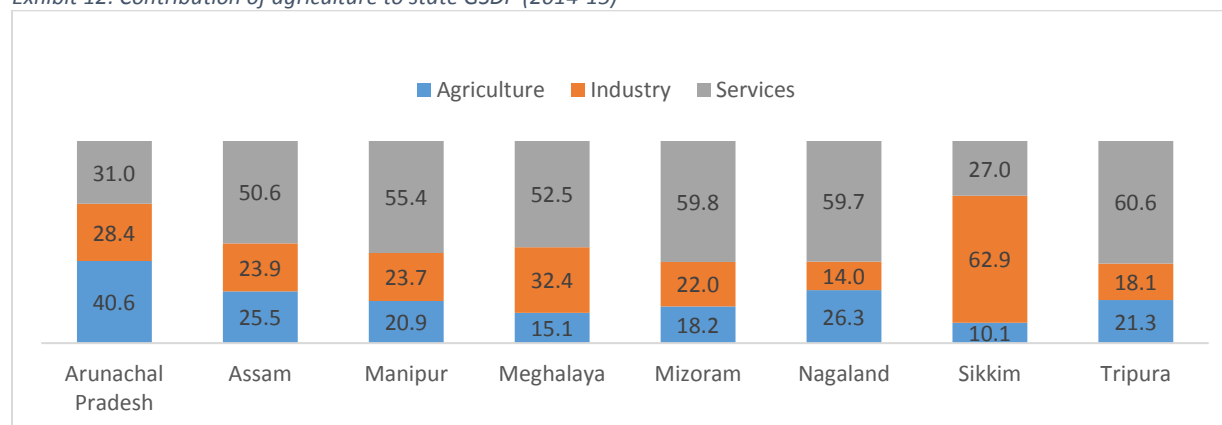
Source: Sathguru Analysis & Ministry of Development of North Eastern Region

Considering the immense possibilities of IWT in reducing costs and increasing connectivity in the NER, the National Waterways Bill, mDoNER, and IWAI are making concrete efforts in operationalizing this mode of transport.

1.6 Importance of Agriculture for NER

The economy of the region is primarily rural and agrarian. The contribution of agriculture to the respective GSDP varies between a minimum of 10.1% in Sikkim which is primarily a tourism driven state to a maximum of 40.6% in Arunachal Pradesh. The following chart shows the contribution of agriculture to the state GSDP and thereby the importance of agriculture to the region's economy.

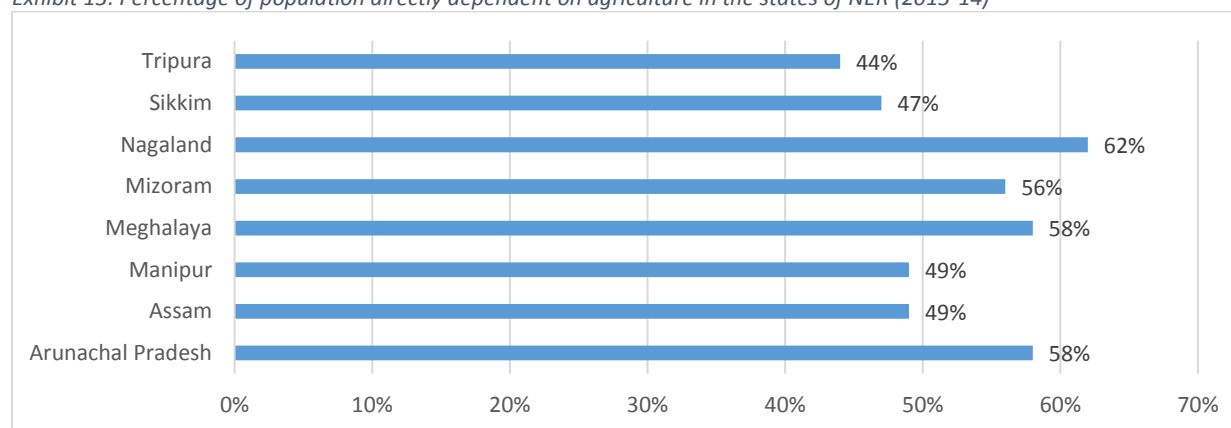
Exhibit 12: Contribution of agriculture to state GSDP (2014-15)



Source: Sathguru Analysis & Niti Aayog

Apart from being the main contributor to the economy of the region, the agricultural sector provides direct employment to a number of people in the region. It is the key economic activity for a large number of people in the region. The percentage of the population directly dependent on agriculture in the region varies between 44% in the state of Tripura to as high as 62% in the state of Nagaland. Indirectly, agriculture provides employment to a much larger population in the region. The following graph shows the percentage of the population that are directly dependent on agriculture in different states of NER.

Exhibit 13: Percentage of population directly dependent on agriculture in the states of NER (2013-14)



Source: Sathguru Analysis & North Eastern Council (NEC)

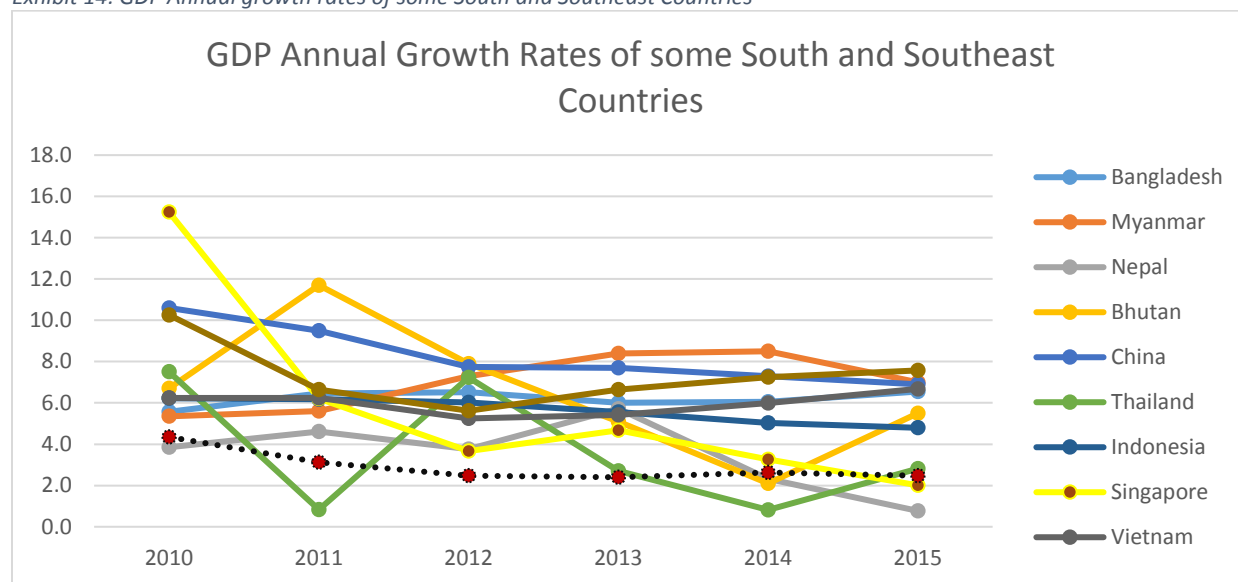
The above scenario is an outcome of state and central schemes implemented in a phase wise manner in the region, albeit inefficiently. It shows that there is immense potential in the agricultural sector of the north east which, if tapped and exploited robustly, in tune with the comparative advantages of the region, can help in boosting the economy of the region like never before. An available labor pool, the presence of resources and crop diversity are well suited to this cause and they already exist in the region.

Given that agriculture is key to NER's economy and given that a large number of people are dependent on agriculture any intervention in the sector will have a positive effect on the entire region. Given that the region is a frontier region sharing 98% of its borders with the neighboring nations, the focus should be on the promotion of agricultural produce exports which is also the focus of this study.

1.7 Emerging Export Potential for the NER – Opening of South & Southeast Asian Markets

The following graph shows the annual GDP growth rates of some of the South and Southeast Asian countries. From the graph, it is observed that majority of the nations are growing at a much faster pace compared to world average.

Exhibit 14: GDP Annual growth rates of some South and Southeast Countries



Source: Sathguru Analysis & World Bank

The following is a small summary of the India's strategic relationships with neighboring as well as some southeast nations and the role that is played by NER.

Bangladesh

India and Bangladesh share a special relationship which is rooted in a common cultural heritage and forged by common aspirations of the people. These relations have witnessed a substantial upswing over the past decade overcoming several challenges. The country today is stabilizing politically and is quickly transforming on several socio economic fronts. Due to the recent border restructuring agreement, the opening of Bangladesh, Bhutan, India, Nepal (BBIN) route, the opening of Petrapole Integrated Check Post and laying of foundation stone for Chittagong port, India has forged stronger ties with Bangladesh in the recent past. Bangladesh is also one of the largest importers for Indian produce. The bilateral trade between India and Bangladesh touched USD 7 billion.



Myanmar

Myanmar, in particular, occupies a special position in India's matrix of ties with ASEAN states. After all, it is contiguous to India's Northeast region, sharing a land boundary of 1,700 km with four states including Manipur, Mizoram, Nagaland and Arunachal Pradesh. Major infrastructure projects such as the India-Myanmar-Thailand Trilateral Highway can prove to be a game-changer to connect India's Northeast with ASEAN. India is also party to the ambitious Trans-Asian railway project, though progress has been less than satisfactory because of the weak political will of the stakeholders and differences in alignment of the rail network among participating countries. Without adequate cross-border connectivity, it would be highly difficult for India's Northeastern states to reap the full potential of the Act East Policy. The country has moved out of the military rule and adopted democracy. India is the 4th largest trading partners of Myanmar.



Nepal

Nepal and India recently had a swinging relationship. Post India's interventions in Nepal constitution, India is being looked as an imposing big brother. However, with the new prime minister in Nepal, the focus should be on restoring the ties back. China's proximity to Nepal also should not be undermined. In 2014, Nepal imports stood at \$7.75B, making it a promising destination for Indian exports. On the other hand, India is also the top importer for Nepal, constituted 61% to the total imports of Nepal. There is a considerable demand for grains, vegetable products and tropical fruits in Nepal which can be supplemented by India. India's exports to Nepal stood at \$4.74B followed by China (\$1.16B), the United Arab Emirates (\$415M), Indonesia (\$136M) and Hong Kong (\$119M). At present India-Nepal Official bilateral trade is the one which is seen in records, but unofficial trade between the two countries has flourished over the recent decades. Siliguri Corridor can be explored to channelize produce from NE to Nepal. Unrestricted trade and easy access to land transportation to boost official bilateral trade between India-Nepal should be worked upon.



Bhutan

Bhutan is a small landlocked country between two Asian giants, India and China. It is the country that is most integrated with India both economically and security wise. The country's border with India is 699 km long and adjoins the Indian states of Assam (267 km), Arunachal Pradesh (217 km), West Bengal (183 km), and Sikkim (32 km). The top import origins of Bhutan are India (\$173M), Japan (\$17.4M), China (\$11.1M), Singapore (\$4.67M) and Germany (\$4.66M)³. India constitutes 73% of the total imports for Bhutan. Building up on the economic cooperation will certainly help in strengthening of ties between India and Bhutan.



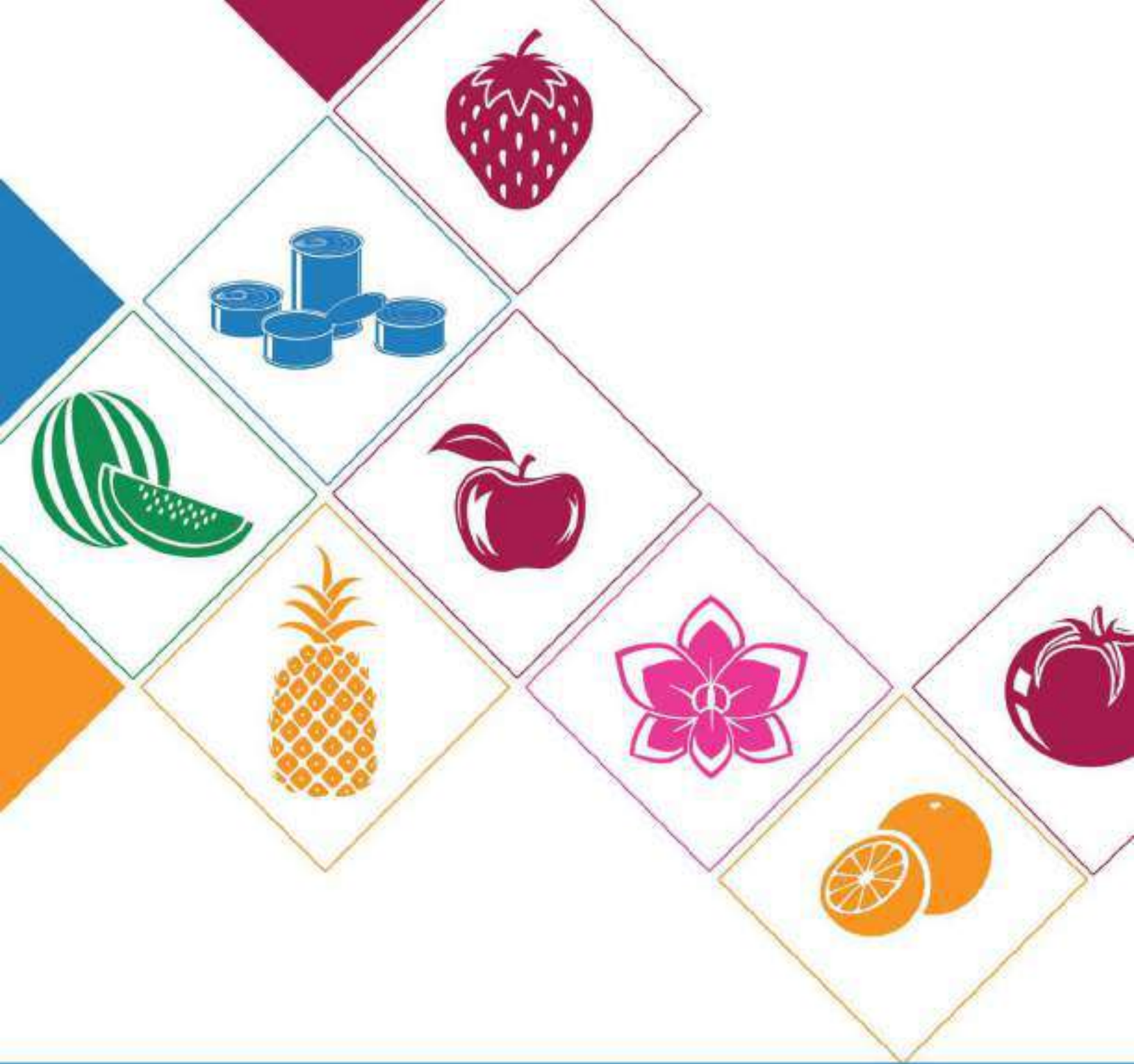
³ Organization of Economic Co-operation and Development (OECD)

Association of Southeast Asian Nations (ASEAN)

The Association of Southeast Asian Nations (ASEAN) is a regional organization comprising ten Southeast Asian nations which promote intergovernmental cooperation and facilitates economic integration amongst its members. Founded in 1967, ASEAN today encompasses Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. It is a major global hub of manufacturing and trade and is also one of the fastest growing consumer markets in the world. For ASEAN, India is viewed as an epicenter of economic development and a potential business avenue while for India, ASEAN offers infinite potential. Today ASEAN is the fourth largest trade partner for India. Given the geographical proximity of NER to ASEAN region, there is a need for NER's participation to be enhanced in this trade.



With the South and Southeast Asian countries becoming politically stable and economically progressive, this is the right time to focus on NER.



PROJECT BACKGROUND



2. Project Background

2.1 Project Objective

The primary objective of this project is to identify agricultural products which offer immense potential for improving exports from NER and thereby prepare a comprehensive action plan to tap the potential.

2.2 Project Background

Despite several inherent natural advantages that NER possesses, the region, however, is challenged by inefficiencies at several levels, the true potential of the region is not getting harnessed and the region has not grown on par with the rest of the regions in the country. Realizing the same, APEDA has proposed a detailed study to understand in detail the bottlenecks for tapping the true potential of NER and thereby prepare a comprehensive and actionable road map taking into consideration all the stakeholders involved.

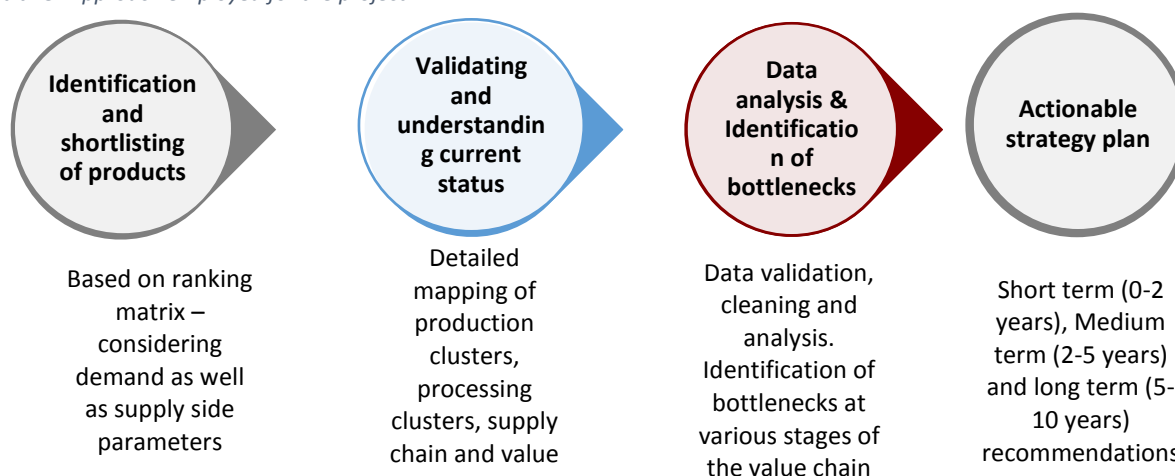
Thus the scope of work for this study involved the following activities:

- ✓ Identifying most promising products that are available in NER and which offer huge export potential.
- ✓ Mapping the existing situation of production, organic farming and production clusters, processing, processing clusters, infrastructure, exports, government support etc. of each of the identified products.
- ✓ Basis the collected data creating projections for exports for these products and
- ✓ Suggesting implementable action plans to counter the challenges and harness the potential of NER.

2.3 Approach & Methodology employed

A phased approach was taken for the completion of the study which is divided into distinct phases and is described below. Each of the tasks is detailed subsequently.

Exhibit 15: Approach employed for the project



Data for the above exercise was collected from secondary sources as well as through extensive primary research. Exports and imports data of different countries and different commodities were collected from databases like AgriXchange database of APEDA, FAOSTAT database of Food and Agriculture Organization of the United Nations and International Trade Center (ITC) database. Several published reports, journals, newspaper articles were also referred for collecting secondary information. On the primary research part, structured interviews were carried out with different stakeholders. Around 93 stakeholders consisting of government personnel, industry personnel, as well as scientists/ academicians, were contacted for the purpose of this study. The contact details of the stakeholders are provided as **Annexure G**.

2.4 Identification and shortlisting of products

Identifying the right products which offer the best potential for exports is the key step for the study. For the purpose of this study, Identification of products was based on a ranking matrix which is developed based on the following parameters. All the major products in the NER were ranked against the parameters in the matrix and the best products which offer better export potential were selected for further analysis.

Product is defined as

Primary produce that APEDA handles which are either from agriculture/ horticulture/ floriculture / animal husbandry (aquaculture excluded)/ forestry

The varietal differences (Ex: Bao rice) and value added/processed products from the raw produce (Ex: Canned pineapples) are dealt inside the main product.

The detailed description of the shortlisting parameters for the selection of the products which are further segmented into supply side and demand side parameters is as follows.

Shortlisting Parameters

SUPPLY SIDE PARAMETERS

Current production levels of the product in the region: Adequate levels of production is the key for any interventions to be carried out in the product domain. Since majority of the farmers in the region are small and marginal, the production levels also indirectly represent the socio-economic dependence of the population on the product/ crop and hence any intervention in the product domain will influence a large part of the farming community. So as to quantify this parameter and place it in the ranking matrix, percentage of product that is produced in the region as compared to the rest of India is used as a metric.

Marketable surplus in the region: The market surplus of the region which is defined as the net of product produced in the region and the product that is consumed internally in the region is key for exports as it determines the maximum quantity of the product that can be exported from the region. So as to quantify this parameter and place it in the ranking matrix, marketable surplus as a percentage of total production is used as a metric.

Current exports from the region: The volumes of current exports in a way acts as a proxy to the systems and infrastructure that are in place for the exports. The systems once in place creates easy pathway for further increasing the exports volumes as well as value. So as to quantify the representation of the region, exports as a percentage of market surplus is used as a metric.

Comparative advantage for NER: North East Region due to its location, climatic conditions, soil types, topography etc. possesses certain inherent comparative advantages. Some of the crops/products grown in this region are unique to the region while some crops are grown in a season which is different from the rest of the world. This parameter is used to capture such inherent advantages and is populated in the ranking matrix based on our analysis.

Integration of activities for exports: Inadequacy of processing infrastructure is one of the key challenges of the region. Establishing the infrastructure along with support systems takes time. Hence, the products where majority of the trade happens in fresh form where NER can participate in the trade immediately with little interventions are preferred compared to the products where majority of the trade happens in processed form and establishment of the infrastructure for manufacturing those products is capital intensive as well as time consuming are less preferred. This parameter is used to capture the requirements and is populated in the ranking matrix based



DEMAND SIDE PARAMETERS

International demand for the product: The total trade that happens in the international markets indicates the gap between the demand and supply of countries of production and consumption. This is one of the key parameters as higher the total amount of trade higher is the scope for exporting the products. So as to quantify this parameter and place it in the ranking matrix, international trade as a multiple of marketable surplus is used as a metric.

Competition in international markets: This parameter helps in understanding the competition present in the international trade of the particular product. A monopolistic or oligopolistic situation (where the international trade is catered mainly by handful of countries) is difficult to target while the scope of exports in case of open market situation is certainly higher. So as to quantify this parameter and place it in the ranking matrix, the market share of the top 3 exporting countries in the world trade is used as a metric.

Economic value of the product & ability to absorb higher transportation costs: One of the major challenges, NER faces today is with connectivity. The support infrastructure for industries like roads and railways though being developed at a faster pace is still in bad shapes. Hence the products which have higher economic value and the ones which can absorb higher transportation costs of air lifting are preferred compared the ones with lower economic value. Since the per ton transportation cost through is independent of the type of the product that is being shipped, the retail price of the product itself is taken as a proxy for this parameter.

Premium for organic: Vast agricultural lands in the NER are organic by default. With the ever increasing demand for organic products in the international markets and the premium that is paid for the organic products in these markets will certainly improve the scope increasing the exports provided the certification of the farms is taken for. Higher is the premium that is paid for organic products vis-à-vis regular products, higher is the scope for absorbing costs and higher is the export potential. % premium that is paid for organic products is taken as a metric to quantify the parameter.

Ranking Matrix

The following table shows in detail the ranking matrix that is developed for shortlisting the products for further analysis. The detailed tables with the background data for the ranking matrix were provided in **Annexure A**. Weightage is allotted to each of the parameters depending upon their importance and major products that are produced in the NER are rated against each of the parameters. A weighted overall score is then calculated basis which ten (10) products are shortlisted for further analysis.

Exhibit 16: Ranking matrix for shortlisting the products for further analysis

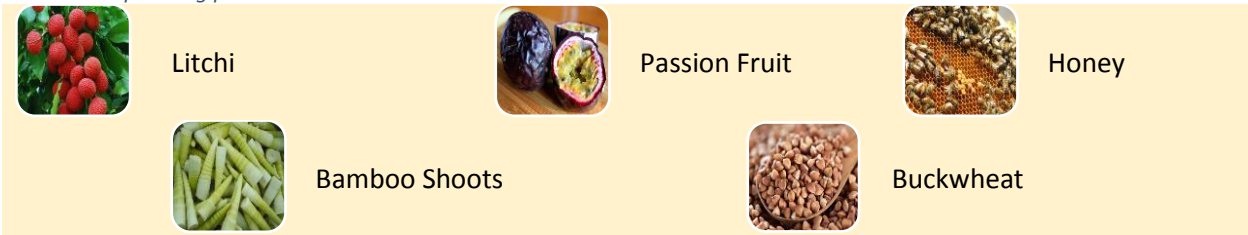
S. No	Product	Current production levels of the product in the region	Marketable surplus in the region	Current exports from the region	Comparative advantage for NER	Integration of activities for exports	International demand for the product	Competition in international markets	Economic value of the product	Premium for organic	Overall Score	
		Weightage										
		20	15	10	10	5	15	5	10	10		
1	Orange	4	5	2	4	2	3	3	3	3	3.5	
2	Pineapple	5	5	1	5	1	2	2	3	3	3.5	
3	Rice	2	2	3	5	3	5	4	3	4	3.4	
4	Chilli	2	2	2	5	3	5	4	4	4	3.4	
5	Ginger	5	5	2	4	2	2	2	2	2	3.4	
6	Lemon	3	5	1	5	3	3	3	2	2	3.3	
7	Kiwi	4	5	1	3	1	4	1	4	4	3.3	
8	Flowers	3	3	2	4	2	4	2	5	1	3.1	
9	Jackfruit	5	5	1	2	1	2	2	3	2	3.0	
10	Banana	3	4	2	2	3	3	3	2	4	2.9	
11	Litchi	2	5	1	4	1	2	3	4	4	2.9	
12	Passion Fruit	2	4	1	4	1	3	3	4	3	2.9	
13	Honey	1	4	1	4	1	3	3	5	5	2.8	
14	Grapes	1	1	2	1	2	5	1	4	4	2.1	
15	Areca nut	4	1	1	1	3	2	2	2	2	2.1	
16	Cabbage	2	4	1	1	1	2	2	2	2	2.0	
17	Cashew nut	1	2	1	1	1	4	2	4	4	2.0	
18	Papaya	2	3	1	1	1	2	3	2	2	2.0	
19	Mango	1	1	1	1	1	3	4	4	4	1.9	
20	Apple	1	1	1	1	1	5	1	4	4	1.9	
21	Cauliflower	2	3	1	1	1	2	2	2	2	1.9	
22	Maize	1	1	1	1	1	5	1	2	4	1.8	
23	Brinjal	1	2	1	1	1	3	3	2	2	1.8	
24	Peas	1	2	1	1	1	3	2	3	3	1.8	
25	Guava	1	1	1	1	1	3	3	3	3	1.7	
26	Okra	1	3	1	1	1	2	2	2	2	1.7	
27	Onion	1	1	1	1	1	4	1	3	3	1.7	
28	Tomato	1	3	1	1	1	1	1	2	4	1.5	
29	Potato	1	1	1	1	1	1	1	1	2	1.1	
	Very Good	5	Good	4	Average	3	Below Avg.	2	Bad	1		

Based on the above ranking matrix, the following products are shortlisted for further analysis. In addition to these, other products relevant to the NER with eminent scope in the future were also identified.

Exhibit 17: Products shortlisted for further analysis



Exhibit 18: Upcoming products in NER

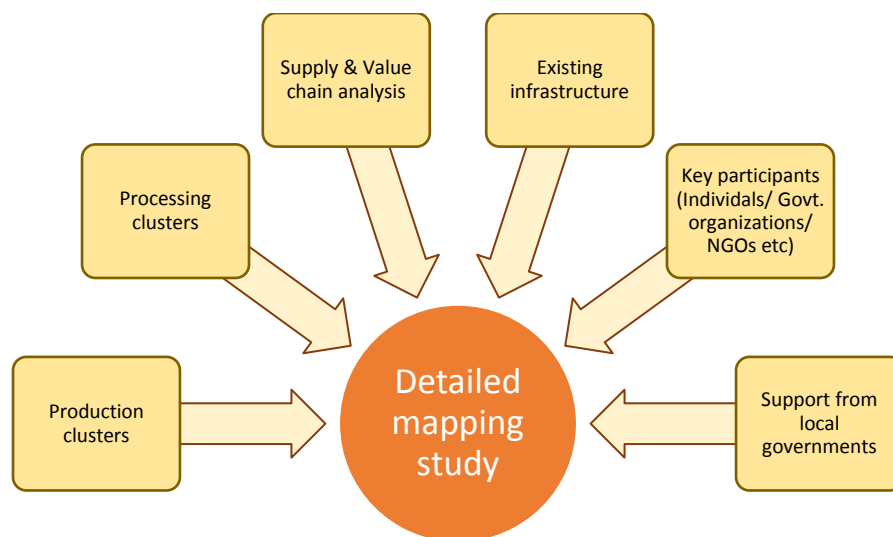


The complete analysis of these products with details on the varieties that are grown in NER, their characteristics, production regions and statistics, package of practices adopted by the local people, supply chain and value chain of the product, existing infrastructure, list of possible products and the export status with respect to the product are mentioned in the next section.

2.5 Mapping current scenarios for each of the identified products

For each of the identified products, a detailed mapping study was carried out to map the current scenario of the product in each state. The following figure shows different modules of the study that was carried out for the identified products. The details collected under each module is explained subsequently.

Exhibit 19: Different modules of detailed mapping study



Production clusters: A detailed mapping of the production scenario along with the identification of production clusters (key districts of production) was carried out and mapped for each of the identified products. In the production clusters, details of planting material variety, a package of practices that are being followed, post-harvest practices and availability of support infrastructure was analyzed and presented in the report.

Processing clusters: There is a heavy inadequacy of infrastructure with respect to processing in the NER. Some new production plants were established in the recent past however, a number of production plants that were established in the past were in-operational due to different issues. A detailed mapping of the infrastructure that is currently running based on primary data collected was presented in the report.

Supply chain and value chain analysis: Detailed supply chain analysis mapping all the players at all the levels and a detailed value chain analysis tracking the value addition that is taking place at different levels and the percentage of customer rupee that is going to each of these players is mapped and analyzed in the report. A case study of inefficiencies and best practices was highlighted. Also, countries to which the products are being exported currently were identified and other countries that can be targeted was highlighted. Details of sanitary and phytosanitary requirements of these countries were presented in the strategy section of the report.

Existing infrastructure: Mapping of infrastructure that is existing in the region and is being utilized for production or processing or marketing of produce or exports of the products was done and the need/ bottlenecks in the infrastructure was analyzed and mentioned in the report.

Identification of key participants: Key participants who can be either an individual or an organization or a government body who is actively participating in the value chain of the identified produce were identified and mentioned. This helps in routing product specific recommendations through the identified participants.

Support from local governments: All the key governmental organizations who are involved either directly or indirectly with any part of the value chain of the identified products were recognized and the key interventions that these bodies are implementing were mapped. This helps in improving the levels of collaboration among these organizations and convergence of different activities that are being carried out by these players..

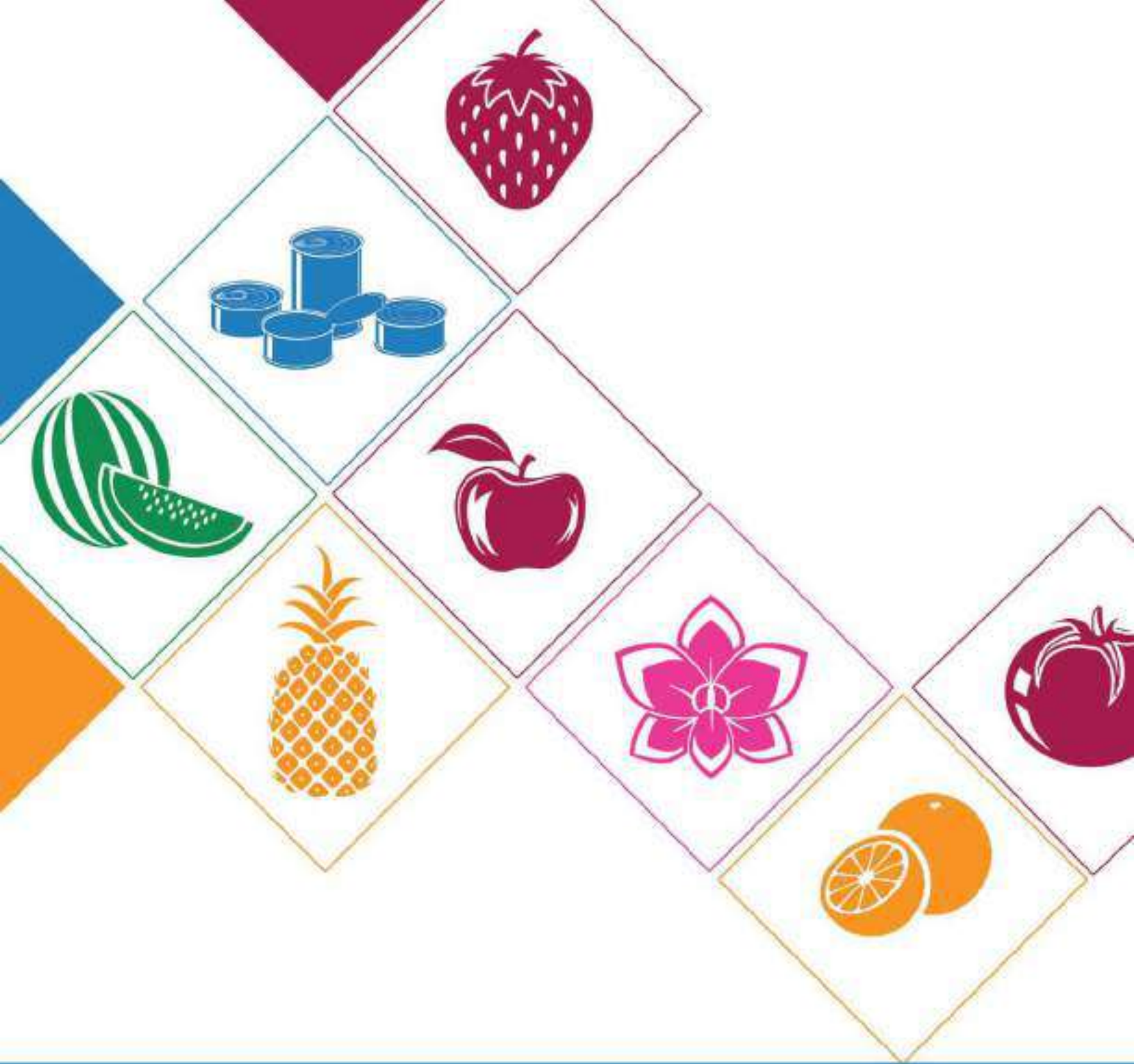
The thorough mapping exercise provides a detailed understanding about the current scenario that is prevailing in different states with respect to different products, bottlenecks/ challenges that are present at different levels which are acting as an impediment to exports growth. An action plan which is highly implementable was suggested based on this understanding.

2.6 Actionable Strategy Plan

A comprehensive action plan covering in detail recommendations on the following aspects is presented in the report.

- **Production:** Plant varietal selection, package of practices for production and harvesting, usage of inputs, irrigation etc.
- **Processing:** Post harvest management of produce, installation of new processing facilities/ upgradation of technologies of existing facilities, value added products that can be produced from the produce, skill development among locals, food safety management systems of the facilities, development of logistics infrastructure, optimum business models for the established infrastructure etc.
- **Marketing:** Different countries that can be targeted for the products and planning promotional activities to promote these products in target countries
- **Policy:** Necessary incentives and policy level interventions that are required to expedite the exports of the identified products from NER

A separate road map is presented in the report for organic produce which discusses in detail the locations for production of organic produce, countries to be targeted for exports, certifications, skill development etc. Based on the detailed mapping exercise that was carried out and the data collected in the exercise, realistic scenarios (scenarios based on the success rate of the measures taken to promote exports) have been presented in detail in the report.



PRODUCT PROFILES



3. Product Profiles

3.1 Orange (Khasi Mandarin)

The citrus industry in India is the 3rd largest fruit industry of the country after mango and banana. A variety known as 'Khasi mandarin' (named after Khasi Hills – region in Meghalaya) is the main commercially grown variety of mandarin in Assam, Meghalaya and other states of the NER. It is consumed fresh or in the form of juice, jam, squash and syrup. It is the main source of peel oil, citric acid, and cosmetics which have international market value. Premium sugar content, color, aroma and prolonged shelf life makes the Khasi Mandarin one of the most sought after commercial crops in the NER.

Varieties and Characteristics

The agro-climatic conditions of the northeastern India support cultivation of Khasi Mandarin in the region.



Khasi Mandarin

- Covers the largest cultivation area in the region due to its commercial value.
- Assam and Meghalaya have the maximum area and production of Khasi mandarin.
- Shape globose/oval, orange-yellow to bright orange with high juice content
- TSS (Total Soluble Sugar): 12-14%

Production

Dima Hasao (North Cachar) Hills and Kamrup in Assam, Tamenglong in Manipur and East Khasi hills in Meghalaya have been at the forefront of mandarin production in the NER. Khasi mandarins from the NER contributed 3.60 Lakh Tons (10%) to the total of 34.61 Tons of oranges produced in India in 2014⁴. The following table shows the key mandarin producing districts in different states of NER. The same is also represented in the map of NER.

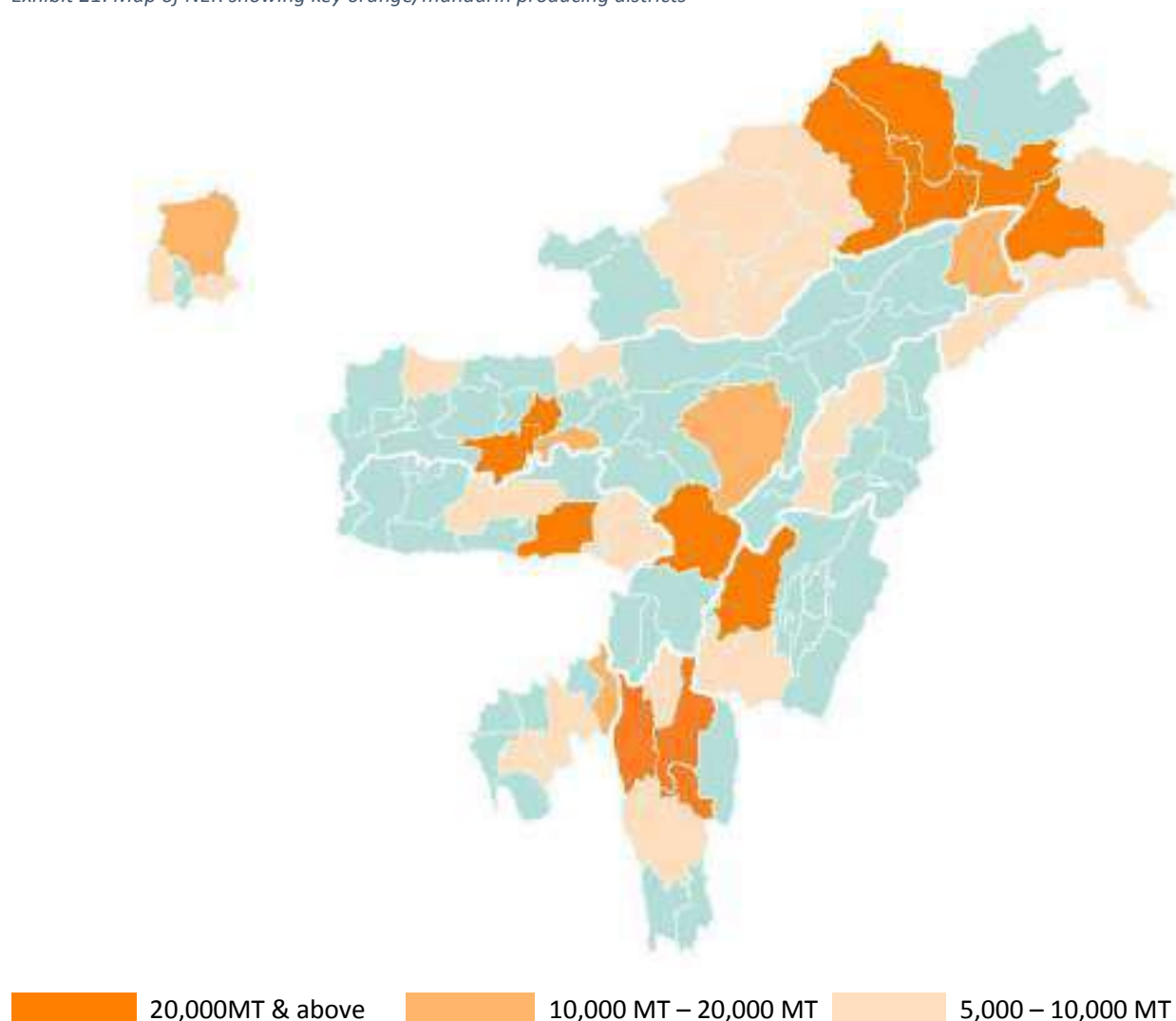
Exhibit 20: Key orange/ Mandarin producing districts in NER

State	Key orange/ mandarin producing districts
Arunachal Pradesh	Lohit, Roing, Upper Siang, West Siang, East Siang
Assam	N.C. Hills, Kamrup (Rural), Tinsukia, Kamrup (Metro), Karbi Anglong
Manipur	Tamenglong, Churchandpur
Meghalaya	East Khasi Hills, Jaintia Hills, West Khasi Hills, West Garo Hills
Mizoram	Serchhip, Aizawl, and Champhai
Nagaland	Mokukchung, Wokha, Kohima, Kiphire
Sikkim	East Sikkim, West Sikkim, South Sikkim
Tripura	North district, Dhalai, Gomati district , West district

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

⁴ National Horticulture Board Statistics 2015

Exhibit 21: Map of NER showing key orange/mandarin producing districts



Package of Practices

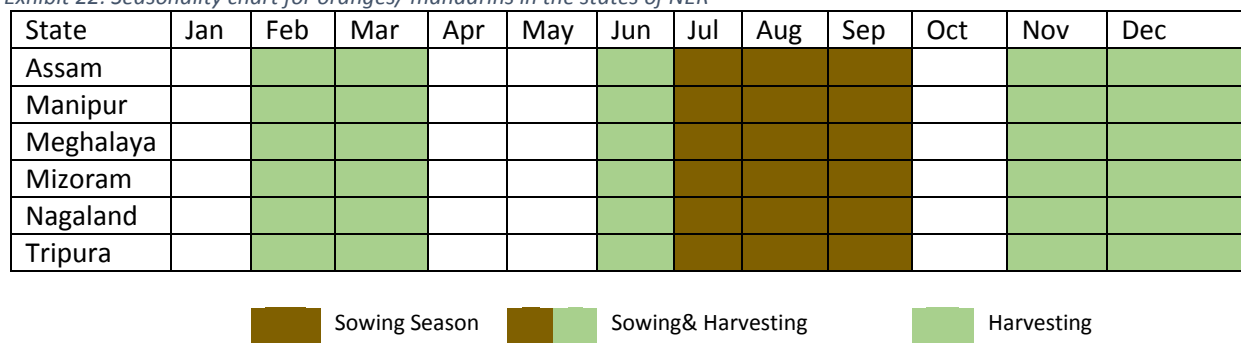
Economic situation of mandarin farming: The mandarin production in the region is dominated by medium and large farmers who together constitute more than 80% of the landholdings in major mandarin producing states of NER.

Production Practices: The Khasi mandarin orchards are nearly 50-100 years old in the region, which has gradually led to lower productivity over the years. One hectare orchard accommodates 350-400 trees. The fruit bearing per tree is nearly 350-400 fruits. The embedding of buds is carried out before the monsoon months (viz. between May and August). The produce is naturally organic except few farmers who utilize fertilizers and micronutrients from government departments. However, the proportion applied is negligible. A new trend which has come to the fore is application of lime in the fields. The

orchards are rain-fed with no irrigation facilities during the growth years. Irrigation thorough alternate means is in its nascent stage and hasn't taken off considerably yet.

Seasonality: The ideal time for planting is generally during monsoon rains i.e. in the months of June to August. With good irrigation systems in place, it can be done in other months as well. The following chart shows the sowing months and harvesting months for oranges in different states of NER.

Exhibit 22: Seasonality chart for oranges/ mandarins in the states of NER



Cost of Cultivation: Cost of cultivation is INR 4800 per Hectare. Cultivation cost is worked out from planting till 15th year when the yield reaches its optimum level. The planting material cost in the first year is nearly 15 percent of the total cost, 5 percent during the second year and 2% in the fifth year, which is mainly the cost of filling the gaps and replacing the mortal plants. Thus, the cost of cultivation of per kg is estimated at INR 8.6, which has been calculated taking into consideration the fact that the trees start bearing fruits in the sixth year and optimum yield is obtained till the eleventh year of bearing.

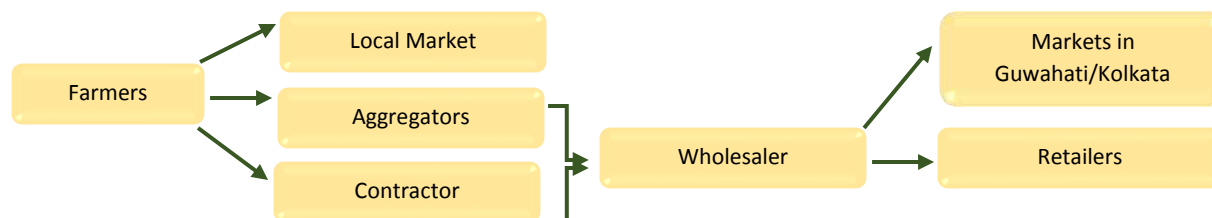
Post-harvest practices: The orchard starts bearing in the sixth year from planting, fruit bearing is around 50 fruits per tree in the sixth year which goes up to 150 fruits in the seventh year and 200-400 fruits in the subsequent years; per kg cost of production comes to around INR 8-9. Harvesting in NE region starts in the month of October which extends up to February. The big farmers with 100 or more than 100 trees sell the fruit to the contractor before harvesting, at a prefixed price; the contractor does the harvesting to sell the fruit to the wholesaler in the main market.

Farmers do the manual grading of fruits in orchards only. They separate the damaged fruits and grade the fruits in three different sizes and pack them in gunny/plastic bag. When the orchard is sold to traders then all these activities are done by hired labor.

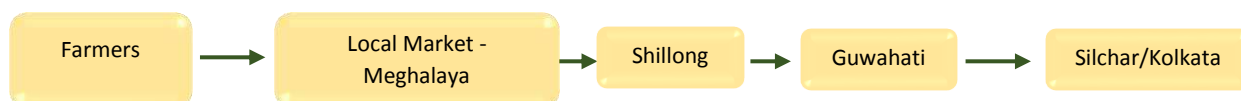
Supply chain & Value chain

The following diagrams show the supply chain & value chain links in orange producing states of NER.

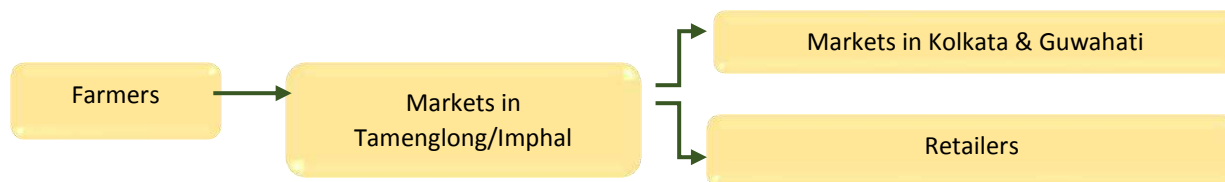
Assam:



Meghalaya:



Manipur



Existing Infrastructure

Moving a step ahead from the secondary data, the real status of north east mandarin processing industry remains questionable. Majority of the produce from NE find its fate by landing into Bangladesh where it is either processed or fancy-packed and reroutes itself into the global markets. Remaining produce secures its place in the domestic market from cities like Imphal, Silchar, Shillong, Guwahati, Gangtok, Kolkata, and Delhi. On ground processing infrastructure for mandarins exists in 3 major factories processing mandarins – Likla (Manipur), The Sikkim Supreme – Govt. Food preservation factory (Sikkim), Exodelicia food product and Kuda cold storage (Nagaland) and M/s Exotic Juices Ltd: A unit of Good Samaritan Association(Mao, Manipur). Apart from these, there is a long list of still standing cold storages, idle processing factories and non-functional processing clusters for NE mandarins. The following table shows the details of the processing plants for mandarins in the region.

Exhibit 23: List of processing plants for mandarins in NE

State	Processing Unit	Location	Details
Manipur	M/s Exotic Juices Ltd	Mao, Manipur	-
	Meira Foods	Imphal/Senapati	Pickles, candies and other commonly used kitchen commodities

	M/S Para Fruit Products Pvt. Ltd	Imphal West	Beverage items of Orange, Lemon, Pineapple and Passion fruit, squash
	Thangjam Agro Industries Private Limited	Imphal East	Orange squashes and jams
Nagaland	Exodelicia Food Products and Kuda cold storage	Dimapur, Nagaland	Orange squash, marmalade
Sikkim	Sikkim Supreme – Govt. Food preservation factory (Sikkim)	Singtam	Orange squash and other fruit candies, pickles etc.

Possible Products

Candied Orange Peel: Orange peel from the processing industries is processed to candied orange peel by shredding and blanching and cooking in sugar syrup. This is used further in fruit preserves, jams and bakery products.

Dried Orange Peel: Shredded and blanched orange peel is dried in hot air. The dried peel is used as such or powdered in applications like traditional medicine, cosmetics.

Jams and Marmalades: Jams are processed by cooking peeled, blanched and pulped orange fruits along with other fruit pulp. Marmalades are processed by adding cooked orange peel shreds.

Orange Juice Concentrate: Orange Juice concentrate is produced by pulping sound, mature, peeled oranges. The extracted juice is concentrated by means of vacuum evaporation to increase the soluble solids to 65°brix. The concentrated juice is packed aseptically in Bag in box/ drum assembly and stored at ambient temperature.

IQF Orange Pieces: Peeled oranges are subjected to caustic boiling and neutralization to remove the septum. The obtained segments are subjected to individual quick freezing by blast freezing. The Frozen segments are packed and stored in cold chain. These are further used in Dairy, Beverages and Bakery products.

Frozen Pulp: Pulp obtained from orange is subjected to quick freezing in order to retain its flavor profile. This is further used in the production of beverages and dairy products.

Orange Oil: Orange oil is obtained by subjecting peel and other fractions of orange to solvent extraction/ steam distillation and fractionation. This is further used as an ingredient in flavor industry and perfumery.

Exports – Current status, India exports, and international status

Global production of oranges and mandarins has been increasing at 2% on an annual average during 2009-2013, amounting to 100 million tons in 2013. The major producers include China, USA, Brazil, and India. India has climbed the ladder in past six years from sixth to the fifth largest producer of oranges and

mandarins in the world with a production of 6 million tons in 2013. India's share in the global production has increased from 7.6 % in 2009 to 9 % in 2013. China was the largest producer of oranges and mandarins with a share of 32 %, which stood higher than 21.5 % in 2004

Looking at the global trade of mandarins and oranges, the global exports aggregated to 11.9 million tons in 2013, recording an annual average growth of 2.9 % during the period of 2009-2013. The top exporters included Spain, South Africa, Egypt, and China. Spain was the largest exporter with a global export share of 28.3 % followed by South Africa (10.2 %), Egypt (9.3 %) and China (7.7 %).

Talking about the global demand in 2015, Russian Federation imported 13.4% of the global mandarins. Russian Federation, Germany, France, USA and the United Kingdom stood as the top 5 global importers grabbing 48.8 % of the Global mandarin imports by value. It was evident from the analysis that India stood way behind the top exporters in spite of being the 5th largest producer of mandarins in the world. It was noticed that top importers of the world (mainly Russian Federation, EU and the US) fetched more than 50% of their imports by value from China and Spain alone. Morocco, Pakistan, and Turkey were next in supplying mandarins to major global importers. Currently, India's export of mandarins is concentrated to UAE (49.6%), Russian Federation (23.3%), Saudi Arabia – Qatar (11.2%), Kuwait (8.2%), Oman (3.8%) and Bahrain (2.3%)⁵. Small quantum of mandarins are also exported to Sri Lanka and Singapore. Analyzing other primary and secondary sources of data, Bangladesh emerged as the biggest importer of Indian Khasi mandarins, importing 14210.73 MT of mandarins worth 2456.01 Lakh Rupees⁶.

The following table shows the major global exporters and importers of different processed products of oranges/mandarins.

Exhibit 24: Major global exporters and importers of value added products of oranges

Product	Major Exporters	Major Importers
Fresh or dried oranges	Spain, China, Turkey & USA	Russia, France, Germany & USA

Source: Sathguru Analysis, International trade map, UNCTADstat

⁵ Trade Map, UNCTAD stat

⁶ Horticultural Statistics at a glance 2015

3.2 Pineapple

Pineapple is one of the important fruits that is grown in India. The crop is originated in Brazil and today it is grown in a number of countries with the tropical climate in the world. The fruit is rich in Vitamins A, B, and C and is also a good source of minerals like iron, calcium and phosphorous. While the fresh fruit is used for table purpose, juice and canned slices are popular as preserves and are traded in the international markets. The plant is a perennial herb with grows to a height of 80-90 cm and has an economic life of 5-7 years. Pineapple is grown in all the Northeastern states except Sikkim. Apart from these states, the crop is also grown in the states of Kerala, Karnataka, Tamil Nadu, Maharashtra and West Bengal.

Varieties and Characteristics

The agro-climatic conditions of the northeastern India support cultivation of best quality pineapples in the region. Some of the varieties of pineapple that are grown in the region include



Kew Variety

- Also known as 'Smooth Cayenne' due to absence of thorns on the leaf margins.
- Large fruit weighing between 1.5 – 2.5 kg.
- Light yellow in color, fibreless and juicy. Considerable aroma and flavor.
- **Best suitable for canning.**



Queen Variety

- Smaller size fruit, deep golden yellow flesh with more aroma and flavor compared to Kew variety.
- Average weight of fruit varies between 1-1.5 kg.
- Longer shelf life compared to Kew variety.
- **Best suitable for table top.**

Other varieties of pineapple that are grown in the region include Jaldhup and Lakhat which are named after the places of their maximum production. Lakhat is relatively sour while Jaldhup is known for its characteristic alcoholic flavor.

Production

Pineapple is one of the key crops that is grown across all the states of NER. Together the region accounts for 72.3% of the area under pineapple and 54.5% of India's pineapple production. The area under pineapple production in NER is 79.51 thousand ha and the total production is around 947.19 thousand tons. The following map shows the key pineapple producing districts and the following table highlights the key pineapple producing districts in the region.

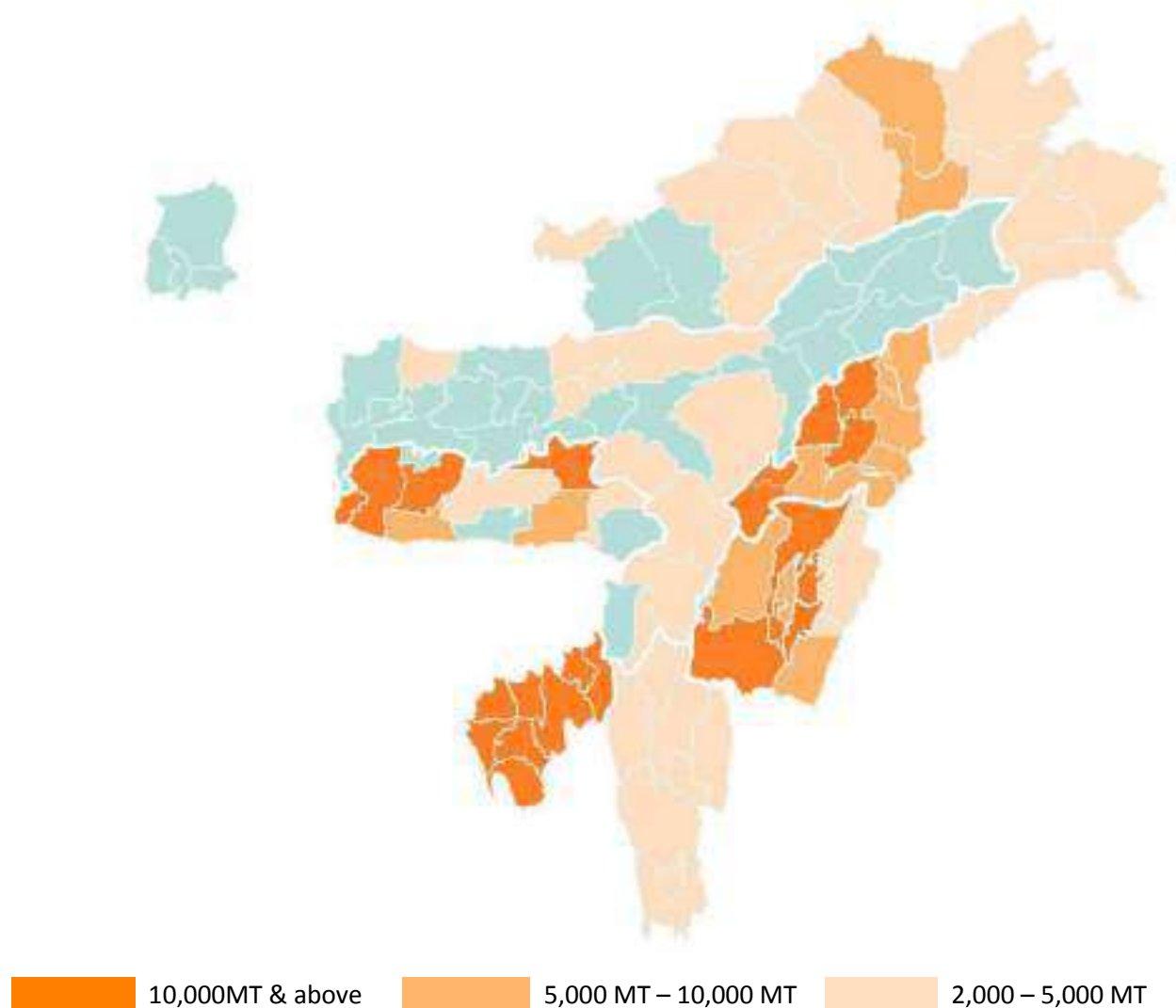
Exhibit 25: Key pineapple producing districts in NER

State	Key pineapple producing districts
Arunachal Pradesh	Papum Pare, West Siang, Upper Subansiri, East Kameng, Lower Subansiri
Assam	Cachar, Kamrup, Sonitpur, Karbi Anglong and North Cachar Hills

Manipur	Senapati, Thoubal, Churachandpur
Meghalaya	
Mizoram	Aizawl, Serchhip
Nagaland	Dimapur, Peren, Mokokchung, Wokha, Kohima
Sikkim	Dhalai, South, North, Unakoti, West, Gomati
Tripura	Papum Pare, West Siang, Upper Subansiri, East Kameng, Lower Subansiri

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Exhibit 26: Map of NER showing key pineapple producing districts



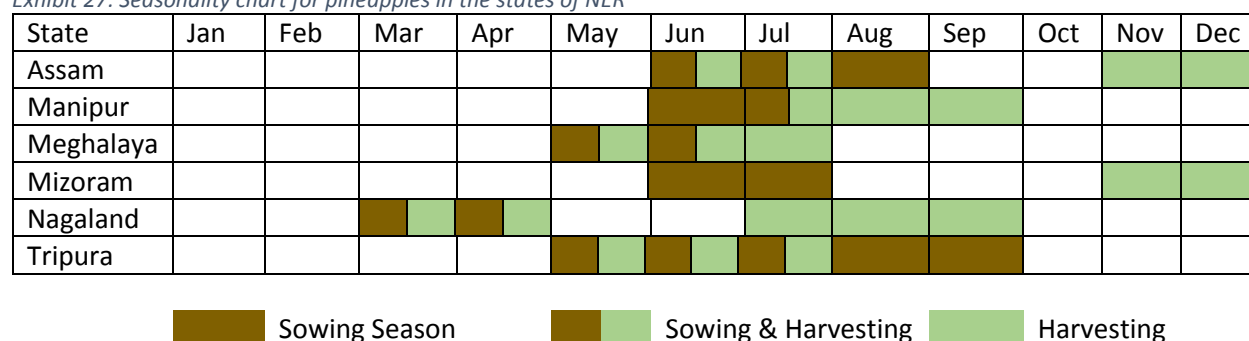
Package of Practices

Economic situation of pineapple farming: Pineapple farming in NER is majorly dominated by small and marginal farmers who account for around 72% of the total number of holdings. This is the case in all the states of NER except Arunachal Pradesh where people own large tracts of land, the majority of the land holdings are occupied by semi-medium and medium sized farmers.

Availability of inputs: Pineapple is propagated through vegetative propagation through suckers. Quality suckers are sourced from the local markets at INR 5-8 per sucker. The usage of chemical fertilizers in the majority of the regions is limited. In place of application of chemical fertilizers, farmers use farm yard manure, farm waste, and leaf manure. Specific irrigation measures are negligible and the crop is reliant on the monsoon for its water requirement. The crop is labor intensive and the labor requirements are met by the farmers and family members.

Seasonality: The ideal time for planting the suckers is generally during monsoon rains i.e. in the months of June to August. However, the planting in some regions start in the month of March and in some regions extend till October. Plants grown from the suckers yield fruits in 15 -18 months. Similar to sowing season, harvesting season also varies in the region and in Nagaland fruits are harvested twice in a year. Due to interventions of ICAR in the state of Tripura (promotion of improved cultivars and application of Ethepon), off season flowering and fruiting are observed which ensured year round supply of fruits. The following chart shows the sowing months and harvesting months for pineapples in different states of NER.

Exhibit 27: Seasonality chart for pineapples in the states of NER



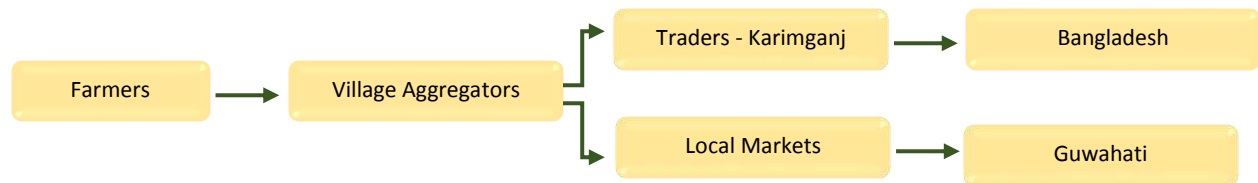
Cost of Cultivation: Pineapple is a labor intensive crop. Manual labor is required mainly for seedbed preparation before planting, weeding, and harvesting of the crop. The crop is perennial and yields remain high till 4-5 years after planting. But farmers in the region take the crop until 7-10 years. The cost of cultivation due to the procurement of planting material will be high in the first year and later on, it is only the labor cost for weeding and harvesting activities. The cost in the first year ranges around INR 65,000 to INR 1.5 lakhs and later on from the second year the costs generally are observed to be in the range of INR 20,000.

Post-harvest practices: The average yield of pineapple in the region ranges between 20-22 MT per ha. /Higher yields (30-35 MT/ha) are observed in Assam and Nagaland while lower yields (10-15 MT/ha) were observed in Meghalaya due to older plantations. During the peak season, due to unavailability of processing units and lack of market access, pineapples in the region faces issues of glut. Also due to lack of storage spaces, a large percentage of the fruit matures in the field itself and gets wasted. The pre harvest losses in the pineapple are to the tune of 20% due to sun-burns, rodent and wild animal attacks. The post-harvest losses are to the tune of 5% due to improper handling and transportation.

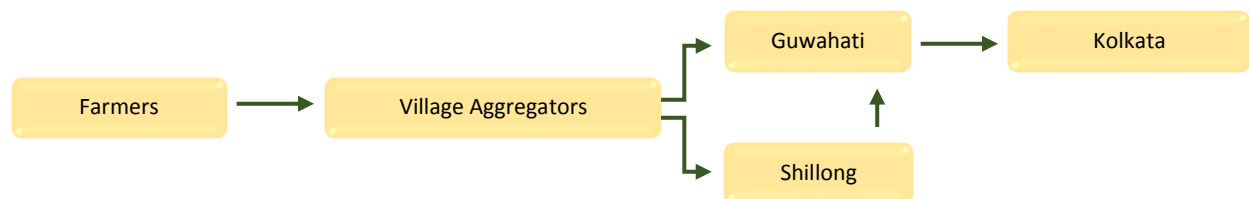
Pineapples are sold generally in the local markets and through village aggregators. The village aggregators, in turn, sell the produce in the local major markets in the nearby towns/cities. The farm gate price of the fruit varies between INR 12-15 per piece and in off-season sometimes touches INR 40 per piece.

Supply chain and value chain

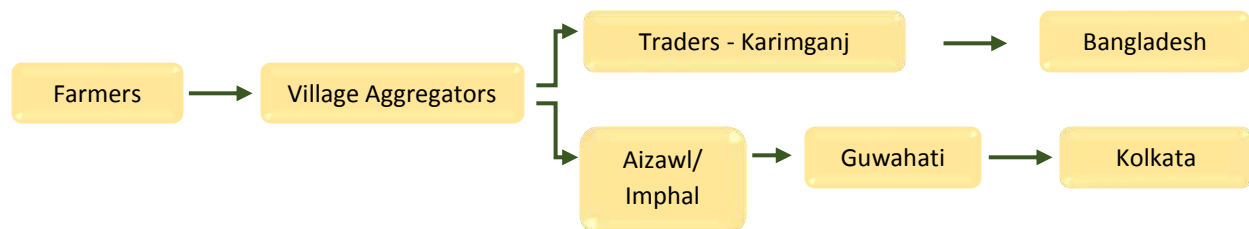
Arunachal Pradesh & Assam



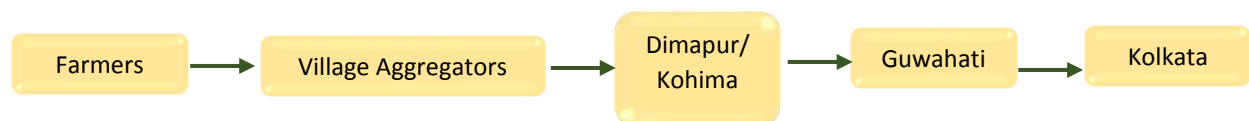
Meghalaya



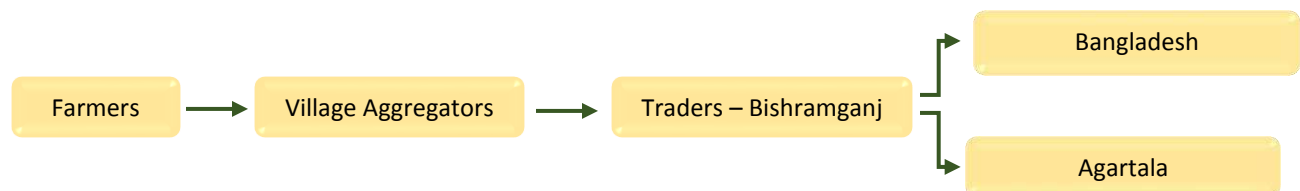
Manipur & Mizoram



Nagaland



Tripura



Existing Infrastructure

A limited number of processing plants are available for processing of pineapple into value added products. The major processing plants are listed below.

Exhibit 28: List of processing plants for pineapples in NE

State	Processing Unit	Location	Details
Tripura	Nalkata	NERAMAC (Non-operational)	Fruit juice concentrate
	Agartala	Pineapple India	Canned Pineapples
Manipur	Imphal	Pineapple India	Canned Pineapples, Fruit Juice concentrate
Meghalaya		Pineapple India	Canned Pineapples
Nagaland	Dimapur	Pineapple India	Canned Pineapples, Fruit Pulp
	Medziphema	Medziphema Village Co-operative Society	Canned Pineapples
	Dimapur	Exo Delicia Private Ltd	Canned Pineapples

Among the above mentioned plants, the plant established by NERAMAC in Nalkata for the preparation of fruit juice concentrate from pineapples way back in 1988, stopped functioning due to issues of insurgency, issues with respect to procurement and problems with age-old machinery.

Possible Products

A lot of pineapples that are produced in the region gets wasted due to perishable nature of the fruits and lack of processing facilities. Some of these value added products of pineapple can be processed by basic training. Different products of pineapple are as follows:

Ready to serve beverages/ squashes: Ready to serve beverages/ squashes are manufactured from ripened and wholesome pineapples by peeling, churning and blending the fruit to extract the pineapple juice and is pasteurized while processing and no preservatives are used. The packaging and preservation is done in line with pre-defined guidelines set by the certification authorities. Shelf life is 24 months under ideal conditions.

Canned pineapple/ titbits: Canned pineapple/ titbits are manufactured from mature and sound pineapples by peeling and cutting them to the desired size as per the standards, blanching and by adding sugar syrup and thermally processing them in lacquered cans. These are further used in desserts, dairy products, culinary applications, bakery and confectionery products.

Candied pineapple pieces: Peeled and trimmed pineapple dices are treated with sugar syrup and subjected to controlled drying.

Pineapple juice concentrate: mature and sound pineapples are processed into juice and then it is further concentrated in vacuum evaporators to a solid content of 65° Brix and packed in aseptic packaging systems like Bag in drum/Box. This product can be stored at ambient temperature up to 18 months. It is further used in Beverage applications.

Freeze dried pineapple snacks: Mature pineapples are sliced/ diced and coated with sugar syrup and subjected to freeze drying, where the moisture in the fruit is removed at very low temperature and high vacuum. This leads to a dehydrated product with superior flavor and texture which is consumed as a snack or used many applications like breakfast cereals

Pineapple Pulp: The natural flavor and aroma of Pineapple fruit is extremely lucrative to prepare pulp which can be used to make jellies, jams, and cream mixes. Normal shelf life is of 12 months.

Exports – Current status, India exports, and international status

Though large quantities of pineapple are produced in NER, exports from the region are minimal. Only small quantities of pineapple are exported even to the neighboring nations of Bangladesh and Myanmar. In general, pineapple is exported in canned or tinned form specifically to the Middle East and EU markets. Nupui Food Processing in Kumarighat, Tripura is currently selling 1.5 lakh cans per annum to markets in EU specifically Italy. Pineapple India is another exporter from the region involved in the exports of canned pineapple and frozen pineapple juice concentrate. On the import side, Pran Foods which is based out of Bangladesh is exporting fruit juices to Tripura via multiple Land Custom Stations across the Indo Bangladesh border in Tripura. They also have a unit in Tripura.

India exported only 4,000 MT of pineapples in the year 2015-16⁷. The majority of the exports were to Middle East nations like Qatar, Oman and Saudi Arabia and were from Southern part of the country. Quantity basis Nepal is the largest importer of Indian pineapples and these were routed through Raxaul border. The country imports some processed pineapple products from Southeast Asian nations like Thailand and Philippines.

Internationally, pineapple is exported majorly in 4 different forms, fresh fruit, canned, concentrated juice and plain juice. Annually just 3 million tons of fresh fruit is exported and the fresh fruit market is dominated by Costa Rica which supplies majorly to EU, US, and Japan and is followed by the Philippines which supplies majorly to Japanese markets. On the otherhand, around 6-6.5 million tons of fresh fruit equivalent is processed in the world and consumed across the world⁸. The following table shows the major exporters and importers of different value added products of pineapple in the world.

Exhibit 29: Major exporters and importers of value added products of pineapple

Product	Major Exporters	Major Importers
Fresh Pineapple	Costa Rica, Philippines, Panama	US, Netherlands, Belgium
Canned Pineapple	Thailand, Philippines, Indonesia	US, Germany, Russia
Concentrated juice	Thailand, Philippines, Costa Rica	US, Netherlands, Spain
Plain juice	Costa Rica, Philippines, El Salvador	US, Netherlands, Belgium

Source: Sathguru Analysis, International trade map, UNCTADstat

⁷ Agriexchange database, APEDA

⁸ Trademap, UNCTADstat

3.3 Rice

Rice is the principal crop of the Northeastern region contributing to the economy, food and nutritional security to the people. Rice is cultivated in all the states with varying degrees of diversity in terms of agronomical practices, varietal differences and end use reflecting the diversity in climatic conditions, terrain and local preference in the region. The region is one of the center of origin for rice and houses a wide range of varieties including indigenous/ wild and cultivated. Some of the locally adapted pigmented, aromatic and quality rice landraces are cultivated for their local preference, high market, and social values. Almost every state in the region is home to local landraces like Bao (Red rice), Joha (Aromatic rice) of Assam, Black/ Purple rice of Manipur and Meghalaya, Tai which is a sticky aromatic rice of Mizoram etc. These rice varieties are unique in terms of their organoleptic and nutritional qualities and possess comparative advantage over conventional non-basmati rice varieties.

Varieties and Characteristics



Bao Rice (Red Rice)

- Deep water variety mainly produced in Assam.
- Red colored endosperm due to high anthocyanin content.
- Contains higher amounts of iron, fiber, zinc, vitamins and other micro nutrients
- Poor yielding variety.



Chak hao Rice (Black/ Purple rice)

- Cultivated in Manipur and Meghalaya states.
- High antioxidant potential due to anthocyanin content leading to therapeutic properties.
- Glutinous texture with aromatic flavor.
- Poor yielding variety.



Joha Rice (Scented Rice)

- Special class under winter/ sali rice.
- Short to medium slender/ bold grain with aroma as high as Basmati
- Non sticky and tasty variety with good returns to farmers
- Joha cultivars like Kolajoha, Krishnajoha, Kunkunijoha, Ramphaljoha and Gobindbhog are important and widely grown cultivars.



Chokowa (soft rice)

- Unique variety to NER, mainly produced in Assam.
- Mainly used as instant rice after boiling paddy followed by drying and de-husking.

Production

Even though the status of rice production is well documented in all the states, no special emphasis is being paid on segregating the production quantities of these specific cultivars. There is a need to sensitize the agriculture, statistics and economics departments to capture the production data of these varieties in the respective states as this the priming step for designing any interventions for export development. During the consultation with various stakeholders, it is observed that these varieties other than Bao rice are cultivated on a very limited scale. Bao rice, Chokowa rice, and Joha rice are produced mainly in the state of Assam while Chak hao rice is produced in Manipur. Despite their superior quality and unique organoleptic properties, cultivation of these varieties are taken up on a limited scale due to low yield potential.

The major share of Bao rice production comes from the flood prone districts of Dhemaji and Lakhimpur and Majuli River Island in Assam and Garo Hill districts of Meghalaya. The following table shows the yearly production of Bao rice in the state of Assam.

Exhibit 30: Production statistics of Bao rice in Assam

District	2010-11		2011-12		2012-13	
	Area (Ha)	Production (tons)	Area (Ha)	Production (tons)	Area (Ha)	Production (tons)
Dhemaji	5,900	13,275	10,360	23,102	6,800	15,640
Lakhimpur	5,295	12,708	5,115	12,276	4,995	11,988
Morigaon	3,520	7,920	3,060	7,344	3,222	7,249
Nagaon	3,715	10,030	3,490	9,423	3,445	7,234

Source: Sathguru Analysis, State departments of Agriculture and directorates of economics and statistics

Package of Practices

Economic status: Nearly 80% of the farmers cultivating all the rice varieties in the region are small and marginal. The cultivation of Bao rice is usually taken up to mitigate the crop losses occurred from the failure of the main crop (Ahu crop) due to floods. But due to the increased demand for Bao rice, farmers, particularly in flood prone districts, are paying more attention to cultivate Bao rice.

Availability of Inputs: Cultivation of these rice varieties is still carried out in the traditional way with very few inputs. The seeds are usually selected and stored from the previous crop or borrowed from other farmers. Bao rice cultivation is mostly carried out in a default organic manner, without any additional inputs like irrigation and fertilizers. Recently fertilizer application came into practice after interventions for yield improvement. Usually, 15 kg of urea is applied per hectare. However, the rice being procured for export is mostly from certified organic farms which are being monitored by a private agency. In such cases, the applications of chemical fertilizers are currently scrutinized. Crop protection inputs are employed by traditional/ alternate methods and local resources.

Seasonality: Bao rice is a long duration summer crop (300 days) planted in the months of March/ April and harvested in the months of November/ December. Joha rice is a winter crop cultivated during the months of July/ August and harvested in the months of November/ December.

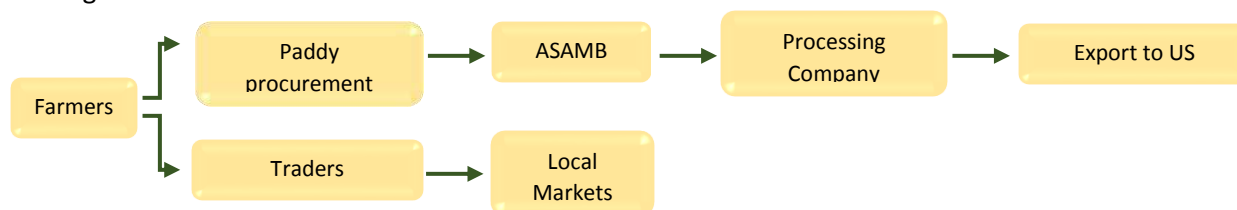
Cost of cultivation: The average cost of cultivation of rice in the NER is INR 30-40 thousand per ha.

This includes inputs like seeds, fertilizers, and labour. The major share of the cost is towards labour procurement.

Post-Harvest Practices: Harvesting is carried out manually in the region and post-harvest operations include drying the grain under the sun and manual threshing to separate the paddy. The paddy is packed in gunny bags or HDPE woven sacks. Lack of modern post-harvest technologies, storage facilities and modern rice mills in the region is limiting the potential of growth of these specialty rice varieties.

Supply chain & Value chain

Currently, Bao rice is one of the products that is exported in considerable quantities from the north eastern region thorough formal channels. Most of the rice produced in the region is limited for self-consumption and any additional quantity left is traded. With the development of export channel, particularly in the districts of Dhemaji, Jorhat and Morigaon districts the trade of rice is taking up an organized structure. Assam State Agriculture Marketing Board (ASAMB) is procuring Bao paddy for Haryana Based Nature Bio foods Private limited which is exporting to US market after processing. Other traders also procure paddy from farmers directly and from Paddy procurement centers for trade with in the region.



Existing Infrastructure

Currently, no significant value addition activity is carried out in the region. Nature Bio foods Private Limited, which currently procures the Bao Paddy, processes in Haryana and exports to US market.

Possible Products

Processing of specialty rice variants has to be considered carefully such that the level of processing should not hamper the nutritional or special organoleptic properties, there by retaining its premium value. The following products can be processed from specialty rice variants.

Milled rice- (Bao/ Joha): This is the minimal level of processing required to create value for these rice varieties. Paddy is subjected to cleaning, de-husking and destoning activities to obtain rice. The polishing step has to be employed with care so that it will hamper the nutritional profile of the rice.

Rice flakes: These rice varieties can be processed into rice flakes by steaming the paddy/ rice and rolling them into flakes. Owing to the organic nature and high nutritional qualities they can be further used as ingredients in healthy and premium breakfast cereals.

RTE Snacks: Processing these rice varieties by means of various technologies like extrusion, retort technology will yield RTE snacks which can be consumed directly. Standardizing the processing of “Chokowa rice” (soft/ waxy rice) will lead to instant products of better quality and high demand, as similar products are not existing currently.

Breakfast cereals: Breakfast cereals is a growing product category that can be made by processing rice with extrusion technology either in single or in a combination of other ingredients.

Exports – Current status, India exports, and international status

India is one of the largest producers of rice in the world a large chunk of which is exported. The export trends of rice from the rest of the country does not give a representative picture of rice exports from NER. This is because the NER has a unique variety of rice inherent to the region which is exported. This variety, Bao Rice has high demand and is being exported to the American market. Nature Bio foods Private Limited is currently exporting Bao Rice after due processing at its facility in Haryana. ASMB has procured around 10,000 MT of Bao paddy in the last three years for L.T. Foods for export purpose⁹.

⁹ Assam agricultural marketing board, APEDA

3.4 Chilli

Naga Chili “the wonder spice” or ‘*Bhut Jholokiya*’ is infamous as one of the hottest peppers in the world. It is considered as one of the most important commercial spice crops and is an integral and important ingredient in many different cuisines in the NER as well as globally due to its pungency, taste, flavor and color. It was accorded the GI status in 2008. The State Government has obtained GI rights for the product in 2008. It is used in many forms - fresh, dried, powdered and pickled.

Varieties and Characteristics

Some of the varieties of chillies that are grown in the region include



Naga King Chilli

- High pungency with capsaicin content to the tune of 2.06 %
- Pungency : 855,000 – 2,200,000 Scoville Heat Unit (SHU)
- High perishability
- Nagaland State Government has obtained GI rights for the product in 2008.
- It can be used in many forms - fresh, dried, powdered and pickled



Cherry Pepper (Dalle Khorsani)

- Potent combination of high pungency and characteristic aroma.
- Round cherry size and bright red when fully ripe
- Pungency : 100,000 to 350 000 (SHU)
- Culinary and medicinal usage



Bird's eye Chilli

- Blood red in colour, highly pungent
- Capsaicin content of 0.59%
- Ideal for culinary, ornamental and medicinal usage

Production

North Eastern region is famous for its Naga King Chilli, Mizo chilli and Cherry pepper. The cultivation of Bhut Jholokiya is mainly practiced in Manipur and Assam. Although the Naga Chilli has originated from Nagaland the area under cultivation is lower when compared to other neighboring states.

Exhibit 31: Key chilli producing districts in NER

State	Key Chilli producing districts
Manipur	Churchandpur, Imphal East, Thoubal , Imphal West , Senapati
Nagaland	Kohima, Mon, Dimapur
Assam	Dhubri, Barpeta, Darrang, Nagaon, Nalbari

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Package of Practices

Economic situation of Chilli farming: Majority of farmers in Assam and Manipur are marginal and small farmers with small land holdings whereas in the case of Nagaland chilli farmers are medium and large farmers.

Seasonality: In the NER, there are two planting seasons, Kharif and Rabi. Kharif cultivation, practiced in the hilly states, starts in February-March and harvesting is done from May -June onwards. In the plains, it is grown as Rabi crops during September-October. The productivity and pungency of Rabi grown crop is generally more than kharif crop.

Exhibit 32: Seasonality chart for chillies in the states of NER

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assam												
Manipur												

 Sowing Season

 Harvesting Season

Cost of Cultivation: Cost of production includes the expenditure on seed, manures, and fertilizers, hired human labor, land revenue, irrigation charges, machinery charges, interest on working capital and depreciation on farm implements and farm buildings etc. A lesser amount of capital is needed to invest in growing this crop. The cost of production is around Rs.35, 800 per acre.

Post-harvest practices

Value Addition at Farm Level: Harvesting is done when the pods are ripened and partially withered. The harvested pods are kept in heaps either indoor or in shade away from direct sun light for 2 or 3 days so as to develop uniform red color. Some farmers perform 'sun-drying' by spreading the chillies on clean dry polythene sheets. Pods are spread out in thin layers for uniform drying with regular flipping and turning to prevent mold growth and discoloration. The dried pods are heaped and covered by clean gunny bags. The dried pods are packed in clean, dry gunny bags and stored ensuring protection from dampness. Dunnage is suggested during the arrangement of packed bags to mitigate the issue of moisture seeping in. Usage of cold storage helps to extend the life of produce to 8-10 months.¹⁰

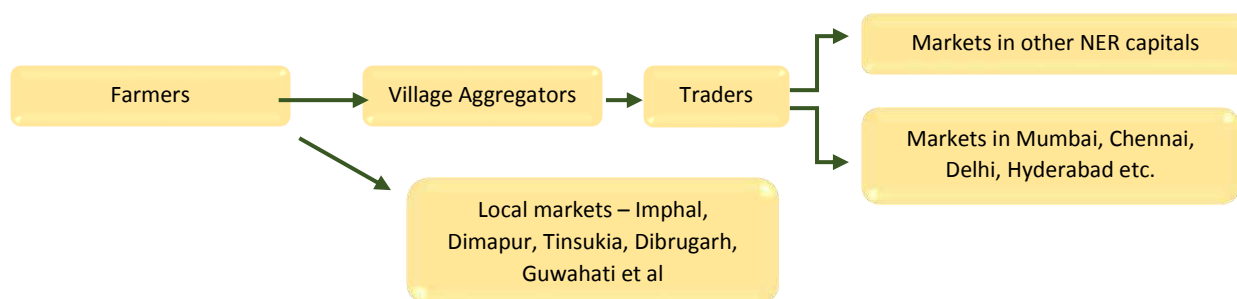
Value addition at Processor level: Chilli, as a spice and processed product offers ample scope for value addition. Small scale cottage scale industries by local entrepreneurs are involved in making Naga chilli pickle or bird's eye pickle. The target for these products is the local market as well as other markets in the NER. They sell these products in local markets In Manipur and Nagaland farmers carry fresh chilli from farms to local markets. The preferred mode of transport is through road. The gunny bags filled with chilli are loaded onto the roof of vehicles and sent to the nearby markets. It has been observed that during transportation of the fresh produce, there are nearly 5% post-harvest losses due to improper handling.

¹⁰ Post-Harvest Profile of Chilli, AGMARK report

Naga chilli is highly perishable in nature, hence it is not preferred to transport fresh chilli to distant markets without controlled temperature facilities.

Supply chain and value chain

Manipur, Assam & Nagaland



Existing Infrastructure

Chilli processing is limited to making chilli pickle and a limited number of processing plants are operating at present, primarily in making chilli pickle. The major processing plants are listed below:

Exhibit 33: List of processing plants for chillies in NER

State	Processing Unit	Location	Details
Assam	Meghalee Foods	Jorhat	Chilli Pickle
Manipur	Thangjam Agro Industries	Imphal	Pickle (need and order based, not full time)
Sikkim	Sikkim Supreme	East Sikkim	Chilli pickle
	Green Grocers		Chilli pickle and sauce
Nagaland	Naga Herbal and Spice	Dimapur	Chilli pickle
	Naga Fragrance Private Limited		Chilli pickle
Meghalaya	Fruit Preservation Centre, Fruit Garden, Shillong	Rhi-Boi (Shillong)	Chilli pickle

Possible Products

As of now, chilli pickle is the most widely processed product made out of indigenous varieties in the NER. Cottage and SSI standard units are present in Assam, Meghalaya, Nagaland, Sikkim, and Manipur. Based on stakeholder consultations and discussions with food processing entrepreneurs yielded a table of products which has potential to enter the market and can be exported as well. These include:

Dried Chillies: Fresh Sound Chillies are dried by controlled methods to retain quality. These are further processed to different products.

Dry Chilli flakes: Dried Chillies are milled to flakes of various sizes, with or without seeds depending on the end use. They are used as a condiment in various food products.

Pickled/ Brined Chillies: Fresh Chillies are subjected to pickling in brine or acetic acid by slicing or in whole fruit form and packed in glass bottles or HDPE drums. These are further used in many culinary applications and food service industry.

Sauces: Specialty sauces are made from Chillies with peculiar taste and flavor profiles like extreme pungency levels. These are produced by crushing the Chillies to paste and cooking them with spices and condiments and packed in glass or polymer bottles.

Seasonings: Seasonings are produced by blending Chillies with other ingredients like spices and flavorings. Depending on the manufacturing process and requirement they can be processed to wet and dry seasoning forms. They are further used to flavor various product like snacks, RTE/ RTC food products.

Oleoresins: Chillies are subjected to solvent/ super critical extraction to obtain oleoresins of various pungency and color unit grades. These are further used in manufacturing of flavors and seasonings

Exports – Current status, India exports, and international status

Major Producers: India is the largest producer of chilli and has the largest area under chillies in the world followed by China and Pakistan¹¹

- **Asia** - India, China, Indonesia, Korea, Pakistan, Turkey and Sri Lanka
- **Africa** - Nigeria, Ghana, Tunisia and Egypt in Africa;
- **The Americas** - Mexico, Argentina, Peru, United States of America
- **Europe** - Yugoslavia, Spain, Romania, Bulgaria, Italy and Hungary in Europe India is the world

Major Importers: ¹²

- Green Chilli: USA, Germany, UK, Russia, France, Canada, Netherlands, Italy, Austria & Poland.
- Dry Chilli: USA, Thailand, Malaysia, Sri Lanka, Spain, Bangladesh, Mexico, Germany, Indonesia & Japan.

¹¹ FAOstat

¹² Spices board, APEDA

3.5 Ginger

Ginger is one of the earliest known spices. It is also one of the few spices that is consumed across the world. In India, It is used both as a fresh vegetable as well as a dried spice. The spice is also known for its medicinal use and is widely used in many Ayurvedic formulations. It is also used to a limited extent in some soft drinks, oils, essences and tinctures. The plant is a perennial herb and is propagated through vegetative propagation. In India, ginger is grown in almost all the states but North Eastern states along with Kerala and Karnataka account for more than 70% of the country's production.

Varieties and Characteristics

There are several varieties of ginger that are grown in India and in India, NER can be considered as a treasure trove of germplasm. Several indigenous varieties are grown in the region and most of them are known by the places of their origin. Some of the important varieties of ginger that are grown in NER include:



Nadia

- Slender rhizome with lemony flavor
- less fibrous, high dry ginger yield



China

- Exotic high yielding variety
- Bold rhizome
- Low crude fiber & high dry ginger yield



Naga- Shing

- Rhizomes with High fiber and good aroma
- High oleoresin content



Varada

- High fresh and dry yield
- Resistant to storage pests
- plump rhizomes having flattened fingers and medium sized reddish brown scales.

Other important varieties of ginger that are grown in the region include Maran, Kachai ginger, Thingpui, Bhainse etc. The yields of many of these varieties are comparable to that of improved varieties and even have high dry matter percentage as well as oil content.

Production

Ginger is one of the key agricultural crops that is grown in almost all the states of the NER. Together the region accounts for 24.6% of the area under ginger and 24.1% of India's ginger production. The area under ginger in NE region is 30.84 thousand ha while the total production is around 318.257 thousand tons. The following map shows the key ginger producing districts and the following table highlights the key ginger producing districts in the region.

Exhibit 34: Map of NER showing key ginger producing districts

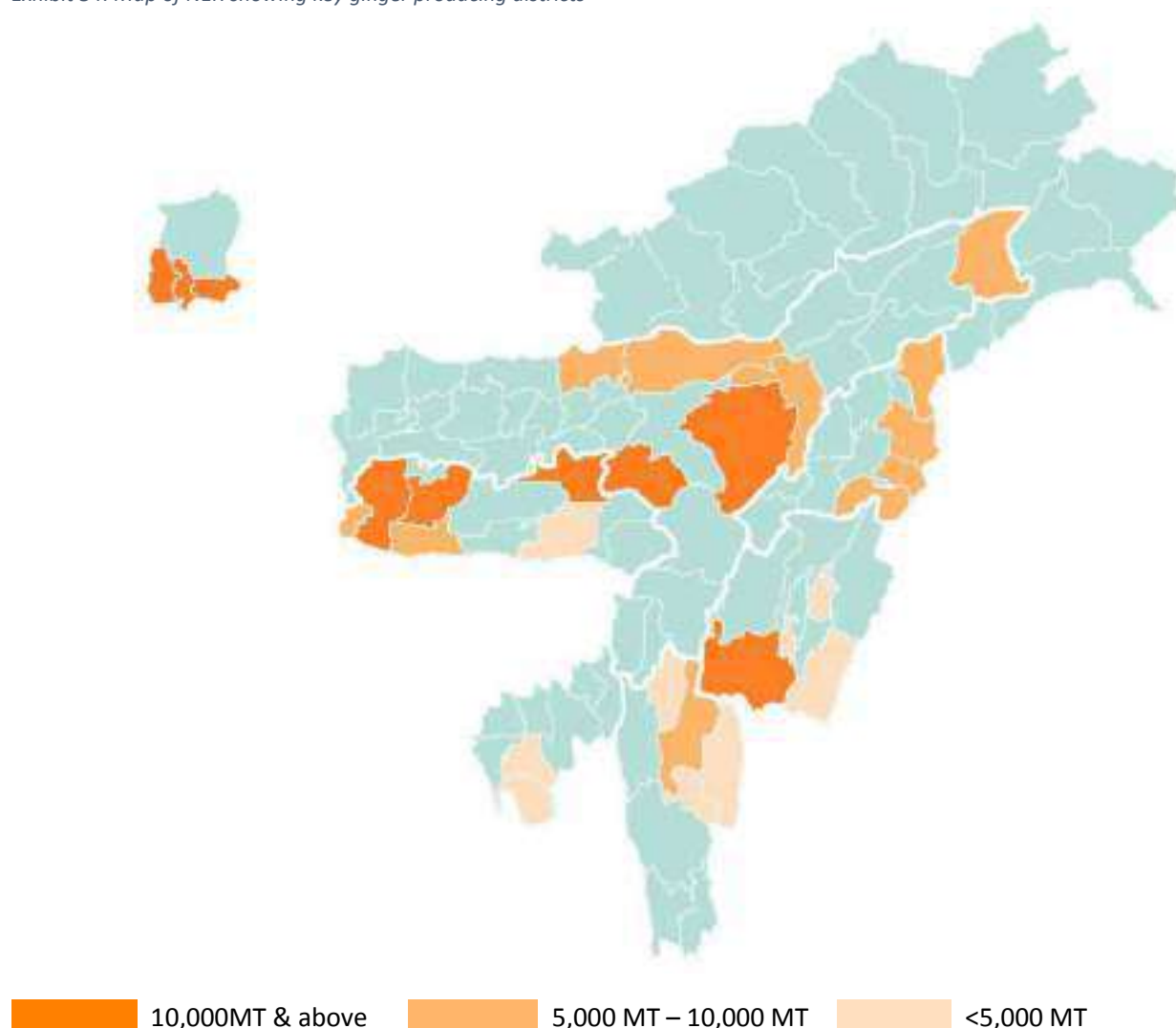


Exhibit 35: Key ginger producing districts in NER

State	Key ginger producing districts
Arunachal Pradesh	Lower Dibang Valley
Assam	Tinsukia, Golghat, Karbi- anglong, Udalguri, Sonitpur
Manipur	Churchandpur
Meghalaya	Ri-Bhoi, West Garo Hills, East Garo Hills, South Garo hills

Mizoram	Aizawl
Nagaland	Mon, Tuensang, Phek,
Sikkim	West Sikkim, South Sikkim, East Sikkim
Tripura	-

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Package of Practices

Economic situation of ginger farming: Though the farming of ginger in the earlier days was restricted to certain communities, as the crop became commercial other communities also took up production of ginger. The production in the region is dominated by small and marginal farmers who together constitute for more than 64% of the landholdings.

Availability of inputs: Except for Sikkim, where the planting material is being provided by the government, majority of the farmers in the rest of the NER store rhizomes from the previous season to be used as a seed for the next season. These rhizomes are stored in pits and covered with leaves while some farmers store them in dry places with shade cover. Usage of fertilizers and pesticides in the region is minimal and majority of the farmers follow indigenous plant protection practices like exposing the roots to the sun, collecting the insects and burning etc.

Seasonality: In ginger, the sowing happens just after the initial showers of the monsoon and the crop attains maturity in 210-245 days. The crop is harvested between October to January depending upon the market demand and prices prevailing in the market. The following table shows the sowing season and harvest season in top 3 ginger producing states of the region.

Exhibit 36: Seasonality chart for ginger in the states of NER

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assam												
Meghalaya												
Sikkim												

Sowing Season
 Harvesting Season

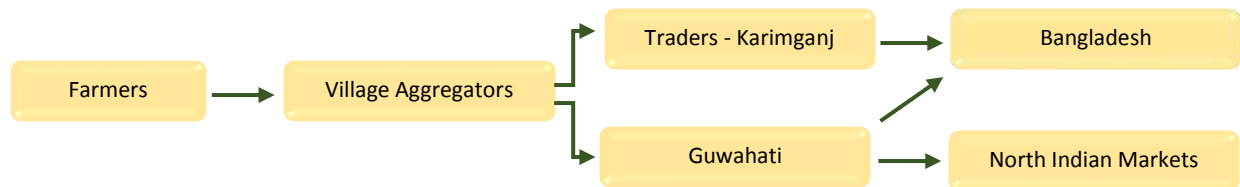
Cost of Cultivation: Ginger is a labor intensive crop. However, in the majority of the cases, it is the family of the farmer working in the field. So the cost of production of ginger in the region varies between INR 30,000 per ha to as high as 130,000 depending upon the dependence on external labor and sourcing of planting material.

Post-harvest practices: The average yield of ginger in the region ranges between 8-10 MT per ha. The ginger from the farms is harvested manually. Ginger in the region faces issues of glut. Also due to lack of storage spaces, unaffordability some farmers postpone the harvesting of the produce till prices improve in the market. Since the majority of the farmers involved in ginger farming are small and marginal, they generally sell their produce to village level aggregators who collect from different farmers and later sell

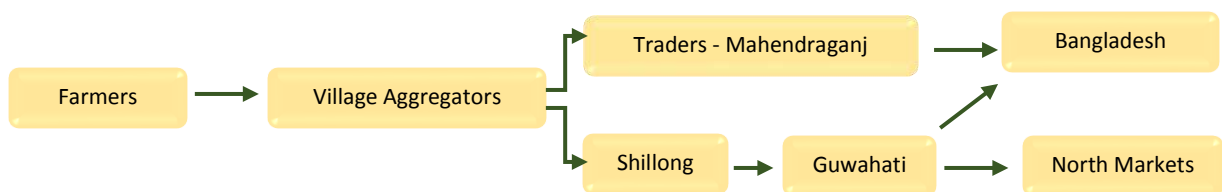
the produce in the nearby towns/ market yards. The farm gate price of ginger varies depending upon season and varies between INR 8 to INR 40 per kilogram.

Supply chain and value chain

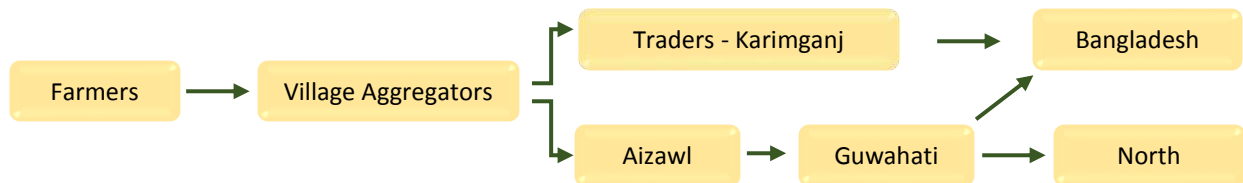
Arunachal Pradesh & Assam



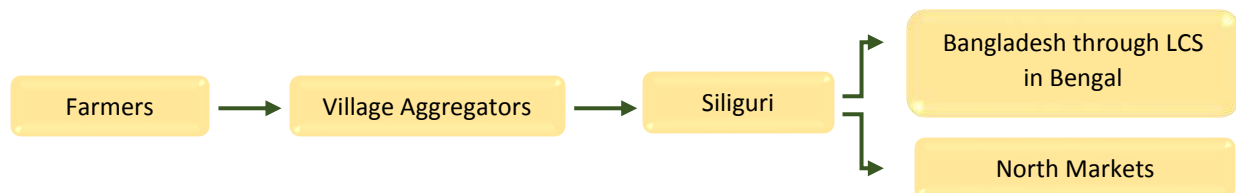
Meghalaya



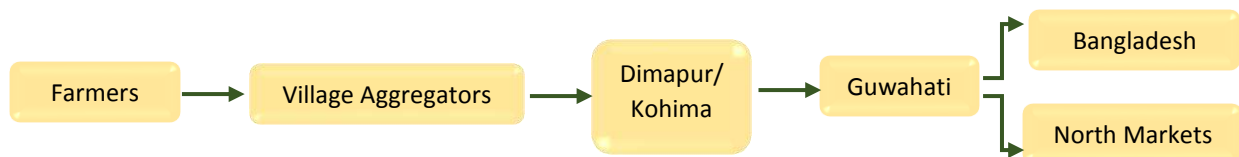
Manipur



Sikkim



Nagaland





Existing Infrastructure

There are no major ginger processing units in the region. Most of the ginger that is exported to the neighboring countries is in the form of fresh ginger. Some small processing units who are producing value added products from ginger are mentioned in the table below

Exhibit 37: List of processing plants for ginger in NER

State	Processing Unit	Location	Details
Sikkim	Parvata foods (W)	West Sikkim, East Sikkim	Raw Ginger (Building infrastructure)
	Nature's Gift (E)		Ginger Flakes, Ginger Powder
	Sikkim Supreme		Ginger Candy
Assam	Seven Foods	Amingaon	Dry ginger, Ginger powder
Manipur	Heiron Food Processing Centre	Bishnupur	Ginger Candy
Meghalaya	K.D. Agro Industries	West Garo Hills	Dehydrated Ginger
Mizoram	Mizoram Food Processing Industry	Aizawl	Dried Ginger Powder, Dried ginger flakes
Nagaland	L. Doulo Builders & Suppliers Co. Private Ltd.	Dimapur	Ginger powder

Apart from the above mentioned processing units, two pack houses for grading, sorting, and packaging are coming up at Karimganj in Assam and Aizawl in Mizoram. Both the projects were funded by APEDA. The first one is coming under the supervision of Assam State Agricultural Marketing Board which wants to run the plant in Public Private Partnership mode while the second one is coming under New Land Use Policy Implementation Board (NIB).

Possible Products

Processing of Ginger into value added products is the prime option to address the perishability of the produce. Some of these products can be processed by basic training. Different products of Ginger are as follows:

Dry Ginger/ Dry Ginger Flakes/ Powder: Dry Ginger achieved by cleaning, peeling and slicing of Ginger and subjecting it to controlled drying. Dry ginger is sometimes subjected to sulphitation. Whole dry Ginger is of limited use in the flavoring of traditional foods and medicinal formulations. Dry Ginger flakes are used for oil extraction from the ginger. Dry ginger is further processed to powder and used in seasonings and as a flavoring agent in Beverages.

Ginger Paste: Ginger paste is produced by grinding cleaned and peeled ginger by adding water. Acidulants like Vinegar or Citric and Preservatives are added for imparting stability. This Ginger paste is used mainly in culinary applications.

Ginger Pickles: Ginger pickles are produced in combination with other vegetables or singly by mixing with Salt, Spices, and Oil. These are traditional products with fair demand in the domestic market.

Candied/ Crystallized Ginger: Cleaned and peeled Ginger slices are coated with sugar syrup and sometimes with other spices. These slices are dried to produce Ginger candy. This is mainly used as mouth freshener or digestive aid.

Ginger oil: Dried Ginger flakes/ Powder are subjected to steam distillation to extract the Ginger essential oil. Ginger oil is used in Fragrances, Flavors and importantly in Medicinal preparations.

Ginger Oleoresin: Dried Ginger flakes/ Powder is used to manufacture oleoresin by subjecting them to solvent extraction. Ginger oleoresin is used in many applications like seasonings, flavors, and pharmaceutical preparations. Processing of Ginger to oleoresin requires advanced manufacturing and analytical capabilities.

Exports – Current status, India exports, and international status

The major ginger producing countries are India, China, Nigeria, Indonesia, Bangladesh, Thailand, Philippines, and Jamaica. It is also grown in Australia, Fiji, Brazil, Sierra Leone and Japan. The United Kingdom, United States, Japan, and Saudi Arabia import large quantities of ginger. Brazil and Nigeria provide ginger to the United States, the United Kingdom, Germany and the Netherlands whereas China, India, and Nigeria are major exporters to Saudi Arabia. Both the Netherlands and Singapore serve as importing countries and re-export to neighboring countries (Netherlands), and other world countries (Singapore)¹³. Malaysia is also a major re-exporter. Ginger from the north eastern states is currently exported to neighboring countries – Bangladesh and Myanmar. The reported exports are very less compared to the actual volumes due to the prevalence of informal trade across the border.

- Fresh Ginger
 - Importing Countries: African & South East Asian countries
 - Exporting countries: Sources of fresh ginger to the United States are Hawaii, South and Central American countries: Brazil, Costa Rica, Ecuador, Guatemala, Honduras, and Nicaragua.
 - Major Trading Center: Singapore, London, New York, Hamburg & Rotterdam.
- Dry Ginger
 - Importing Countries: Japan, Europe, USA, and Saudi Arabia.
 - Major Trading Center : Hong Kong

Internationally India faces competition in terms of both price and quality for its ginger. In terms of pricing Indonesia, China, Thailand, Vietnam & Malaysia offer lucrative prices to importing countries. India faces tough competition in quality standards with Australia, North American countries and Jamaican and Sierra Leone ginger. The Australian ginger is perceived to be of high quality due to its standardized size and clear appearance. The Chinese ginger though available at lower prices is not much recognized for its quality due to high usage of bleaching agents and Sulphur dioxide during processing.

¹³ UNCTADstat, Trade map, Spices board

3.6 Lemon

Lemon is a very popular fruit because of its appealing color, odor, and flavour. The NER is home to different varieties with unique characteristics. The two primary ones include Kachai and Assam. Like most citrus fruits, they are an excellent source of Vitamins C and B6. Kachai lemon has been accorded the GI tag and is propagated through dedicated Lemon festivals which take place annually. Both the varieties have immense potential due to their high juice content and unique taste. The suitable agro climatic conditions in the NER enable the proliferation of these varieties.

Varieties and Characteristics

The agro-climatic conditions of the NER support cultivation of a unique quality of lemons in the region, which are different from the other varieties grown across the country. 2 major variants grown in the region include:



Assam Lemon

- Seedless variety
- Long cylindrical in shape
- Skin is smooth and color ranges from green to yellow
- Length goes from 5 cm to 10 cm
- Flesh is pale green and very juicy
- Juice is mildly acidic and somewhat sweet with lime flavour



Kachai Lemon

- Endemic to Kachai village in Ukhrul District, Manipur
- 51 percent ascorbic acid
- The juice content is 36-56 ml per fruit
- Recently awarded GI Tag

Production

India is the largest producer of Lemon followed by Mexico and China. In India, Assam is the eight largest producer of Lemon. The NER produces nearly 226 thousand tons which is around 9% of India's lemon production. In the NER, Assam leads in production followed by Manipur, Tripura, and Mizoram.¹⁴ The following map shows the key lemon producing districts and the following table highlights the key lemon producing districts in the region.

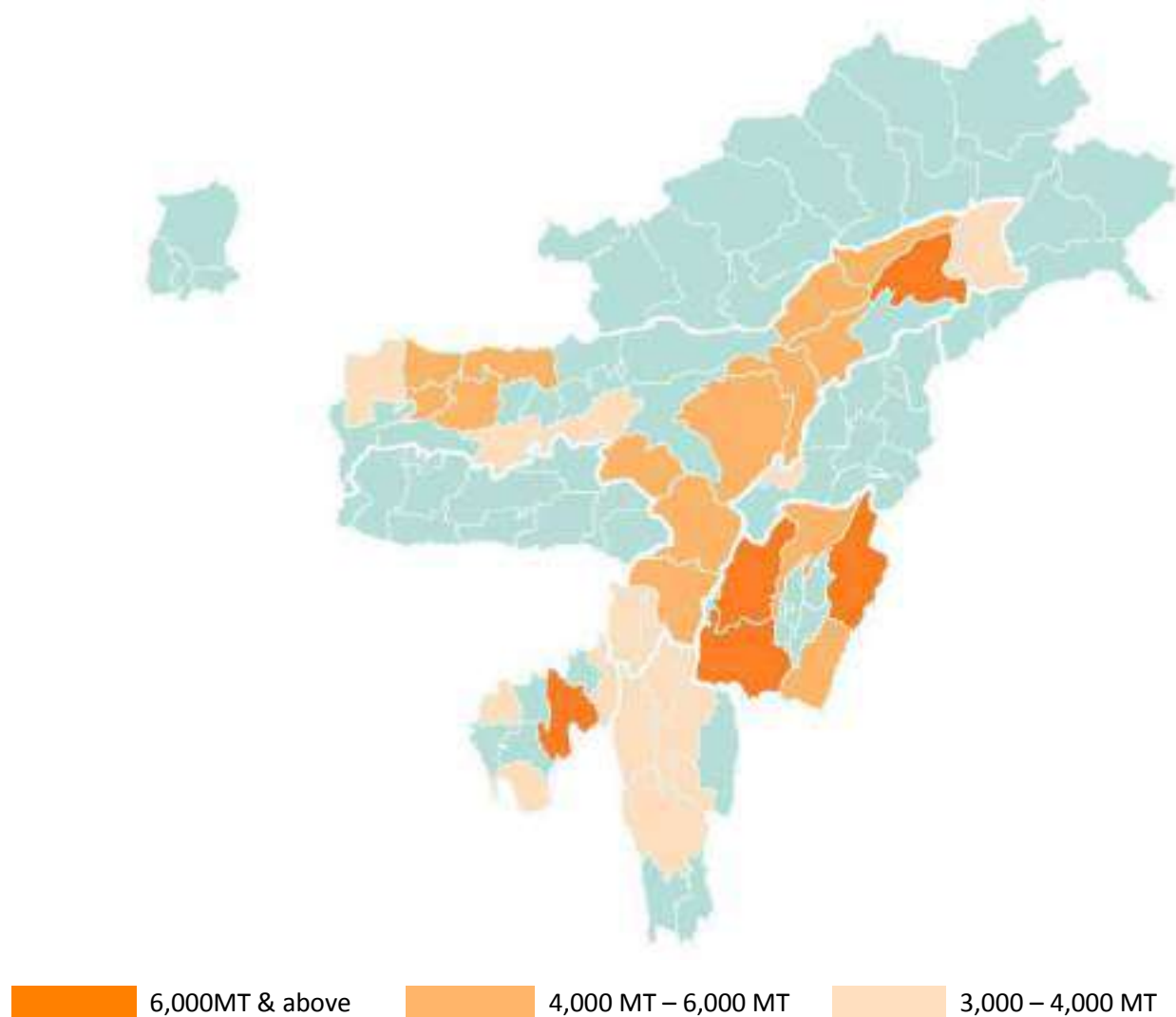
Exhibit 38: Key lemon producing districts in NER

State	Key lemon producing districts
Assam	Dibrugarh, Golaghat, Cachar, Chirang, Nalbari, Dima Hasao, Barpeta, Nalbari
Manipur	Ukhrul, Tamenglong, Churachandpur
Meghalaya	East Garo Hills, West Garo Hills, Jaintia Hills
Mizoram	Aizawl, Serchhip, Mamit, Kolasib, Lunglei

¹⁴ Department of Horticulture

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Exhibit 39: Map of NER showing key lemon producing districts



Package of Practices

Production Practices: individual farmers grow 10-20 plants in their backyard, for which they generally use their own planting material grown through stem cuttings and layering for propagation. The planting is carried out between the months of May and August before the commencement of monsoon. Nearly 800-900 plants are accommodated in one hectare in a commercially managed orchard.

Seasonality: The ideal time for planting the grafts is during June - July just after the first monsoon showers. In case of heavy rainfall in a particular region, the planting can be done September-October optimally.

Exhibit 40: Seasonality chart for lemon in the states of NER

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assam												
Manipur												
Meghalaya												
Mizoram												
Tripura												

 Sowing Season
  Sowing & Harvesting
  Harvesting

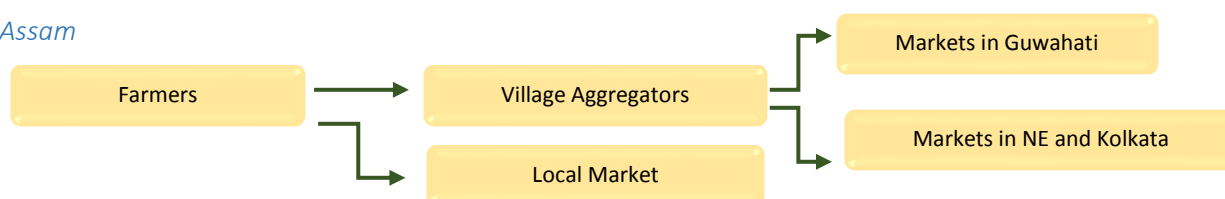
Post-harvest practices:

- Nearly 100-120 fruits are borne per tree under normal conditions. At field, nearly 8-10% of fruits is lost due to insects, pests, and diseases.
- The fruit is packaged in gunny or plastic bags in a makeshift manner with negligible maintenance of standards and guidelines at farmer level.
- The fruit is inspected to detect and discard unripe, immature, undersized, damaged or decayed fruits. For local markets, the citrus fruits are graded as per the size into small, medium and large grades. The differences between categories will depend on the type of fruit.¹⁵
- The value addition of lemon can be done in various ways like Lemon juice, Lemon juice concentrate, Lemon pickle, Lemon puree, Lemon syrup, dried lemon peel.
- Farmer takes the produce to nearby market in gunny bags of 50 kg at the rate of Rs. 10 per gunny bag through private vehicles like bus/mini trucks where they sell it to aggregators and then aggregators sell the produce to wholesalers. The losses during transportation are nearly 3% and at wholesaler and retailer level, the loss is about 2%.

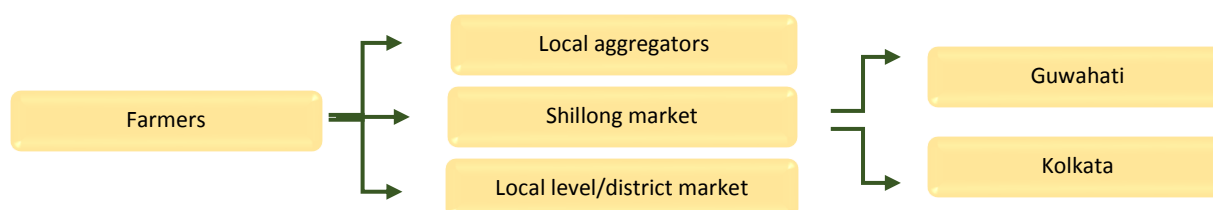
Lemons are sold generally in the local markets and through village aggregators. The village aggregators, in turn, sell the produce in the local major markets in the nearby towns/cities.

Supply chain and value chain

Assam

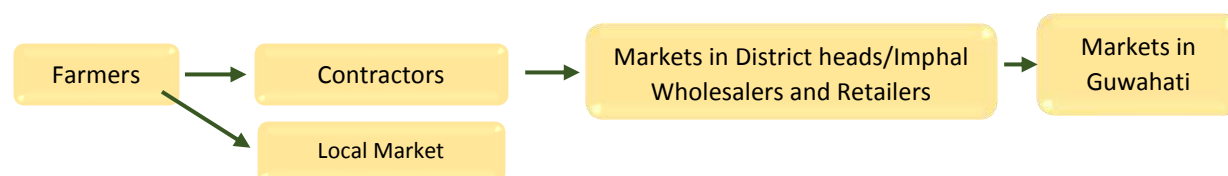


Meghalaya



¹⁵ National Horticulture Board Website, Citrus – Post Harvest Technology

Manipur



Existing Infrastructure

A limited number of processing plants are available for processing of lemon into value added products. The major processing plants are listed below

Exhibit 41: List of processing plants for lemons in NER

State	Location	Processing Unit	Details
Manipur	Imphal	Thangjam Agro Industries	Lemon Water
	Imphal	Magfruit Products, Department of Horticulture & Soil conservation, Govt. of Manipur	Lemon Squash
Meghalaya	Shillong	Fruit Preservation Centre	NA
Assam	Jorhat	Meghalee Food Products	Squash, Pickles, Chutneys

Possible Products

Lack of proper logistics in the NER taking care of perishability and transport for fruits and vegetables is a major reason that the farmer engages with intermediaries and commission agents. Also, lack of a local fruit processing ecosystem is a major reason that the farmers have to sell the produce at throw away prices to the traders. Different lemon based products are as follows:

Dried lemon peel: Dried lemon peel is usually a by-product of juice extraction or other processes and finds application in cereals, baked products, sauces, marmalade, spice mixtures and herbal teas.

Lemon juice: Lemon juice is a popular acidulant for other fruit juices, beverages, and various food products. Although it is seldom consumed as a beverage on its own, it can be made more acceptable by sweetening and the blending of various other juices or ingredients

Lemon juice concentrate: Concentration and freezing are the best long-term preservation options for lemon juice. The concentrate thus serves as a semi-processed product that can be further processed into various beverages such as lemonade, juice blends etc. or purely an acidulant.

Lemon puree: Lemon puree is prepared from sound, whole fruits that have been sliced/crushed and pureed. The puree is a semi-processed product that is useful in the commercial preparation of baked foods, beverages, and frozen desserts. It is preserved by freezing. The yield of puree is approximately 50 - 60 % of the whole fruit.

Exports – Current status, India exports, and international status

India is currently exporting 21874 MT of lemons to various nations whose value is 9394 thousand USD. It majorly exports to UAE (65%), Nepal (10%), and Saudi Arabia (2%) and also it exported to Maldives, Bahrain, Kuwait and Bangladesh.

The world leaders in lemon production are India (16%), Mexico (14%), China (12%), and Argentina (8%).

Amongst the importers, it is the USA (19%), Russia (8%), Netherlands (7%), Germany (6%), France (5.2%), UK (5%), Canada (4%), Italy (3.7%), Poland (3.6%) and UAE (3%). In terms of pricing, India faces tough competition from almost all major exporters like Netherlands, China, Germany, USA, Italy, Chile, Spain, Brazil, Iran, Egypt, Argentina, Morocco, South Africa, Turkey, and Mexico.

Major challenges facing the lemon market in the NER is due to the decline in production due to improper planting material, inadequate nutrition, poor management practices and damage caused by pests and diseases. Farmers are using preceding year's planting material leading to poor planting material. Also, lack of knowledge of modern cultivation practices and low level of value addition at farmer level with the lack of proper infrastructure for storage, packing, and marketing is also a major constraint. The following table shows the major exporters and importers of different value added products of lemons in the world.

Exhibit 42: Major exporters and importers of value added products of lemons

Product	Major Exporters	Major Importers
Fresh and Dried lemons ¹⁶	Spain, Mexico, Turkey, South Africa	USA, Germany, France, Netherlands

Source: Sathguru Analysis, International trade map, UNCTADstat

¹⁶ Trademap.org, UNCTADstat

3.7 Kiwi

Kiwi fruit, also known as Chinese gooseberry, with its unique flavor and soft texture is gaining prominence as an exotic fruit across the world. It is a fair source of vitamins C, E and A, and minerals like potassium, phosphorous, magnesium and copper. It is an ideal snack for weight watchers owing to its low calories and delicate flavor. It is preferred to be consumed as raw fruit or mostly processed into desserts or beverages. Kiwi plant is a perennial twiner with complex production practices and climate requirements than regular horticultural crops. In India kiwi is produced in the northeastern states of Arunachal Pradesh, Nagaland, Mizoram and in the Himalayan states of Sikkim, Himachal Pradesh, and Jammu & Kashmir.

Varieties and Characteristics

Of the 60 species under Kiwi family, Fuzzy Kiwi fruit (*Actinida deliciosa*) and Golden Kiwi fruit (*A. chinensis*) are most commonly consumed species. The kiwi cultivars are broadly classified into Chinese and New Zealand Cultivars. In the North eastern region, the commonly grown varieties Allison and Hayward are New Zealand cultivars.



Allison

- Vigorous and prolific vine
- Large and oblong fruits with dense hair
- Light-green flesh, good flavor, good keeping quality.



Hayward

- Moderately vigorous and moderately prolific vine
- Blooms very late; exceptionally large broad-oval fruits with slightly flattened sides
- Light greenish-skin with dense brown, fine, silky hairs
- Light green flesh of superior flavor and good keeping quality.



Monty

- Highly vigorous and productive vine
- Medium sized oblong, somewhat angular fruit
- Brownish skin with dense hairs
- Flesh is light-green; fruit ripens in early May.



Bruno

- Vigorous and productive vine
- Large, elongated cylindrical fruits-broadest at apex; darker-brown skin with dense, short, bristly hairs
- Flesh is light-green, of good flavor; Ripens in early May.

Production

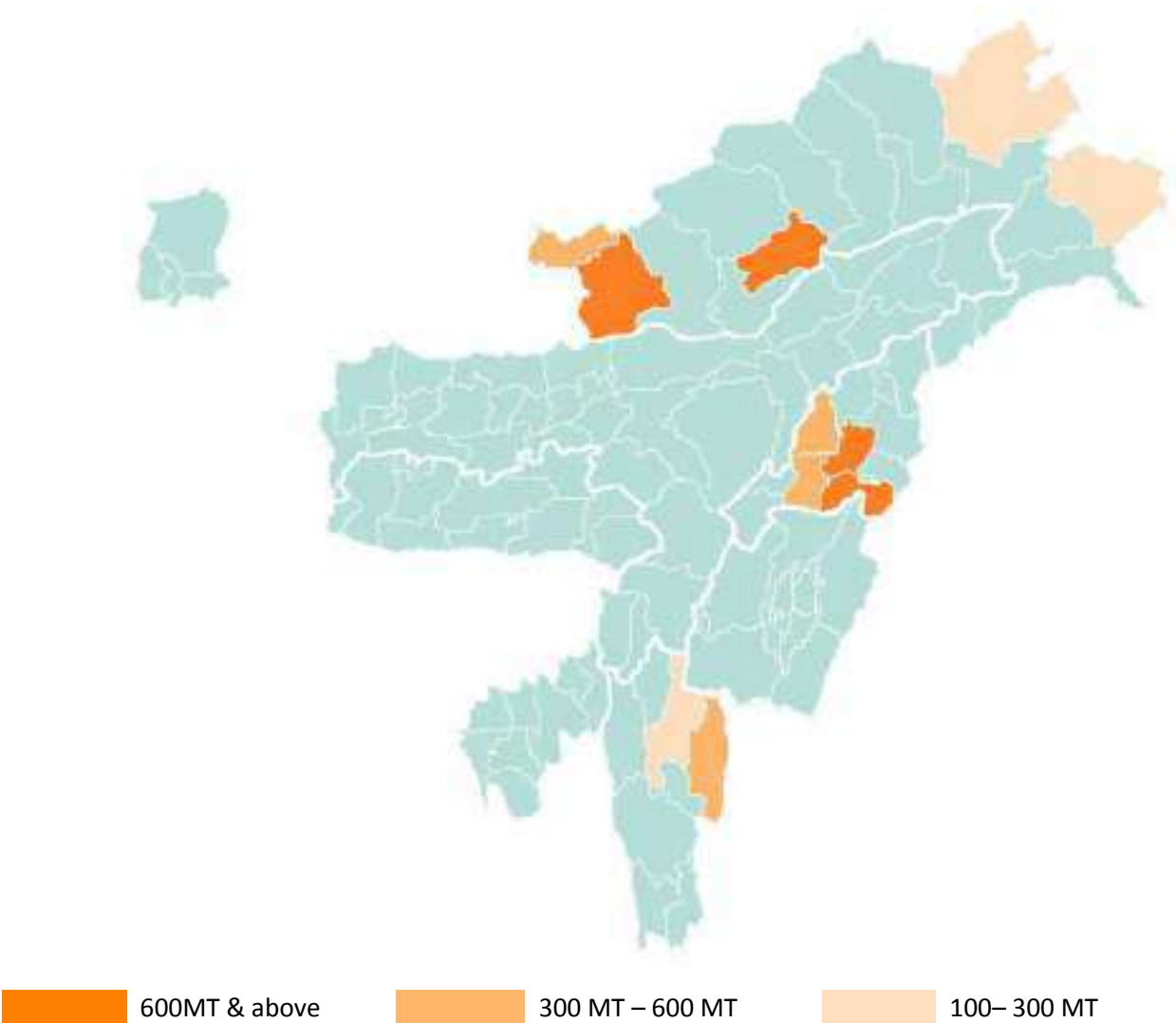
Arunachal Pradesh is the highest producer of Kiwi in India producing around 6000 MT followed by Nagaland which is producing 2400 MT. Other states where Kiwi cultivation takes place are Mizoram, Himachal Pradesh, and Jammu & Kashmir.¹⁷ The following map shows the key kiwi producing districts and the following table highlights the key kiwi producing districts in the region.

Exhibit 43: Key kiwi producing districts in NER

State	Key kiwi producing districts
Arunachal Pradesh	West Kameng, Lower Subansiri
Nagaland	Zunheboto, Phek

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Exhibit 44: Map of NER showing key kiwi producing districts



¹⁷ National horticultural board database, 2015

Package of Practices

Economic Status: Nearly 80% of the kiwi growing farmers are medium and large farmers holding more than 2 hectares of land as opposed to other horticultural crops. This can be attributed primarily to general land holding pattern of Arunachal Pradesh and secondarily to the high cost of cultivation associated with the crop, lack of skills and high gestation before fruit bearing, creating barriers for small holders.

Availability of inputs: The planting material for propagation are vegetative grafts that are currently being procured from horticulture department and private nurseries. The area expansion and rejuvenation program under HMNEH in the earlier years contributed to the growth acreage under Kiwi in the region. Application of fertilizers and pesticides is not a standard practice in the region. Farm yard manure and vermi compost are applied at the rate of 5-7 kg/ Plant.

The growing season of at least 240 frost free days is required for Kiwi cultivation. Also, 700-800 chilling hours below 7°C are needed to break dormancy period. Fruit grows on vines which require regular pruning. Fruits start bearing on one year old canes, but production declines with the ageing of canes.

Seasonality: Planting is usually done in the month of January. It takes 4-5 years for a kiwi vine to start bearing worthwhile fruits and 7-8 years for commercial production. Kiwi is available in North East from September to November.

Exhibit 45: Seasonality chart for kiwi in the states of NE

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Arunachal												
Nagaland												

 Harvesting Season

Cost of cultivation: The cost of cultivation for Kiwi fruit is between INR 1.2 to 2.5 lakhs per hectare. Land preparation, irrigation and establishing the orchard in the initial years accounts for the major share. The payback period for kiwi cultivation is about 6 years and the difficult terrain in the kiwi growing regions further escalates the cost of production. Support to farmers is currently being extended by reimbursing the cost of second and third year maintenance of the orchard under HMNEH.

Post- Harvest practices: Harvesting in Kiwi is carried out manually in multiple instances, depending on the maturity of the fruits. The harvested fruits are rubbed with a coarse cloth to remove bristly hair on the surface and transported in trucks. On the basis of weight, farmers carry out manual sorting and grading of fresh Kiwi. A sizeable quantity of about 10 % is lost at farm level and during transportation. Irregular and small fruits are left on the farm as they find no demand in the market. The losses during transportation are attributed to the poor transportation conditions.

Supply chain and value chain

Kiwi are transported in mini trucks without packaging or are packed in gunny bags. If the main market is nearby, farmers directly sell the produce to consumers and otherwise, produce is taken to nearest transport point and from there it is transported to local market by jeep/maxi. From the local market, the product is transported to the main market in mini trucks. Most of the farmers sell their produce to contractors even before harvesting at a pre-agreed price and others sell their produce to aggregators/traders in Guwahati, Silchar, Kolkata and Delhi. The farm gate price of kiwis ranges from INR 60 to 80 depending on the season and condition of the market. The kiwi producing areas in the region are in difficult terrain and the connectivity is very poor and the lack of cold storages and processing plants compounds pressure on farmers after harvesting. This leaves farmers on the weaker side of the bargain with the traders. The transportation cost incurred by the traders to move the produce out of Arunachal Pradesh is also very high at about INR 15 kilogram and the fruits are further shipped to terminal markets by road or by air.

Arunachal Pradesh and Nagaland



Existing Infrastructure

Currently, there are no Packaging, primary and secondary processing plants for Kiwi in the region.

Possible Products

Kiwi is perceived to be an exotic and premium fruit in the consumer market and the same is extended to the processed products. The range of products from kiwi are listed below

Dried/ Candied Kiwi: Dried Kiwi slices are processed by coating cleaned, peeled and sliced kiwis with sugar syrup and then subjecting to hot air or vacuum drying. The dried slices are consumed as a snack or used in breakfast cereals, garnishing in bakery products.

Individual Quick Frozen (IQF) Kiwi Slices: Cleaned, peeled, blanched and sliced kiwis are subjected to quick freezing by a cryogenic dip or by blast freezing. IQF Kiwi Slices are used in dairy foods, confectionery, and desserts. Complete cold chain infrastructure is required to process the product.

Kiwi Juice Concentrate: After cleaning and peeling, the juice is extracted from kiwis and the seeds are separated. The extracted juice is concentrated by means of vacuum evaporation and the solids content is raised from 10° to 65° Brix. Juice concentrate is a very stable product with long shelf life that can be stored at ambient temperature and can be made from culled fruits.

Kiwi pulp: Kiwi pulp/ puree is made by homogenizing the fruits after primary processing. Depending on the end use, sometimes gelling agents like pectin and stabilizers are added. Kiwi pulp finds use in Dairy and dessert preparations and Beverages.

RTS Beverages/ Squashes: The pulp extracted from kiwis after primary processing is blended with water, sugar, acidulants and preservatives to make Squash or RTS beverages, depending on the end use. These beverages are usually marketed in the premium consumer segment.

Kiwi Wine: A very light and smooth flavored Kiwi wine is manufactured by controlled fermentation of kiwi juice and subsequent aging. This product can also be manufactured from culled fruits and stored at ambient temperature for a very long time.

Exports – Current status, India exports, and international status

India currently produces about 9,000 MT and imports 12,389 MT of Kiwi majorly from Italy, New Zealand, Iran, Chile, Greece, and France. Nearly 7,000 MT of the India's production is from the north east region. Nearly 70% of the kiwi produced in the north east is wasted annually due to lack of storage and packaging facilities. While a great deal of attention is paid to achieve the area expansion and rejuvenation of orchards in the region, apathy on the creation of market linkages and post-harvest facilities is making the good work done in strengthening the production futile.

Kiwi Exports from India are not existent. Top producing countries of Kiwi are China (54%), Italy (14%), and New Zealand (12%). Others like Chile, Greece, France, Turkey, Iran, Japan, and USA also produce sizeable quantities. 85% of exports of Kiwi take place from five countries i.e. New Zealand (34%), Italy (24%), Chile (13%), Belgium (8%) and Greece (7%). Major importing countries are Spain (11%), Belgium (10%), Germany (8%), China (6%), Japan (6%), United States of America (5%), France (5%), Netherlands (4%), Russian Federation (4%) and Italy (3%)¹⁸.

¹⁸ Trade map, UNCTADstat

3.8 Cut Flowers

The NER owing to its unique topography and climatic conditions offers the exhaustive potential for beautiful natural fauna to flourish. The NER has the agro-climatic advantage at tropical and temperate regions to grow varieties of floricultural products in addition to rich genetic diversity. India is renowned for growing traditional flowers such as Jasmine, Chrysanthemum, Anthurium, Gerbera and Aster along with several aromatic and medicinal varieties such as Patchouli, lemongrass, and Citronella. This gives a massive opportunity for commercial production and lucrative investment opportunity for the farmers and agro entrepreneurs across the NER. Commercial cultivation of cut flowers such as rose, orchids, gladiolus, carnation, Anthurium, gerbera and lilies have also been adopted by farmers on large scale. These products fetch high demand and prices in the domestic and international market.¹⁹ Only 0.1% of the total area is used for flower production in the entire region. Out of about 1300 species of orchids reported so far from India, about 870 species are from N. E. India and about 560 species are from Arunachal Pradesh.²⁰

Varieties and Characteristics

The agro-climatic conditions of the northeastern India support cultivation of flowers products in the region. Some of the varieties growing in the region include:



Gerbera

- Two-lipped ray florets in yellow, orange, white, pink or red color
- Widely used as a decorative plant or in a cut form



Cymbidium

- Distributed widely from the North West Himalayas passing through Arunachal Pradesh, Bhutan, China, Japan and Malaysia
- A total of 44 varieties known out of which 21 grow in the NER
- Sikkim, Darjeeling hills and Arunachal Pradesh are the hotspots
- Come in shades of white, pink, yellow and green



Anthurium

- Famous ornamental variety in the subcontinent
- Has medicinal value with usage with steam for the discomforts of arthritis and rheumatism

¹⁹ SIDBI

²⁰ Floriculture prospects in Arunachal Pradesh with special reference to orchids, 2012, Journal of Biodiversity and Environmental Sciences (JBES)

Production

Ornamental flowers are grown primarily in Sikkim, Nagaland, Assam, Arunachal Pradesh and Mizoram in the NER. The growth has shown an increase ever since the 90s, however, India still lags behind when compared to mature markets like Netherlands, Belgium, Columbia and Ecuador. Yield per hectare is a constraint in the NER. Major production period is October-December. As of 2012, the NER accounted for 3459.3 thousand MT for producing loose and cut varieties over 1.58 thousand Ha which is just 4.5% of the national growth figures. The following table highlights the key flower producing districts in the region. The following table highlights the key flower producing districts in the region.

Exhibit 46: Key flowers producing districts in NER

State	Key flowers producing districts
Arunachal Pradesh	Ziro-Hapoli, Itanagar, Bomdila, Tawang/Dirang, Namsai, Pasighat
Assam	Kamrup, Nagaon, Sonitpur, Jorhat, Silchar, Dibrugarh, Tezpur
Manipur	Imphal, Thoubal, Senapati
Meghalaya	Upper Shillong, Barapani
Mizoram	Aizawl, Lunglei, Kolasib
Nagaland	Kohima, Wokha, Mokukchung, Dimapur
Sikkim	East District, West District, South District

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Package of Practices

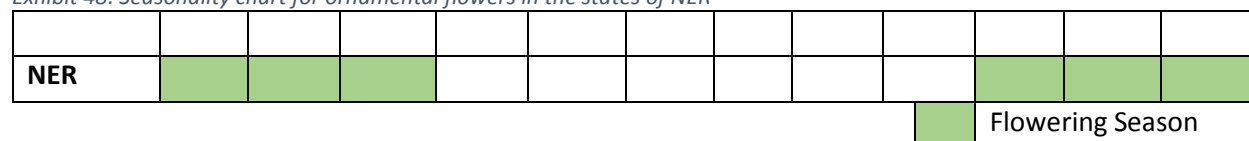
Propagation: Major varieties in the NER are propagated by various methods namely bulb division technique which takes around 6-10 months to flower, via back bulb and offshoot method taking about 12 months to flower, and through tissue culture method which necessitates the availability of a high technical skill and modern tissue culture laboratory. It offers a rapid way of multiplying stock with the advantage that the young plants are disease and virus free. After 5-6 months in community trays, these are transplanted into pots and green house where it takes 12 months to flower.



Seasonality: Most of the floricultural varieties occur in sub-tropical cool humid conditions. Large varieties of modern day hybrids of commerce also require cool and humid conditions with the temperature ranging from 8° C minimum in the winter to a maximum of 24° C in summer. In other words, ideal conditions for growth and blooms of orchids and floricultural plants are warm and humid in growing period and cool climate in flowering seasons i.e. mostly in winter.

Exhibit 47: Greenhouse at National Horticulture Research Institute - Medziphema, Nagaland

Exhibit 48: Seasonality chart for ornamental flowers in the states of NER

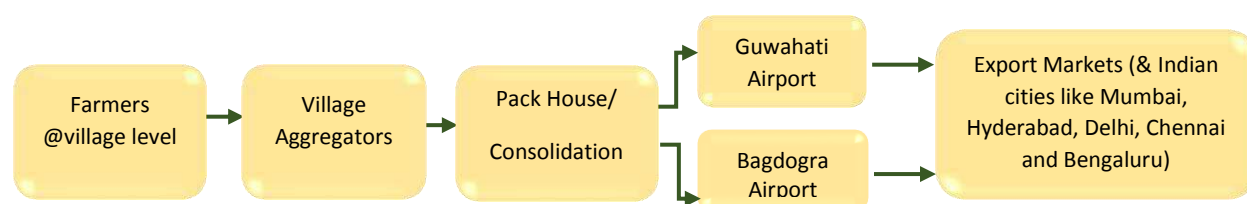


The flowers, once picked from the fields have their stem cut under water and then sent for makeshift packaging through local aggregators. The packaging is done according to the length of stem and in corrugated boxes. The bud is wrapped in corrugated paper and sealed with a tape. Labeled flower bundles are placed opposite to another in such a way that their flower buds face the sides of the box and their stem ends towards the centre of the box. The inside of the box is finally covered with a sheet of tissue paper before putting on the cover of the box. These are sold generally in the local markets and through village aggregators. The aggregators then link it to other interested parties in major metro cities across India or internationally.

Supply chain and value chain

The floriculture produce gets airlifted from the NER and is being marketed in major metros in the country, however, the volumes are negligible and fail to induce organized producer/entrepreneurs to go for intensive cultivation of such produce. After consolidation and packaging at farm gates or pack-houses flowers are transported by road to a nearby airport where the cargo transport facility is available. As a result of the lack of direct connectivity of airports from NER to other cities, products are first brought either to Guwahati airports (by road or air) and from here, the products moves to major cities such as Delhi, Mumbai, Kolkata, Bengaluru, and Hyderabad etc. Bagdogra airport in Siliguri in West Bengal is another major airport (the nearest airport for Sikkim) which has direct connectivity with Delhi, Mumbai, Kolkata and major airports in North East region. Except for Guwahati and Kolkata airports, none of the airports has facilities for handling perishable cargo.²¹

All States



²¹ Report on Market Linkage of High Value Horticulture Produce of North Eastern Region, SFAC

Exports – Current status, India exports, and international status

Though the production of ornamental plants from the NER has increased over the years, exports from the region are yet in the nascent stage. In the year

2014-15 floricultural products were exported to 105 countries, of which 86.3% was exported to only 18 countries. The main export market is the USA importing 5490 MT quantity valued at 98.13 crores. The USA imports 23.9% of the total exported quantity followed by UK, Germany, the Netherlands, UAE, Canada, Japan, Australia,

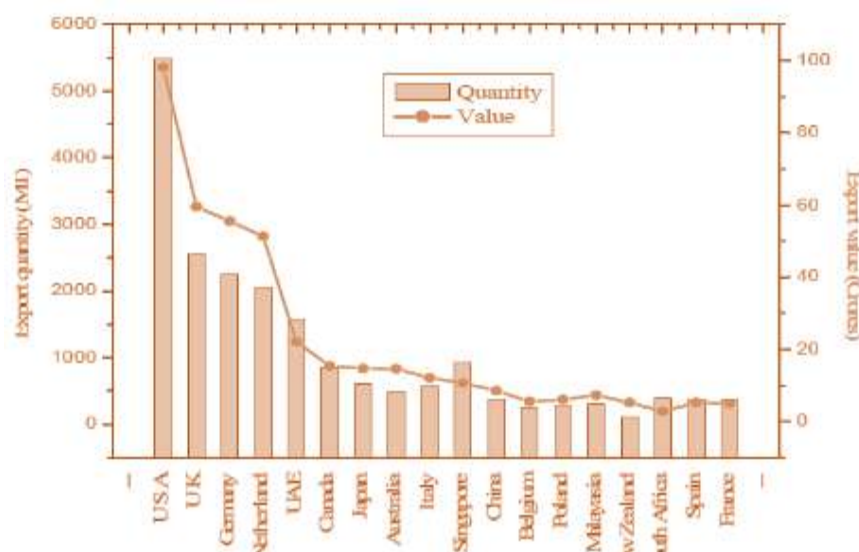


Exhibit 49: Export of ornamental flowers from India to major importing countries

Italy, and Singapore. These ten countries together import more than 70% of the total exported quantity. The Netherlands, which is known as the leading exporter in the world trade of flowers, also imports a large amount of floricultural products from India. The following table shows the major exporters and importers of floricultural products in the world.

Exhibit 50: Major exporters and importers of floricultural products

Product	Major Exporters	Major Importers
Floricultural products	USA, Germany, United Kingdom, Netherlands, UAE, Canada, Japan and Singapore	Thailand, Netherlands, China, UAE, Italy, UK, Spain, Israel and USA

Source: Sathguru Analysis, International trade map, UNCTADstat

3.9 Jackfruit

Jackfruit, known to be originated in the Western Ghats of India, is the largest tree borne fruit in the world. Although India is one of the largest producers, it is one of the most under-utilized fruits in the country. The Jack fruit tree grows as large as 30 meters and bears fruits ranging from few numbers to as high as 200. Nutritionally jackfruit is a fair source of Vitamins- A, C and B and minerals like Potassium, Magnesium, and Manganese. The Unique flavor and taste of the ripe jack fruit bulbs is sought after by consumers across the East Asian countries and the very same flavor is rejected by the European and Western population and its lesser cousin “Bread fruit” is preferred over it attributing to its mild flavor. The fruit is used in its raw and mature forms. In the north eastern region, jack fruit is grown primarily in the states of Tripura and Assam and a meager share is cultivated in Nagaland and Mizoram.

Varieties and Characteristics

The varietal classification for Jackfruit in the north eastern region is not very distinct. In Assam and Tripura, both soft flesh (Pakikhua) and firm flesh (Khoja) varieties are available. Velipala, Singapore, Hybrid jack, Panruti selection, Thanjavur jack, Burliar 1, PLR 1 and PPI 1 (Peechiparai-1) are the popular varieties in the country.



PPI 1

- High yielding variety; Fruit bearing –twice in a year.
- Primary Fruiting season (April - June)
- High quality carpels-Crisp and attractive creamy yellow color
- Sweet taste with pleasant aroma
- Medium tall tree
- Suitable for commercial planting and home gardens.



Kahikuchi

- Twelve subtypes were identified
- Soft fleshed variety; Dominant in North east region
- Significant variations in fruit bearing and fruit quality
- Fruiting season- June to July

Production

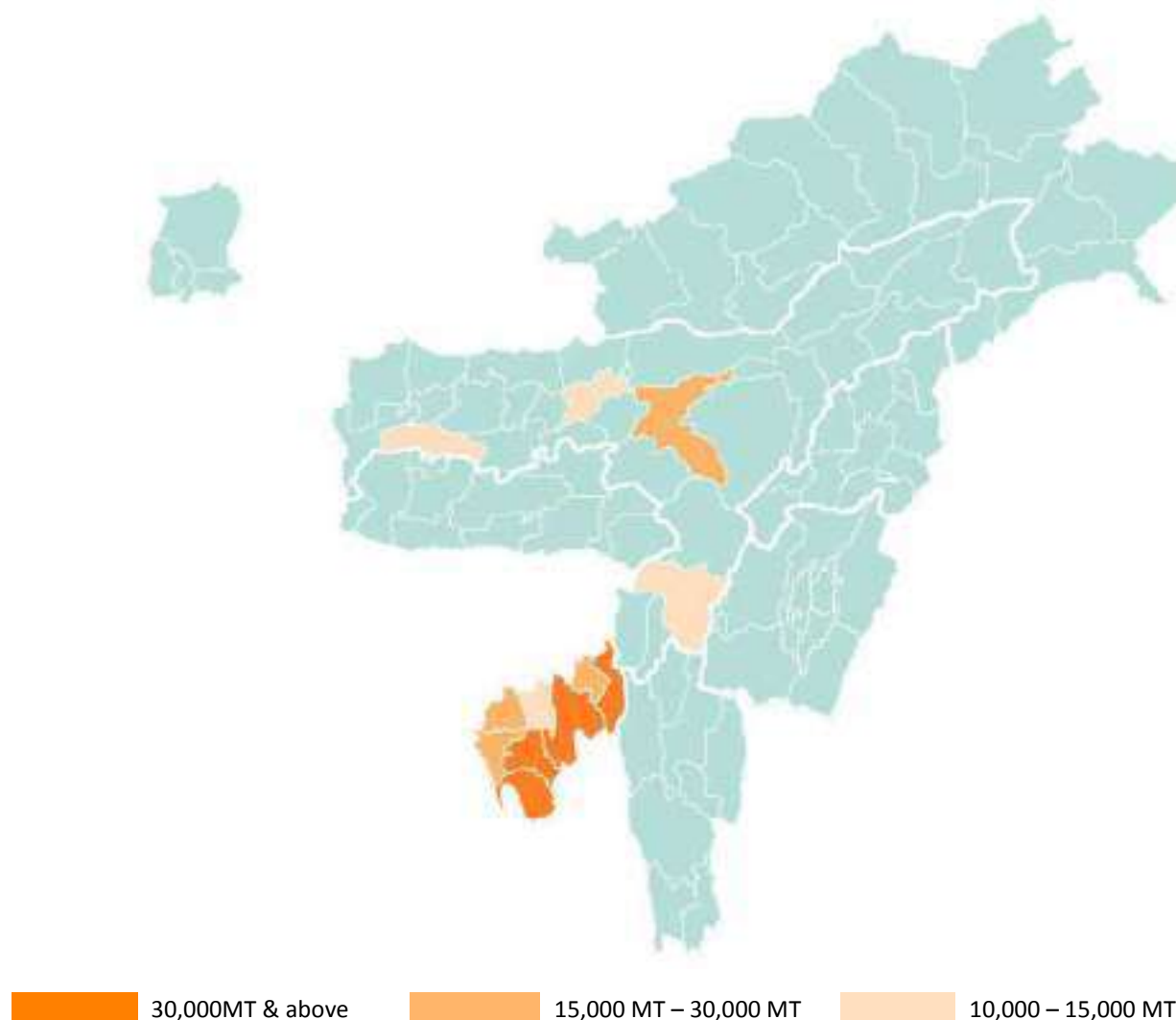
Of the total jack fruit production in the country, about 23.6 % is contributed from the two north eastern states of Tripura and Assam. Tripura, With 300,000 MT of production, is the second largest producer in the country. The following map shows the key jackfruit producing districts and the following table highlights the key jackfruit producing districts in the region.

Exhibit 51: Key jackfruit producing districts in NER

State	Key jackfruit producing districts
Tripura	South Tripura, North Tripura, Gomati and Dhalai
Assam	Nagaon

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Exhibit 52: Map of NER showing key jackfruit producing districts



Package of Practices

Economic situation of jackfruit farming: The organized cultivation of jack fruit is not prevalent in the north eastern region. It is either grown in the wild or as a backyard crop. Hence most of the farmers in the region are marginal and small farmers. Around 97% of the farmers are marginal and small farmers in Tripura whereas in Assam it is around 90%.

Availability of inputs: The commercial cultivation of jackfruit is non-existing, primarily because of the difficulty in procuring planting materials and due to its large scale availability in the wild. The general

method of propagation is by means of seeds. Specific measures for irrigation and application of fertilizers and pesticides are not practiced.

Seasonality: Generally the tree takes 8-10 years for fruiting. The fruiting season begins in May-June and is at the peak during the monsoon season. July-Sep is the peak season for jack fruit in these areas.

Exhibit 53: Seasonality chart for jackfruits in the states of NE

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assam												
Tripura												

 Fruiting Season

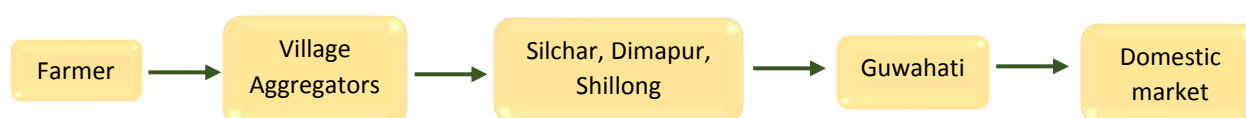
 Peak Season

Cost of Cultivation: Since there is no commercial cultivation in the region the production cost only involves the cost of harvest. Mostly the farmer along with his family members is engaged in this activity hence the cost is minimal.

Post-harvest practices: Harvesting is a difficult operation in Jackfruit owing to the bulky size of the fruit and large trees. The harvested jack fruits have relatively well keeping quality till it ripens, but upon ripening the spoilage is very quick. Peeling, Cutting, and separation of bulbs from the pericarp is skilled operation mastered by few. The no defined post-harvest practices are followed at the farm level, at markets a rudimentary grading is done by the traders. Harvested fruits are carried individually by holding the stalk and loaded into bullock-carts or push-carts which are later transported to a nearby town or village markets for retail sales or wholesale to visiting tradesmen from larger towns.

Supply chain and value chain

Tripura & Assam



Existing Infrastructure

There are no large scale processing units in the region only small scale household units are functioning to make jams and pickles which are sold in the domestic markets.

Possible Products

Canned jack fruit bulbs: The separated and de-seeded jack fruit bulb are cooked in sugar syrup and packed in lacquered cans. These are further used in dessert preparations and dairy products like ice creams.

Dried jack fruit slices: Separated and de-seeded bulbs are sliced and dried in controlled conditions after dipping in sugar syrup and acidulants. These are used as a snack and in confectionery preparations.

Preserves/ Jams: Jack fruit slices are pulped and processed with sugar, Pectin, Acidulants, and preservatives. These are used for house hold consumption and bakery applications.

Fruit Snacks: Unripe/ Semi ripe jack fruit bulbs are sliced and subjected to frying in conventional or vacuum frying systems and often coated with salt and seasonings to be consumed as a snack.

Exports – Current status, India exports, and international status²²

Despite the fact that North east region is producing a huge volume of jackfruits, the exports are non-existent. Bangladesh which otherwise imports some of the horticultural produce from the region is the largest producer of Jackfruit. A negligible unorganized trade with border villages is the only cross border trade from the region. Bangladesh, Myanmar, Thailand, Vietnam, China, Philippines, Indonesia, Malaysia & Sri Lanka are the major jack fruit producing countries.

The main exporters of jackfruit in Asia are Thailand, China, and Malaysia and among them, Thai products are considered to be the market standard, followed in quality by Malaysian and China. Malaysia exports to Singapore (almost 85%) and Hong Kong. Thailand. With Existing agreements Malaysia, Bangladesh exports raw fruits to the former country and it re-exports after processing. A few companies in Kerala and Karnataka are exporting processed jackfruit products to USA and Middle East countries.

²² APAARI. 2012. Jackfruit Improvement in the Asia-Pacific Region – A Status Report. Asia-Pacific Association of Agricultural Research Institutions, Bangkok, Thailand. 182 p

3.10 Banana

Banana, known to be originated in South- East Asia, is the fourth most important staple crop in the world. It is cultivated in more than 130 countries owing to its significance in terms of household food, nutrition, and social security. Banana is most consumed tropical fruit in the country in fresh as well as processed form like snacks, beverages, dairy products and bakery products etc. The green banana or “plantain” is used as a staple in culinary preparations in cuisines across the world. North east region is a treasure trove of banana germplasm with diverse and new varieties being discovered in the present day. Banana is grown all the states of India and the major of production from North-east region is from the states of Assam and Tripura.

Varieties and Characteristics

The most commonly grown varieties in banana in the Northeastern region are Jahaji (Dwarf Cavendish), Chini Champa, Malbhog, Borjahaji (Robusta). Other Varieties like Kanchkol, Bhimkol, Jatikol, Manjahaji, Chinia (Manohar), Digiowa, Kulpait, Honda and Bharat Moni are grown in the homesteads or kitchen gardens. The characteristics of the important traded varieties in the north east region are as follows:



Jahaji (Dwarf Cavendish)

- Dwarf variety; important for international trade and high density planting.
- Bunch weighing 20 - 25kg with 12 hands, 150 or more fruits.
- Large curved fruits with thick greenish peel.
- Soft, sweet, juicy pulp with delightful aroma.



Chini Champa

- Tall and slender plant harvested throughout the year.
- Bunches weigh about 15-30 kg with 11-13 hands consisting of 12-16 fruits.
- Fruits are small and yellow in color with firm, sweet and white pulp with a typical flavor.



Malbhog

- Leading commercial cultivar with location specific ecotypes.
- Bunches weigh about 12-13 kg with 8-10 hands of 12 -14 fruits.
- Fruits with slightly acidic taste, sweet and sour aroma and golden yellow color.



Borjahaji (Robusta)

- Medium Dwarf variety
- Pendulous bunch with, 7-9 hands and 12-15 fingers per hand.
- Average 100 fruits per bunch, 25-30 kg.
- Large fruits with medium thick skin in green to dull yellow color. Sweet juicy pulp; Better keeping quality than Dwarf Cavendish.

Production

India, with a share of 25% of global banana production, is the leading producer followed by China and Philippines. In India Tamil Nadu, Gujarat and Maharashtra are the leading banana producing states with production volume more than 4 Million tons. In Northeastern region, Assam holds the largest share of banana production with 0.86 Million tons. Tripura, Manipur, Mizoram, Nagaland and Meghalaya produce sizeable quantities of Banana. The following map shows the key banana producing districts and the following table highlights the key banana producing districts in the region.

Exhibit 54: Map of NER showing key banana producing districts

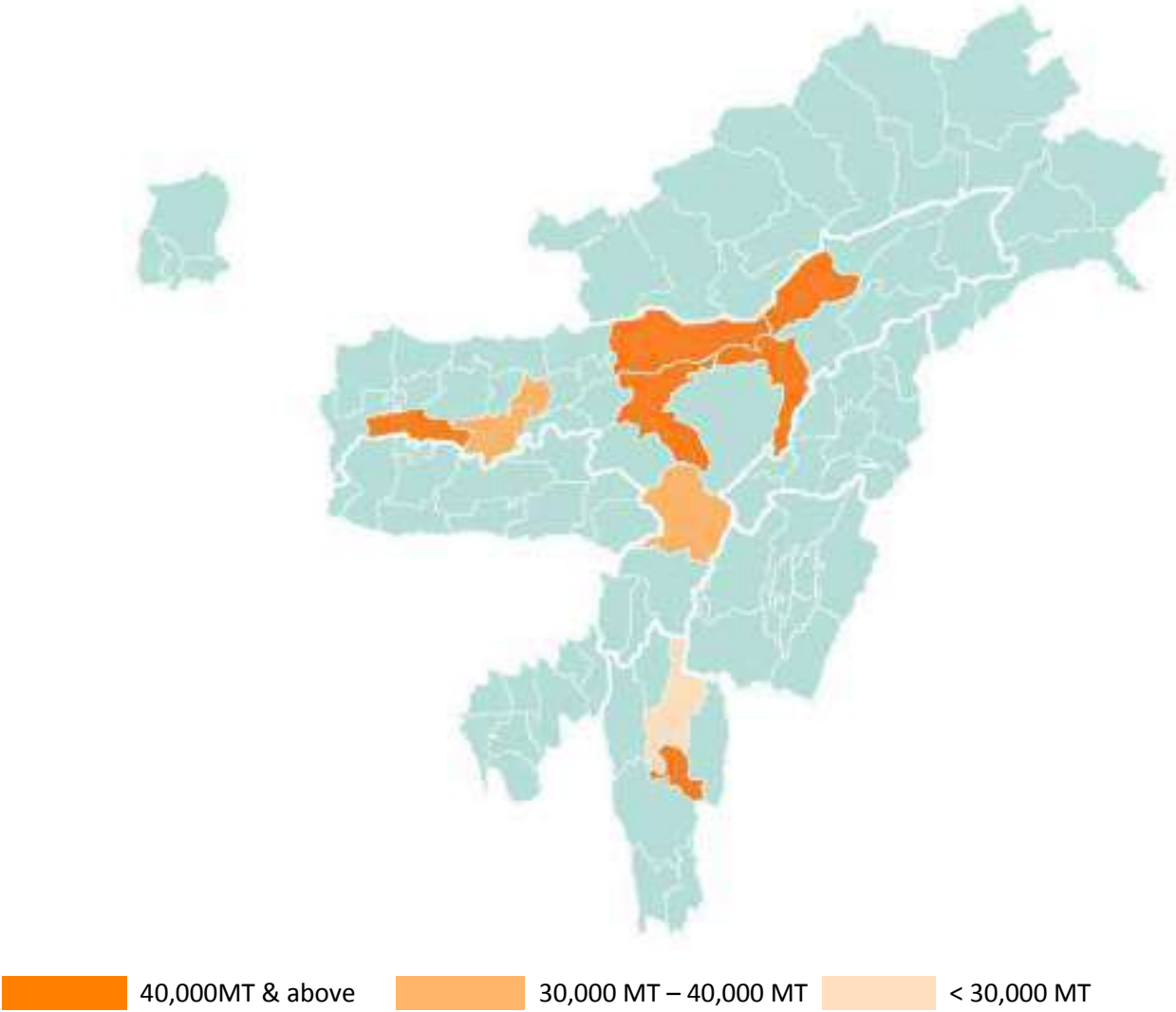


Exhibit 55: Key banana producing districts in NER

State	Key banana producing districts
Assam	Nagaon, Dhalai, Goalpara, Lakhimpur, Sonitpur
Manipur	Imphal West, Tamenglong
Meghalaya	West Garo, North Garo
Mizoram	Aizawl
Nagaland	Mokukchung, Wokha

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Package of Practices

Economic status: Nearly 79 % of the Banana farmers are small and marginal with a land holding less than 2 Hectares. The presence of only 0.6 % of large farmers also coincides with the fact that banana cultivation is still unorganized in the region. Most of the small and marginal farmers collect the banana bunches from wild or from homesteads and sell them in the local market. Commercial cultivation of Banana is being taken up in Assam and Meghalaya.

Availability of Inputs: The Propagation of Banana in the region is mostly done through vegetative suckers form the previous crop primarily due to the cultivation practices and secondarily due shortage in the availability of propagation material. Only few farmers take up replanting with fresh tissue culture saplings from the nurseries within and outside the region. Fertilizer application is done few farmers by applying approximately 10 -12 kg FYM during planting and before fruit setting. Other crop protection measures are relatively inconspicuous in the region.

Seasonality: Banana is available all through the year in the states of Assam, Tripura, and Nagaland. In the other states even though the availability is year round, the bulk of harvest happens in between the months of April and August.

Exhibit 56: Seasonality chart for banana in states of NER

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assam												
Tripura												
Nagaland												
Mizoram												
Meghalaya												
Manipur												

 Harvesting Season

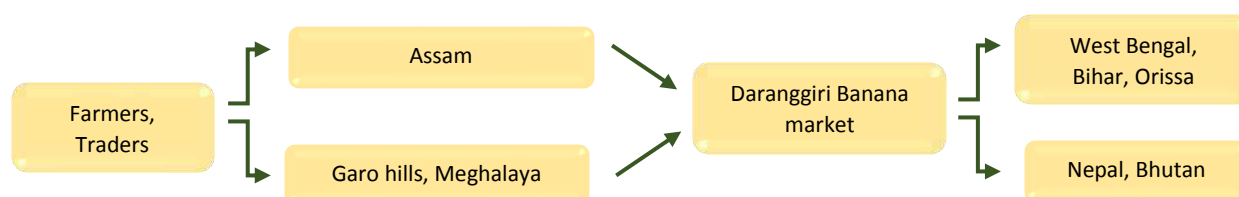
Cost of cultivation: Banana is an ancillary income source for the small and marginal farmers in the region, apart from other crops. Usually, bananas are cultivated in the forest land or collected in the wild/ Homesteads. With recent interventions by respective horticulture departments and HMNEH, commercial cultivation of banana is taken up in Assam and Meghalaya. In the commercial cultivation of banana, for one hectare, production costs incurred are about INR 60,000 per hectare, inclusive of fertilizers, tilling and planting material and irrigation and harvesting.

Post-Harvest Practices: Harvesting is carried out manually after the attainment of harvesting maturity. Significant post-harvest operations are not evident in the region. The harvested bunches are transported on bicycles or trucks to the nearest market. Often, bunches are wrapped in banana leaves during transport for long distance. The covers on the trucks are removed intermittently during transit to facilitate better aeration. No significant packaging, grading practices or any other post-harvest practices are followed in the region.

Supply chain and value chain

Apart from the interstate trade, inherent consumption of banana is significant in NER. Culinary variety of bananas i.e. Plantains plays an important role in the cuisines of the north east and of high demand owing to the deficit of vegetables in the local markets. In the states of Manipur, Mizoram, and Nagaland most of the produce is traded in markets for local consumption and in the states of Assam and Meghalaya owing to their better connectivity, banana is traded with other states. Daranggiri Banana Market in Goalpara district in Assam is the biggest banana market in the region which operates twice in a week on Mondays and Thursdays. 80% of Banana produce is brought from Garo hill districts of Meghalaya and 20 % from the surrounding districts of Assam. Bunches are procured by traders to be transported to neighboring states like Bihar, West Bengal and Orissa and a minor share of the produce goes to nearer countries like Nepal, mostly through unorganized trade.

Assam & Meghalaya



Existing Infrastructure

The Government fruit preservation factory (MEG) under Meghalaya Horticulture Department is currently processing a limited quantity of Banana into products like vacuum fried snacks. In Assam, a local plantain variety called Bhim-kol is being processed into a baby food called “Bhim-Vita” by a start-up venture. Apart from these, there are no significant processing operations are evident in this region.

Possible Products

The year round availability of Banana makes it viable to process it to different value added products. Some Important processed products of Banana are:

Dried Banana slices: Dried Banana slices are produced by subjecting bananas to peeling, slicing and blanching. They are further dried by means of hot air/ Vacuum drying methods. They are used as ingredients in breakfast cereals, snacks or for further processing into powder.

Banana Powder: Banana powder is produced by subjecting dried banana slices to milling or by means of spray drying of the Banana pulp. Banana powder is used in multiple applications like baby foods, Bakery, and dairy foods.

Banana Pulp/ Puree: Banana pulp or puree is produced from sound, ripe fruits by subjecting them to peeling, pulping, homogenizing and thermal processing. It is further used in the production of products like beverages, jams, and dairy foods.

RTS Beverages/ Squashes: RTS Beverages like Banana Nectar, Squashes are produced from Banana fruits or Pulp by mixing them with ingredients like sugar syrup, flavors, and preservatives.

Fried Snacks: Unripe Bananas are processed to snacks by slicing them and frying them in vacuum or normal fryers and flavored with seasonings/ salt for ready consumption.

Freeze dried snacks: Sound, ripe bananas are sliced and subjected to freeze drying under high vacuum conditions in order to retain the flavor and color of the fruits. These are consumed as healthy snacks or further used as ingredients in products like breakfast cereals.

Exports – Current status, India exports, and international status²³

India is the leading producer of banana in the world but accounting to only 5 % of the export. This can be attributed to high domestic consumption and poor post-harvest practices. The Philippines is the leading exporter with 70 % share of the total export volume followed by Mozambique and Ecuador. Major importing countries in the world are Saudi Arabia, UAE, and Namibia. Major Banana importers from India are UAE with a quantity of 122,664 MT (2014) and Saudi Arabia with 205,809 MT (2014).

²³ Trade map, UNCTADstat, Agrixchange-APEDA

3.11 Other upcoming products of NER

Litchi

Assam and Tripura together contribute about 13 % of India's Litchi production. In 2014-15, approximately 49,000 MT of Litchi is produced from a cropped area of 5440 Hectares in Assam and approximately 20,500 MT from 3900 Hectares in Tripura²⁴. The Tezpur and Sonitpur varieties are considered to be superior varieties in the region and the former variety has acquired a GI tag. Even though NER has congenial agro-climatic conditions for the cultivation of Litchi, the production quantity is currently limited. Another important challenge is the inability of the cultivars to express similar superior characteristics when cultivated in other areas of the NER. High perishability of the fruit and lack of proper infrastructure is currently limiting the potential of the product to reach distant markets, domestic as well as International. Assam agricultural university has taken up the issue and currently conducting studies in university orchards to improve the cultivar characteristics and productivity. Currently, a limited quantity of the produce is exported to Bangladesh and Nepal. By strengthening the organic production systems and by the creation of infrastructure for handling perishables, exports of Litchi and related processed products can be taken up in future.



Passion Fruit

NER has a distinct comparative advantage in the production of Passionfruit due to its suitable agro-climatic conditions. Manipur, Nagaland, and Mizoram together produce about 95 % of the India's production of the fruit. In 2014- 15, with an area under cultivation of 9270 hectares, Manipur has produced approximately 99,000 MT and Nagaland produced about 21250 MT from 8500 hectares²⁵. The production and acreage have consistently increased with sustained efforts under area expansion programs under NHM and HMENH programs. However, poor development of supply chain and post-harvest infrastructure and poor connectivity to the producing regions limited the opportunity processing and exports of the fruit. Passionfruit is perceived as premium fruit in both domestic and international market and offers a good opportunity for processing. By establishing processing facilities and strengthening the supply chain, domestic trade and exports of passion fruit can be improved to a greater extent.



Honey

In 2015-16, NER produced about 2000 MT of Honey, with the highest share of 850 MT coming from Assam, followed by 430 MT from Nagaland, 320 MT from Sikkim and 200 MT from Meghalaya. Currently, most of the honey is collected rather than cultivated from apiculture. The sector is facing challenges in terms

²⁴ National horticultural board database, 2015

²⁵ Department of horticulture, Nagaland and manipur

highly unorganized collection, non-standard practices, lack of proper network, data collection, highly prevalent adulteration issues and centralized processing systems. Nagaland has done a commendable job in addressing some of these challenges and encouraged many farmers to take up apiculture. This resulted in increased output of honey from the state and by creating common facilities, processing and marketing facilities the state helped the farmers to sell their produce easily and sustain the activity to the next season. This can be taken up in the other states of the NER to strengthen the production systems. The region offers a unique advantage of being a biodiversity hot spot and default organic zone. By promoting honey from the region, it will also help to maintain the ecological balance. These aspects should be effectively used for branding in order to promote honey exports to the international market and domestic trade as well.



Bamboo Shoots

Nearly 66 % of the total bamboo production in the country is from the NER. Tripura, Mizoram, Manipur and Nagaland comprises a high density of bamboo plantations in the region. However, there is no proper



data available about the quantum of the bamboo shoots production even though it is consumed as a regular food/vegetable in the local cuisines in fresh, dried, shredded and pickled forms. Currently, not much of the cultivation is taken up for the production of Bamboo shoots and the package of practices are not clearly defined and are completely from that of culm/ timber. Better soil, water and light conditions, and more intensive management are required in the cultivation of Bamboo shoots for Food purpose. Due to the highly perishable nature, it

is invariable requirement to process the bamboo shoots. Bamboo shoots are gaining prominence in the international market owing to factors like globalization and increased acceptance of various oriental cuisines. China is currently dominating the international market with about 80 % share of exports and offers many learnings about how to take up organized cultivation and processing of Bamboo shoots.

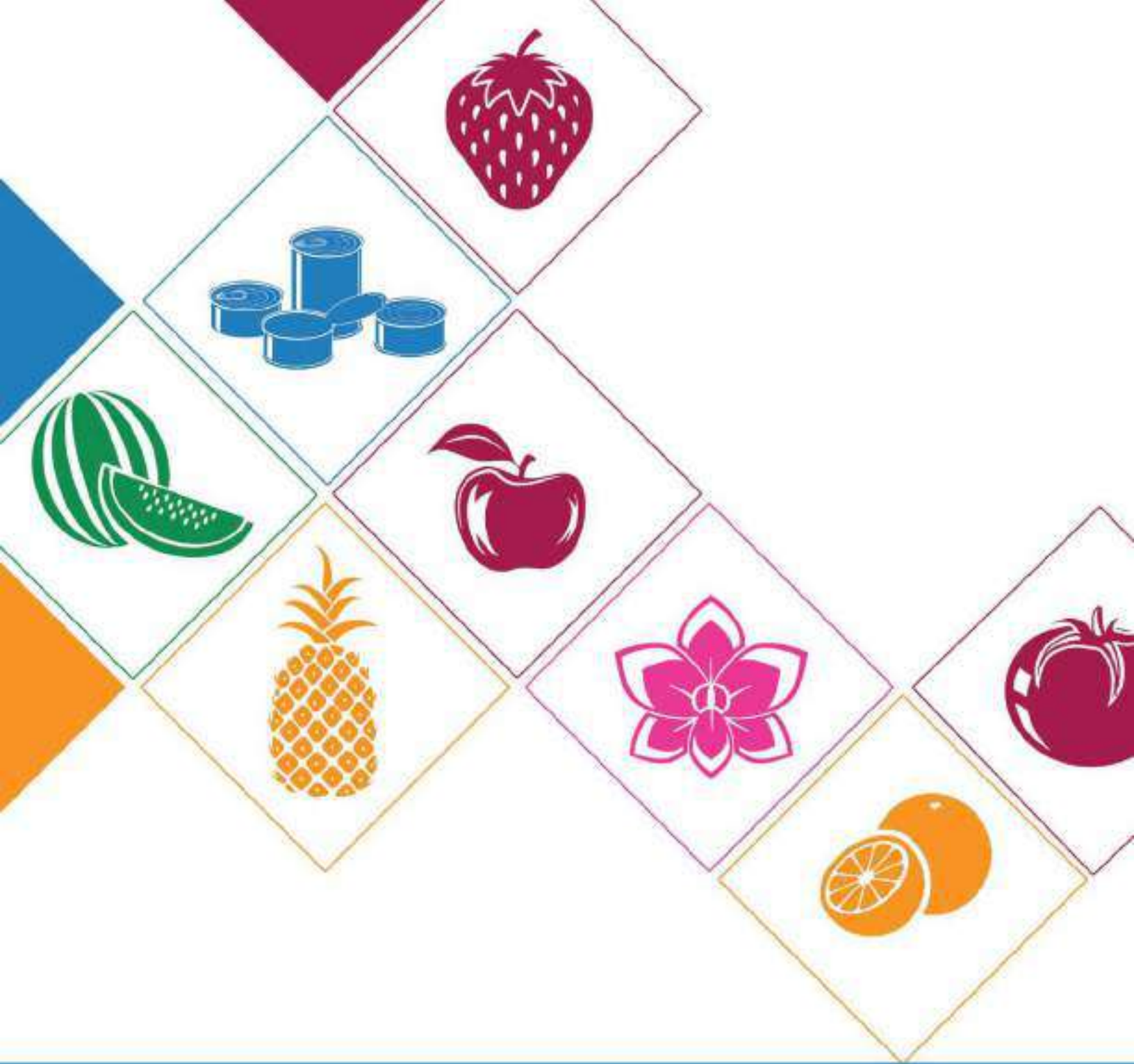
Buckwheat

Buckwheat is a pseudo cereal, produced mainly in the northeastern states of Sikkim and Arunachal Pradesh. In 2014-15, Sikkim with an area under cultivation of



3270 hectares produced 3160 MT of Buckwheat²⁶. Sikkim government, under one village- one product program, is giving due importance to the promotion of the product in the state. Buckwheat is a choice ingredient for gluten-free products and it is also consumed for its high protein and dietary fiber content. The growth of health and wellness category globally offers a good potential for the product in both domestic and international markets. Support should be extended to further strengthen the production systems of Buckwheat in NER, as other high altitude zones also offer congenial conditions for its cultivation. Establishing proper supply chain and trading networks will play a catalyzing role in strengthening both front-end and back-end operations and thus gains a conspicuous size for exports in future.

²⁶ Department of agriculture, Sikkim



STATUS OF EXPORTS FROM NER & KEY BOTTLENECKS HINDERING ITS EXPORT POTENTIAL



4. Status of exports from NER & Key bottlenecks hindering its export potential

4.1 Current status of exports from NER

Given the optimal conditions for cultivation, a wide variety of agricultural and horticultural crops are grown in abundance in the region. Also given the lower consumption levels, there exist huge surplus quantities which are available for domestic as well as export markets. The following table shows the marketable surplus in some of the key crops grown in the region.

Exhibit 57: Marketable surplus in some of the key crops grown in NER

Product Name	Production in NER (MT)	Consumption in NER (MT)	Marketable Surplus (MT)	Marketable surplus as % of production
Ginger	355,454	49,241	306,213	86.1
Lemon	215,287	38,605	176,682	82.1
Orange	589,736	86,606	503,130	85.3
Pineapple	777,144	38,891	738,253	95.0
Jackfruit	492,898	82,295	410,603	83.3
Rice	6,754,700	6,387,320	367,380	5.4
Maize	350,000	10,246	339,754	97.1
Banana	12,08,197	243,846	964,351	79.8
Chilli	122,444	89,760	32,684	26.7
Litchi	78,847	3,666	75,181	95.4
Papaya	216,462	80,259	136,203	62.9
Grapes	23,980	4,054	19,926	83.1
Guava	99,554	19,830	79,724	80.1
Mango	115,314	52,703	62,611	54.3
Brinjal	398,376	314,591	83,785	21.0
Cabbage	912,387	235,520	676,867	74.2
Cauliflower	479,245	147,134	332,111	69.3
Okra	203,083	55,544	147,539	72.6
Peas	104,805	12,935	91,870	87.7
Potato	1,112,780	917,216	195,564	17.6
Tomato	517,365	167,007	350,358	67.7
Honey	1,663	227	1,436	86.3

Source: Sathguru Analysis, Ministry of Statistics and Programme Implementation

While some of them are traded in the domestic markets, some of the produce is exported to the neighboring countries of Bangladesh and Myanmar and a majority gets wasted in the region itself. With regards to products, it is majorly ginger and oranges/mandarins that are getting exported from NER while

with respect to geographies, it is majorly the neighboring countries of Bangladesh and Myanmar through the several Land Customs Stations (LCS) that are established along the borders. The following picture shows the map of NER with key LCSs marked.

Exhibit 58: Map of NER with key Land Customs Stations



The following table shows the key commodities that are exported from these LCS.

Exhibit 59: Key commodities exported from different LCSs in NER

State	Land Customs Station	Partner Country	Key Commodities
Assam	Hatisar	Bhutan	Rice, Maize
	Mankachar	Bangladesh	Ginger
	Sutarkandi		Ginger, Orange, Apple
	Karimganj		Ginger, Orange
Manipur	Moreh	Myanmar	Wheat flour, dry chilli, dry grapes
Meghalaya	Mahendraganj	Bangladesh	Ginger, Betel nut
	Ghasuapara		Ginger
	Dawki		Tomato, Betel Leaves, Ginger
Tripura	Old Ragnabazar	Bangladesh	Orange
	Manu		Apple
	Agartala		Vegetable seeds

Source: Sathguru Analysis, Customs and Central Excise Department, Shillong

While the exports were restricted to the neighboring nations, there is not much growth in the trade with these countries due to a multitude of reasons. Some of the key challenges which are hindering the export potential of the region are discussed in detail below.

4.2 Key bottlenecks hindering the export potential of NER

Exhibit 60: General value chain for agricultural/ horticultural produce



The above picture shows general value chain for any agriculture/ horticultural produce and the same holds true for the identified products in the NER. Across this value chain in NER, there are several challenges in each of the product and to tap the export potential of NER and to promote exports of products from the region these challenges need to be countered strategically. Some of the key challenges and the stage of the value chain at which they act are mentioned in the table below.

Exhibit 61: Key challenges hindering the export potential of NER

Inputs	Farming	Procurement	Storage	Processing	Markets	Consumer
Age old farms and suboptimal agricultural practices		Production in small pockets – Aggregation Issues		Dearth of adequate processing units	Unavailability of quality testing laboratories	
Necessity of an organic certification agency		Connectivity to end markets – Middlemen & perishability of the produce			Being land locked with limited water connectivity	
Inadequacy of support infrastructure						
Unavailability of power						
Unavailability of incubators and capacity building avenues						
Insurgency and economic blockades						

The details of the above mentioned key challenges are as follows.

A. AGE OLD FARMS AND SUBOPTIMAL AGRICULTURAL PRACTICES

- Both agricultural, as well as the horticultural operations in NER, are largely subsistence cultivation. While the technological advancements have improved the productivity of crops in the other regions of the country, the adoption of these technologies in NER has been limited. The situation is accentuated by the lack of awareness about technologies, poor capacity of farmers to adopt, poor credit support and weak infrastructure.
- The predominance of old and senile orchards in case of fruits and plantation crops and low seed replacement in case of other crops is leading to low and declining productivity for a number of crops in the region.

- Cultivation practices like shifting/ jhum cultivation are leading to large scale deforestation and loss of soil fertility.
- Community ownership of the land, ownership by the village chief and prevailing land tenure systems often act as a detriment to sustainable development of agriculture in the region. The average land holdings are quite small and are unviable as sustainable economic units.
- Apart from the above, other constraints such as topography, low inputs usage, poor technology transfer and weak post-harvest infrastructure are limiting the productivity of the region.



Exhibit 62: Oranges in Arunachal Pradesh Source: Maps of India

B. NECESSITY OF AN ORGANIC CERTIFICATION AGENCY

- A majority of the farming area in the NER is traditionally organic. The farmers are less aware of the usage of agri inputs and their sourcing. Hence, any inputs utilized are natural and organically acquiescent or aren't used at all. The average fertilizer consumption in the NER is 51.73 Kg per hectare which is almost half of the national average of 128.34 Kg per hectare (N, P, and K).
- This indigenous capacity of naturally organic farming can be leveraged to the fullest only by selling the products as organic in premium markets of US and EU. As exports need adherence to international standards and certifications, a certifying agency in the region is highly essential to hasten the process of certification as well as to reduce the cost.

C. PRODUCTION IN SMALL POCKETS – AGGREGATION ISSUES

- The NER is characterized by difficult terrain and unpredictable climate which has made it difficult for the farmers and agri-based entrepreneurs to access markets.
- Due to thinly distributed growers, each with small quantities makes the aggregation of produce for processing extremely difficult. This, in turn, increases the costs and thereby decreases the cost competitiveness of the processed/ fresh produce in the international markets.
- The geographical distances and the land holding patterns in the NER make it a cumbersome process for aggregation or distribution. The land holdings are small in size with very limited scope for expansion due to difficulties in land acquisition and transactions. The farming pattern in a majority of the North East tilts towards subsistence farming.
- As the market is underdeveloped and accessibility is restricted, the common consensus is that the farmer is not willing to grow more quantum as the produce is not able to reach the desired market due to these constraints. Hence, the potential is not seen in increasing quantity and farmers are satiated with existing produce which is targeted at self-sustenance and the local market. The majority of the farmers follow this pattern with no dedicated focus on commercial farming.
- This leads to less quantum reaching the transit and market nodes in isolation, thereby affecting the economies of scale.

D. CONNECTIVITY TO END MARKETS – MIDDLEMEN – PERISHABILITY

- A major feedback during the primary feedback garnered by the consultants is that of fluidity in the market chain. All the states in the NER have agricultural produce in abundance; however, are plagued by unregulated market players, loss in output, inadequate return on produce and lack of accessibility to proper logistics and transport facilities.
- Over-reliance on Assam, primarily Guwahati due to geographical and political constraints for aggregation and market avenues compared to respective states needs to be addressed and other avenues for logistics and marketing channels need to be explored. Few efforts in this direction have been made, few have remained on paper but with meagre tangible outcomes.
- IN NER, around 4-5 persons are involved at several levels in the value chain between harvesting to reaching the neighboring Bangladesh market.

E. DEARTH OF ADEQUATE PROCESSING UNITS IN THE REGION

- The region offers immense potential for processing of a wide variety of horticultural crops that are grown in the region such as oranges, ginger, banana, kiwi etc. However due to several constraints which include the absence of adequate infrastructure in particular rural road connectivity, marketing linkages, inadequacy of information, absence of cold chain etc. the industry has never picked up.
- As a result, marketing of the crops has been the biggest challenge for the farmers, as during the peak season, the price falls and occasionally there are no buyers. Earlier, Dabur and NERAMAC used to buy pineapples for processing purpose, but now the NERAMAC plant has been closed down and Dabur does not procure due to high logistics cost. Similarly, NERAMAC has also shut down its cashew processing plant in Tripura due to similar reasons.

F. UNAVAILABILITY OF QUALITY TESTING LABORATORIES

- As per the guidelines set out, a processed food item needs to be certified by the Food Safety Standards Authority of India (FSSAI) before commercial sale. One of the major feedbacks received by the consultants during the field interactions was the unavailability of a quality food testing lab in the NER.
- There are around 96 NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited labs in India but not a single capital/state in the NER is having a FSSAI notified/NABL Accredited Food Testing Laboratory Facility. For all samples and testing is done at the FSSAI designated laboratory in Kolkata which is quite distant from few of the far flung areas in the NER.
- A food testing laboratory is coming up in Food Park at Bodhjungnagar Industrial Complex in Tripura under the Tripura Industrial Development Corporation Ltd. (TIDC) and will be the first NABL accredited food testing laboratory in NER.

G. BEING LAND LOCKED WITH LIMITED WATER CONNECTIVITY

- As mentioned earlier, the entire NER is connected to the rest of India through the Siliguri corridor. Due to the terrain and climate, the road transfer from the region through the corridor consumes more time. As a result, over time, Guwahati has gained the upper hand in terms of development and connectivity owing to its geographical location and its role as the gateway to the NER. The airport and roadways are developed well in Assam than other states>

- Over time, the roadways in other states also developed along with the heralding of railways to important junctions and nodes. The states further east, namely Nagaland, Tripura, Mizoram, and Manipur earlier had only roadways to depend on. With the advent of low fare and no frills airline era in India, the connectivity to these centers has become better with people opting to fly rather than take the roadways. However, still, air transfer for trade and transfer of crops to Guwahati is considered to be an expensive prospect and hence, entrepreneurs and farmers consider roadways to be their only option. This is a hindrance, as the food loss during road transport is manifold (almost 15-20%) in the case of perishable crops. The scenario is expected to improve with further expansion of rail and roadways in the future.
- The majority of the international trade happens through sea routes. NER being landlocked does not have access to sea ports which is a major hindrance for exports. All stakeholder consultations yielded one common point of congruence, that the Chittagong Port in Bangladesh is a massive opportunity which, if materializes, can boost the trade scenario in the NER to a whole new level. Access to this port opens up the immense potential to export to the South East Asian and Oceania market. The Kolkata-Dhaka-Agartala route has not been utilized to its full potential for trade. As of now, it is being used for passenger transfer and few trial runs for trade in rice have been done. This is one of the major avenues which hold potential.

H. INADEQUACY OF INFRASTRUCTURE

- The NER has faced the brunt of India's Partition as well as the subsequent insurgency over the last few decades. The area, being geographically and culturally different from the rest of the country has had a tough going when it comes to infrastructure development when compared to the rest of India. Major issues plaguing this development has been the perilous terrain, unpredictable climate and lack of overall political will. Hence, as a result, the NER has not grown as it should have agriculturally.
- Major infrastructural lacunae in the NER include:
 - **Primary** - Post-Harvest Infrastructure
 - **Secondary** - Roadways (National and State Highways), Railways, Power generation facilities
- As a result of lack of adequate post-harvest infrastructure in the region, the post-harvest losses are high as well as the farmers are made to be dependent on intermediaries for marketing. This hinders the farmer from getting adequate return proportionate to the yield produced. The cold chain in the region is also under developed.
- Poor infrastructure development in terms of roads, railways, waterways, power and water is another massive constraint in the development of NER. From the trade point of view, existing rail infrastructure is mainly limited to Assam. Some of the other states have received railway connectivity very recently.
- Due to hostile topography, road construction, and more so ever, its maintenance is an arduous task. However, in recent years, improvement of road infrastructure work has been taken up on a grander scale with several massive road infrastructure projects under execution and much more in the pipeline.
- The entire NER shares 3 vital border roads i.e. Stilwell road or the Ledo road (connecting Assam to China), the Numaligarh-Moreh road (connecting Assam, Nagaland & Manipur to Myanmar) and the Aizawl-Champhai-Zokhawthar road (connecting Mizoram to Myanmar). These border roads are crucial for the development of the NER, especially under the gamut of India's 'Act East Policy' which specifically lays emphasis on the ASEAN countries. Of the three border roads, two are operational at

present from the point of border trade. Proper infrastructure needs to be developed at these border points to boost trade between India and the ASEAN. This, in turn, will benefit the entire NER.

I. AVAILABILITY OF POWER

- Historically, NER has borne the ill effects of underinvestment in the power sector. While generation capacity is slowly being upgraded, insufficient investments in the transmission, sub-transmission and distribution network because of limited financial resources has taken its toll. There are frequent power cuts in most of the states which allow only one full shift per day in many industrial units. The existing intrastate transmission and distribution infrastructure in all the northeastern states has logjams with regard to inadequate capacity or lack of capacity, which constrains power delivery to the consumers.
- The power generation for 2013 in the NER amounted to 3,324 MkwH compared to an all India total of 373,191 MkwH which amounts to a paltry 1%.²⁷ Assam led with 1,772 MkwH followed by Tripura at 817 MkwH, both amounting to approximately 80% of the total NER generation. This shows the massive push which is required on this front to make sustainable and efficiency power supply in the region. Also, the power requirement in the region is dispersed due to terrain and transmission reach. As a result of this, the per-unit cost of transmission is higher in the NER when compared to the rest of India.
- Hydel and solar power holds immense potential in the region and can be utilized to meet the deficit.

J. UNAVAILABILITY OF INCUBATORS AND CAPACITY BUILDING AVENUES

- Lack of funding and opportunities in the region compels the skilled and unskilled human resource from the NER to migrate to Assam and other parts of the country. All the other NE states lack credible training facilities and incubation support. Awareness levels are less when it comes to government schemes for entrepreneurship.
- Also, due to lack of understanding and exposure to defined package of practices, the general risk taking appetite of the farmer and entrepreneurs in the region is found to be lacking. There is a shortage of skilled teachers and staff to impart training in various sectors to the manpower available. As a result, people don't get proper training and thereby shift to alternate carriers and professions to earn a livelihood.
- As there are negligible market opportunities, even the trained individuals and manpower are compelled to seek employment in other regions of the NER/India rather than their natives.

K. INSURGENCY & ECONOMIC BLOCKADES

- Ever since the uneven and unceremonious partition of the country in 1947 and the subsequent formation of Bangladesh in 1971, the NER has never had going easy in terms of economic development and policy focus. A sense of distinctiveness and neglect has spurred on the belief of a separate state with the NER landscape.
- Different bodies cropped up over the years under the veil of 'socialism' or 'liberalism' across various states demanding territorial hold over different states. Bandhs and strikes with occasional damage to property still throw daily life out of gear. As a result of this, private sector investment and risk taking appetite of the local populace has never witnessed growth. However, the situation has improved owing

²⁷ Report on The Performances of State Power Utilities for the Years 2009-10 to 2011-12, Power Finance Corporation Ltd.

to sustained efforts by the local and central government. Development of infrastructure and investment push has seen a positive spurt.

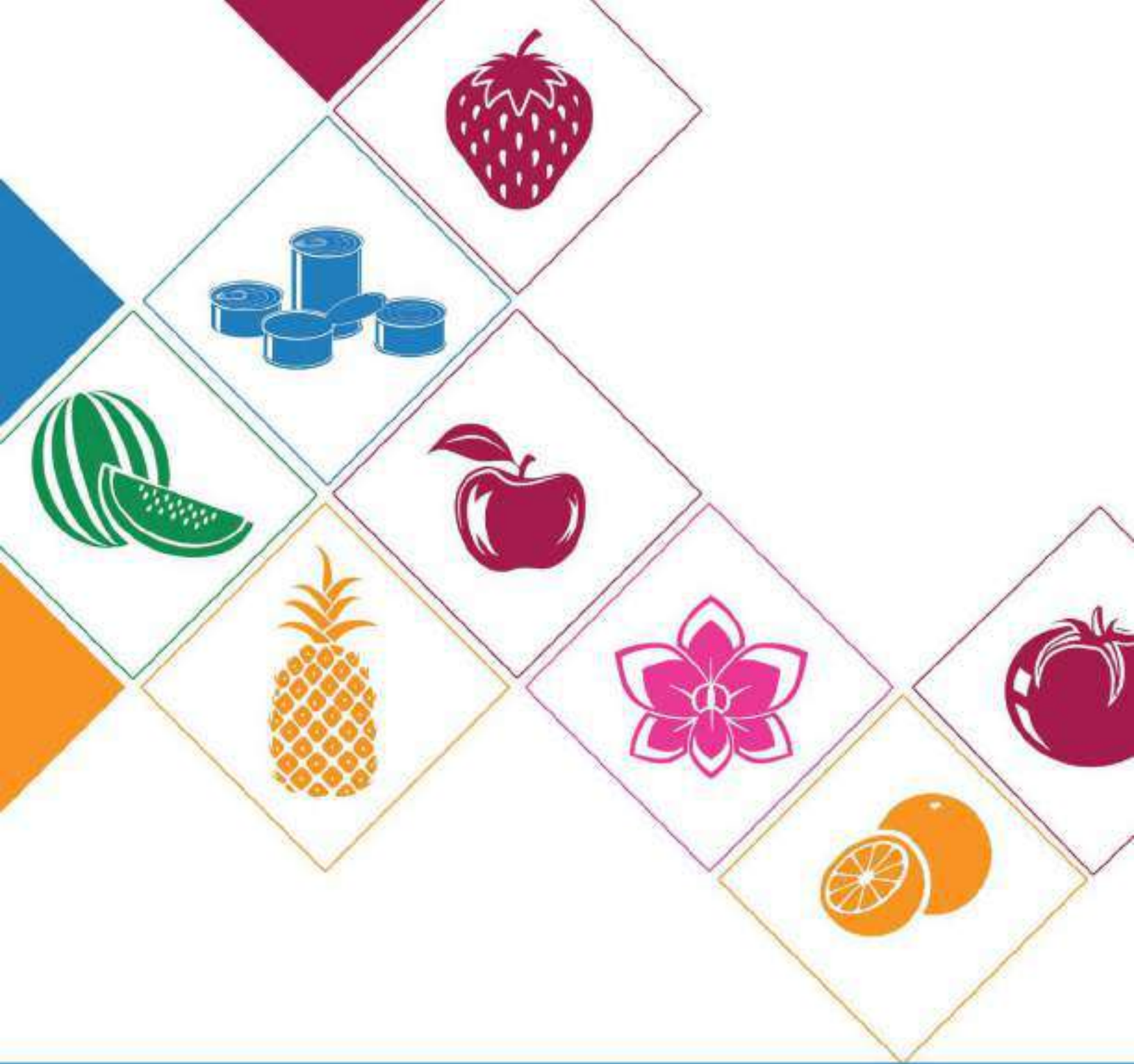
A. UNAVAILABILITY OF LABOUR & ENTREPRENEURIAL SKILLS

- The entire NER, owing to under performance and lack of opportunities due to a plethora of social, political, economic and environmental factors, sees the migration of its labour pool (both skilled and unskilled) to other parts of the country to seek education and job opportunities.
- Emphasis on skill development has not been ideal for the schemes and programs launched for the same having underperformed.
- Compared to the rest of India, private sector investment in technical education and skill development has been negligible with inadequate impetus on research and development.
- Holding of land and property by small scale farmers and budding entrepreneurs is on a lesser scale. The distribution of land is inadequate and disproportionate. This has been a practice which has affected risk taking the ability of the farmers and has created constraints leading to restricted farming practices and has stifled opportunities for entrepreneurship. To overcome this, external funding support and mediation are required.

B. GOVERNMENT SUPPORT - UNDERUTILISATION

- History has witnessed how the partition of India and creation of East Pakistan led to the Northeast being virtually disconnected from other parts of India with the only remaining link being “chicken neck”, the narrow 27 km Siliguri corridor. This had immense effects on the economic situation of the Northeast and its capability to trade its goods.²⁸
- The NER has been an under the influence of a skewed perception when it comes to the people and policymakers from the so called ‘mainland’ India. It differs largely in terms of culture, ethnicity, and rituals which cements this image further. Of late, successive governments have made dedicated efforts in focusing on the development of the NER. The passing of the 6th Schedule, the formation of mDoNER, NEC, Look East Policy and Act East Policy has all contributed to getting the NER back in focus into the overall economic scenario of the country.
- Still, the NER deserves more focus and emphasis in terms of funding and policy making to bring it at par with the rest of India. The NER needs to be seen as a definite avenue for progress and investment and not only from the security point of view it holds, due to its strategic location internationally.

²⁸ Government of India's Northeast policy, by Anne-Sophie Maier, HBF Intern, August 2009



STRATEGY AND ACTION PLAN



5. Strategy and Action Plan

India shares its largest international border with Bangladesh stretching over 4,000 kilometres across multiple states of Assam, Tripura, Mizoram, Meghalaya and West Bengal. This makes bilateral trade with Bangladesh inevitable with massive potential due to the ever-growing economies of the two South Asian behemoths. As of 2015, Bangladesh accounted for 2.1% of India's overall export basket amounting to around \$5.5 billion. However, as neighboring countries, India and Bangladesh have not realized their full potential as far as bilateral trade is concerned. The tariff liberalization under SAFTA agreement has not yet borne desired gains. Whatever existing trade is prevalent, is done through Land Custom Stations (LCS) and Integrated Check posts which dot the border between the two countries at strategic locations. However, the export and import statistics through these facilities sheds light on the underperformance in terms of exchange of agricultural and horticultural commodities. As of 2016, the major exports from India to Bangladesh in these domains only include primarily Ginger followed by Orange to a lesser degree. The export quantities of other crops such as banana, apple, chilli, pomegranate, and mango are miniscule.

Here are a few statistics to substantiate the scenario in a nutshell.

- *The value of fresh ginger being exported to Bangladesh from India amounts to @ \$207 per MT (total export – 28,043 MT, 2015).*
- *At the same time, China exported its fresh ginger to Bangladesh at almost 4 times the price i.e. @820 per MT²⁹ (total export – 34,680 MT, 2015).*

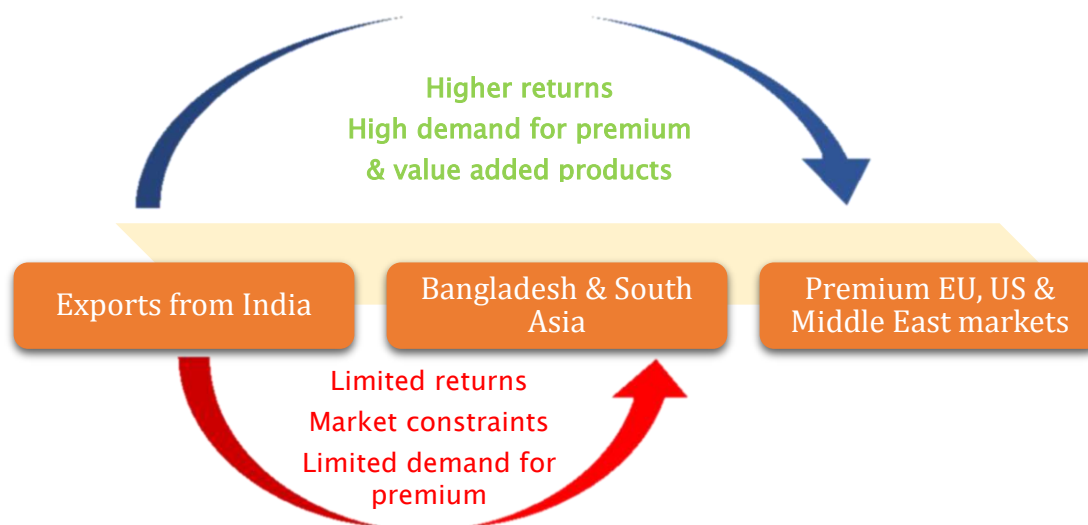
This clearly shows the vacuum between the Indian and Chinese imports into Bangladesh in terms of pricing, even though the quantity is pretty uniform. There are multiple reasons for this situation such as: overall inefficiency in the existing trade systems and infrastructure of India and Bangladesh which has encouraged and nurtured unregulated trade through a porous border. This has been assessed to be as huge as half the volume of formal trade³⁰. Per unit trade cost which includes transportation, storage, testing, duties, and documentation is comparatively high and time consuming as a result of which sellers adopt the informal mode of trading. This is noticeable from the LCS statistics which shows that the major exports from India are nonperishables, construction materials, and electronic goods.

Hence, it is high time that India shifts its focus from targeting a low income-low demand economy to high income-premium economy for exporting its agricultural and horticultural produce. The inherent nature of the commodities produced in NER makes them naturally organic which has huge potential in lucrative Middle Eastern and European markets. Also, the focus needs to be laid on exporting ready processed products abroad instead of fresh variety. This ensures reduced wastage, high returns, and logistical convenience. Processing clusters need to be given a shot in the arm and implemented at critical

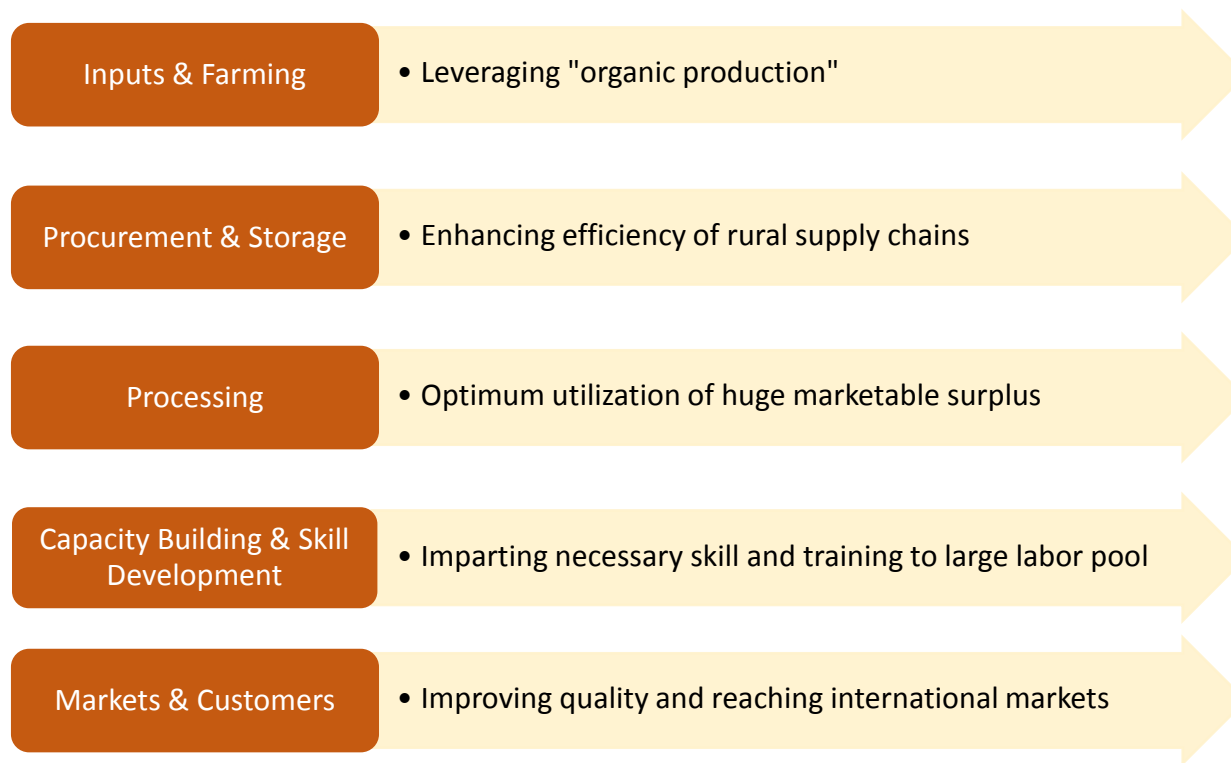
²⁹ ITC trademap.org – online trade statistics

³⁰ India-Bangladesh Trade Potentiality An Assessment of Trade Facilitation Issues – CUTS International

production clusters aided by quality testing and certification wherever required so as to make the products export ready.



As observed in the previous section, the agricultural/ horticultural produce value chains in the NER are marred by several challenges. To counter these challenges and to promote exports from the region, the product value chains need to be strengthened adequately and this needs a coherent and synergistic framework. The “Strengthening Value Chain” framework is based on identifying the stronger as well as weaker links i.e. inherent strengths as well as the weakness of the value chain and thereby leveraging or strengthening them respectively. The framework is based on five enabling pillars and is discussed below.



5.1 Leveraging Organic Production

Just non usage of agrochemicals does not make the farming system organic. For a product to be categorized as organic, apart from production without the usage of agrochemicals, the entire production chain needs to be managed and a strict organic farming regime needs to be observed. In international trade, there are several other important aspects, and the most important of all is the certification of the farms, production processes and products. Certification is key for exports and is given by a certification body after due checks. The certification agency has to be duly accredited by the overarching bodies which in India is the National Accreditation Body (NAB). The guidelines under National Programme of Organic Production (NPOP) should be followed in the process of implementation and should adhere to National Standard for Organic Production (NSOP). The state wise status of organic farming in NER is mentioned in detail under **Annexure J**.

Since a major portion of the region is either organic by default with zero or low usage of chemicals, and since the certification is key for exports, the focus of the strategy should be on bringing more area under certification. Since Sikkim has already traversed through this path, pages can be taken out of its experience and the strategy it adopted can be used for the remaining seven states. As the task to convert large areas under organic is humongous, there is a need for a strategic road map supported by meticulous planning and clear policy support. The project needs to be carried out in a mission mode with clear and quantified targets. Focus crops need to be identified and the areas in which they are produced need to be converted on a priority basis. Necessary linkages with inputs market as well as the end consumer markets need to be established for the success of the initiative. Covering all the above mentioned aspects is the road map which is discussed below.

Recommendation 1: Focus on pineapple, orange, lemon and banana as they can be easily promoted on basis of organic production

Out of the 10 identified crops, the focus crops for organic certification are recommended based on the following parameters.

- Total area under the crop in NER: determines the importance of the crop for the region. Also higher the acreage under the crop, higher is probability for contiguous areas and hence easier it will be to group the farmers and implement certification controls.
- Global demand for organic form of the produce: The crops which have higher demand for their organic form need to be prioritized.
- Percentage premium the organic form commands compared to the normal produce: The crops with higher premium need to be prioritized as there will be higher margins for the exporters.

From the secondary analysis, it is observed that pineapples, oranges, lemons, and banana offer most potential for organic. Given the vast areas under these crops and assuming that 60% of the area under these crops are to be converted into organic, the target for the conversion stands at 1.75 lakh ha and since the area under the crops in the state of Sikkim is already certified the state-wise targets for the remaining states are as follows.

Exhibit 63: State wise targets for conversion of land into certified organic

Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Tripura
11,700	57,670	19,580	17,060	22,820	14,680	7,970

Recommendation 2: Establish a nodal agency for implementation of organic plan across NER

Since the targets are humongous, it is advised that a nodal body local to the region be created to implement the plan in a mission mode. Since APEDA is also the overarching body for the organic certification in the country, it can assume a leadership role and engage with respective stakeholders in each of the North Eastern states for participation in the mission. All the states in the region have already realized the opportunity present in organic farming and hence will be ready to participate in such engagement. Some states have already identified some targets under organic missions and the respective activities/ action plan to achieve those targets can be merged with the action plan for the nodal body. Part of the financial outlay can also be shared by the respective states from the funds allocated to such missions.

Stakeholders: Members from horticulture boards/marketing boards / organic mission can be part of the nodal body and they will be instrumental in mobilizing the resources for the implementation of the action plan.

Time frame: 4-6 months

Costing: INR 10 - 15 lakhs for travel and engaging with respective stakeholders, INR 15-20 lakhs for engaging a consulting organization for the preparation of detailed mission document on the lines of this action plan.

The agency thus established needs to focus on following key elements:

Recommendation 3: Invest in awareness creation, training and capacity building at least for the initial two years.

As the conversion of farms into organic involves the adoption of a new technology and shifting from established farming practices, awareness creation, training, and capacity building of all the stakeholders involved in the activities is an important step. The agency thus created should focus on these aspects at least for the initial two years. Later the success of the program itself creates the awareness.

Awareness creation: Every stakeholder taking part in the activity should be well aware of the organic farming concept as well as its benefits and should voluntarily participate in the activities. Since the target population is large, mass media campaigns can be used to communicate the ideas to the public at large. The same can be achieved through conducting public meetings using popular personnel local to the region, publicity through mass media like newspapers, radio, and TV, digital media campaigns, dissemination of information through internet as well as through traditional methods like wall paintings,

songs and dramas etc. Depending upon the target population, the channel has to be selected for efficient transmission of the message. Establishment of **model organic villages** where the area under the whole village is converted into organic can also be used as an awareness creation tool.

Training and Capacity building: Along with awareness creation, equally important is imparting training and capacity building of all the stakeholders. Every stakeholder should be made well aware of the concepts of organic farming. Farmers can be trained on various related subjects like crop cultivation, composting technologies and techniques, bio fertilizers and bio pesticides, integrated pest management, certification processes and requirements etc. Traders, processors, exporters and other stakeholders need to be trained on concepts of handling of the produce, processing, value addition, packaging, branding and marketing, varietal selection and nursery management etc. The other officials/ trainers working in the domain needs to be trained on latest and relevant technologies related to organic farming. Field exposure visits/training on successful models need to be provided to such officials/trainers. Care should be taken that all the training should be imparted by experienced persons with rounded knowledge about the field. **Information and communication Technology (ICT) tools** can be used effectively for training a large number of people.

Stakeholders: Government machinery has to be mobilized for effectively reaching the targets where people from each level i.e. panchayat level, mandal/ sub division level, districts level and state level needs to be involved. This requires the involvement of the project partners i.e. respective state horticultural departments and marketing boards. Also, the awareness creation activities, as well as training activities, can be outsourced to media agencies/ training institutes respectively. Local unemployed youth can also be used affectively for these initiatives.

Time frame: Focus on these activities at least for initial 2 years and later depending on the success of the mission, the focus can be reduced slowly.

Recommendation 4: Establish internal systems in place to expedite “organic certification” process

Converting a farm into organic requires establishment of an organic management system and building of soil fertility which in turn requires an interim period which is also known as conversion period. Depending upon several factors like type of land, past land usage, crops grown etc. this conversion period may vary between 2-4 years. During this conversion period, the farmers have to adhere to NPOP guidelines. So this conversion period can be used to keep internal systems in place so that the certification process at a later stage can be expedited.

The systems should smoothen out the process and help the farmers get into organic production. They should take care of the entire processes right from the registration of the farmer till he sells his produce in a market place/ to a trader. ICT tools can be used extensively for creation of such systems. A professional organization can be hired for supporting the agency in setting up such systems and local youth needs to be trained on such systems so that they can take up the program independently at later stages of the mission. Post conversion period APEDA accredited certification bodies can certify the farms and due to cost effectiveness group certification needs to be encouraged.

Stakeholders: A third party organization which has credibility and relevant past experience can be hired through a process of tendering, to setup the internal systems and train the local interested youth on them.

Timeframe: 1 year for selection of organization and setting up of internal systems.

Recommendation 5: Establish an organic certification agency local to the region

Sikkim has already become a complete organic state and it already has its own certification agency (Sikkim State Organic Certification Agency (SSOCA)). However, the state of Sikkim remains aloof from the remaining seven states. Hence to further bring down the costs and expedite the certification process it is advised to have a certifying agency local to the remaining seven states. Establishing such an agency in the region will reduce the dependence on accredited private certifying agencies for certification whose costs are on a higher side and will accelerate the process.

A lot of stakeholders during the consultation opined that lack of a local certification agency is a serious drawback for the progress of organic agriculture in the region. Hence it is advised that APEDA identify and approach right entity which can form a certification body and start the process for its accreditation. The agencies thus identified should fulfill the following criteria:

- Knowledge of local agricultural practices and limitations.
- Offer services at realistic costs, considering most of the farmers in the region are small and marginal.

The agency thus proposed should not be working for profits but should focus on extending certification services in the identified regions at realistic costs. Once established it should also actively take part in training of farmers and other stakeholders as well as in establishment of internal systems. The agency should ideally start with 5-10 auditors in one state (preferably from a central location like Guwahati) and later on in medium term can be expanded to other state capitals. This is recommended as it addresses practical difficulties and shortens the time of implementation, as the repository of the work done earlier acts as a guide. Later on in order to facilitate expansion into premium international markets, certification can be extended to other organic certification standards like USDA-NOP and JAS.

Stakeholders: An interested third party organization which has credibility and relevant past experience should be identified for accreditation. Such an entity can be a part of an agricultural university (e.g. Assam agricultural university) or a sub-department of Government agencies like agriculture department or seeds agency etc.

Timeframe: 1 year for selection of organization and starting up of accreditation procedure. Depending upon the demand for its services, the expansion of personnel as well expansion of services can be planned from year 3 onwards.

Recommendation 6: Develop infrastructure for production of organic inputs and promote organizations doing the same

In order to successfully implement the practice of organic agriculture in the region and to leverage the maximum benefit, it is crucial to develop the whole ecosystem covering right from the inputs to marketing of organic produce. The concept of organic farming discourages the use of inputs from external sources and encourages on farm production of inputs which are prepared from farm waste. On similar lines, **state wide policies along with checks and monitoring measures have to be adopted to reduce the flow of chemicals into identified regions** and the chemical inputs need to be replaced with organic inputs. Easy availability of organic inputs has to be ensured and for the same necessary infrastructure has to be developed. For the same, the agency should focus on following key elements.

- *Quality seed and planting material:* Seed/ Planting material is the most important input for crop production. In case of organic farming, the seed/ planting material used have to be free from chemicals and has to be organically grown. So as ensure free availability of quality seed/ planting material the agency has to
 - Procure foundation seeds and encourage farmers to multiply under supervision
 - Promote open pollinated varieties
 - Establish seed processing units which focus on procuring, processing, packaging and distribution of seeds
 - Establish seed testing laboratories to assess and maintain the quality of seeds that are being distributed
 - Establish nurseries to distribute quality planting material to farmers
 - Encourage private participation in establishing seed processing units/ nurseries through training and capital subsidies.
 - Promote latest technologies by providing subsidies to interested parties on technology upgradation.
 - Establishing research centers to conduct studies on crop varieties that are suitable for organic inputs and conditions.
- *Farm yard manure and bio-fertilizers:* Farmers have to be encouraged on farm production of farm yard manure and usage of bio-fertilizers in place of chemical fertilizers. For achieving the same, the agency has to
 - Procurement and distribution of organic manures from other regions/ states they are prepared locally.
 - Encourage construction of rural composting pits and vermicomposting pits in the farms by providing subsidies to the farmers.
 - Establishment of bio-fertilizer production units and encouraging private sector participation in establishing and operating them on a PPP mode.
 - Establishing mobile soil health centers, collecting samples from the farms and advising farmers on soil nutrient management.
 - *Crop protection and Integrated Pest Management (IPM):* Plant and crop protection are important in the organic system of farming and integrated pest management along with bio

pesticides developed from plant materials, biodynamics are the answers to pest and disease problems. For efficient crop protection in an organic setup, the agency has to

- o Extensively train farmers in the region on IPM methods
- o Establish systems to regularly conduct pest surveillance and advise farmers on usage of bio-pesticides
- o Promote biological control agents, bio-pesticides as an alternative to chemical pesticides by offering them on subsidies.
- o Establishing research centers to conduct studies on bio-agents, bio-pesticides, plant extracts etc. that can be used as an alternative to crop protection chemicals.

Stakeholders: Machinery of agriculture and horticulture department have to play a major role in promotion of organic inputs. The assistance of state seed agencies, co-operatives departments, and environment departments can also be sought for. Construction of composting pits, Vermicompost units etc. can be done through MGNREGS scheme.

Timeframe: Organic inputs can be procured based on demand in the early stages of the mission from other parts of the country while focusing on the development of infrastructure locally. Targets should be to meet the internal demand at least by 3rd or 4th year of operations.

Recommendation 7: Streamline supply chain and reach out to premium international markets

Organic products are required to be handled in traceable channels in the supply chain. Current agricultural supply chains and marketing systems in the region are ill equipped to handle the certified organic systems requirement. A special emphasis needs to be paid to create systems and necessary infrastructure like separate warehouses, demarcated storage spaces in the existing warehouses, record keeping procedures in the existing supply chain strengthening programs being carried out by state and central schemes or support programs.

A wide variety of exotic products can be produced under organic conditions in the region. The real potential of the organic production can be leveraged only by taking the produce to domestic premium markets and international markets where the products fetch premium prices. The action plan for streamlining the supply chains and reaching out to premium international markets is discussed in detail in subsequent sections.

5.2 Enhancing efficiency of rural supply chains

Current supply chain scenario and challenges

The primary constraint hindering the markets in the NER is that of fluidity in the market chain. All the states have abundant potential and of high export potential crops, however, are plagued by unregulated market players, loss in output, and inadequate return on produce and lack of accessibility to proper logistics and transport facilities. Over-reliance on Assam, primarily Guwahati due to geographical and political constraints for aggregation and market avenues compared to respective states needs to be addressed and other avenues for logistics and marketing channels need to be explored. Few efforts in this direction have been made, few have remained on paper but with meagre tangible outcomes. As mentioned earlier, the major issue plaguing the region is that of accessibility to transport and thereby less quantum of output arising due to meagre avenues for sale of produce. Streamlining and optimizing the current channel thereby reducing reliance on middlemen and other supply chain actors who consume a major chunk of the overall yield deserved by the farmer is essential.

The following picture shows the existing supply chain with multiple middlemen operating for margins. There is absolutely no streamlining of the process. Local markets are markets at smaller cities like Shillong, Imphal, Itanagar, Silchar etc. while the central market as of now exists only at Guwahati where a considerable level of aggregation takes place.

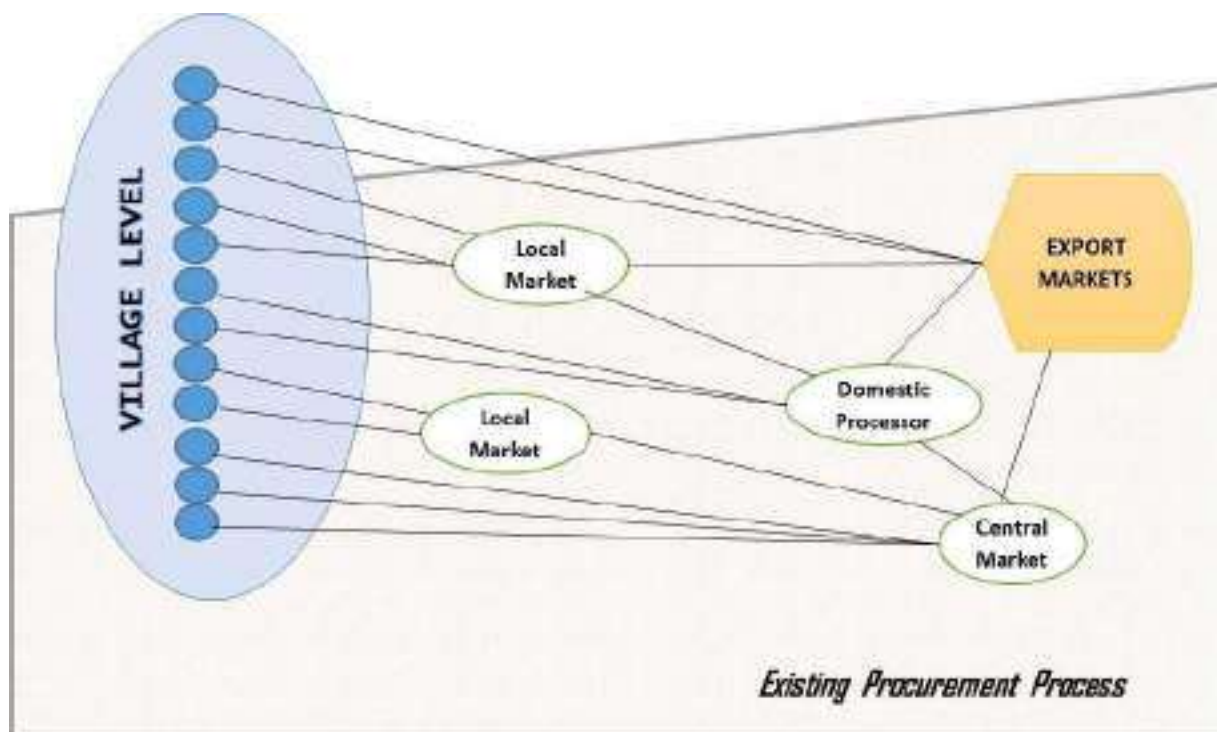


Exhibit 64: Existing procurement process for agricultural commodities in NER

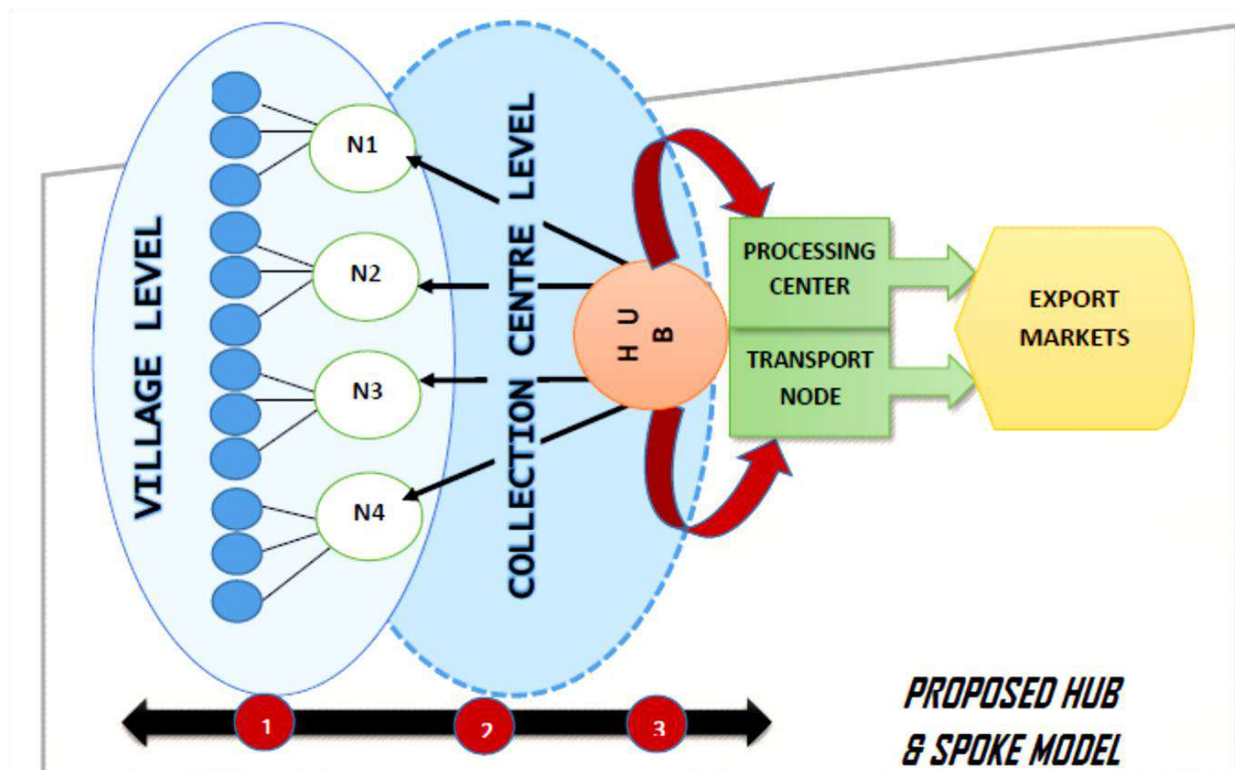
The above process has several demerits which are as follows

- Higher costs of procurement in some channels as they procure smaller volumes directly from remote villages in the region. As a result, the cost competitiveness of the product in international markets gets reduced.
- No efficient price discovery achieved as the supply chain is mainly operated by cartels of traders at each level who determines the price.
- Higher losses as the produce that is mainly dealt is of perishable in nature and transporting such perishable produce for longer distances results in food losses and wastage.
- The chains work only during the season as there are no storage spaces in between to store the produce.
- Traceability is an important requirement in the case of agricultural produce exports which cannot be handled through this system as the produce gets mixed at different levels.

To counter these challenges and to streamline the process of procurement, the following model was suggested. In it, care was taken not to completely disturb the existing situation as such models are bound to fail.

Recommendation 1: Robust Procurement Framework – Hub and Spoke Model

The broad framework for such a model is shown below:



The proposed model intends to make the process of procurement more lucid and regulated. This will ensure efficient distribution, increase competition, reduce transportation costs, and real price discovery, benefiting the farmers. Simultaneously, in the vicinity, industries clusters can be created for micro, small and medium enterprises to ensure common facilities, thus reducing operating costs and increasing

competitiveness and skill development in the region. This model also takes into account the risks posed by seasonality, external disruptions and lack/excess of quantum at any period of time. The key components of this model are elaborated below:

1



VILLAGE: GRASSROOT LEVEL FARMERS TO BE AGGREGATED AND PRODUCE COLLECTED FROM THEM

- Each collection center will cater to a set of villages designated to it. It will be responsible for sending out cargo trucks to collect the yield from the farmer's doorstep and bring it to the collection center where it will be sorted or graded to be processed further.

2

THE 'SPOKES': COLLECTION CENTERS NEAR THE CLUSTERS PRODUCING DESIRED AGRO HORTICULTURAL CROPS



- Collection centers to be set up at strategic locales across different states of the NER, which will be linked to the 'Hub'
- These collection centers will be responsible for the collection of yield from designated farmers in the nearby clusters. Each center will have a radius area spanning 8-10 villages depending on the geography and the yield available
- A major advantage here will be addressing of food loss/perishability due to unavailability or unviability of transport options for the farmer. The collection centers will ensure that the produce is collected at periodic intervals from their designated areas and assigned community. Hence, the farmer will not face the hassles of bringing the yield to the collection centers, which, currently are distant and difficult to access in many regions across the NER
- These would also act as basic pack house facilities with low cost storage in case of contingency.

3



THE HUB: STRATEGICALLY LOCATED FACILITIES ACROSS THE NER TO FUNCTION AS MULTI COMMODITY PROCUREMENT CENTRES

- The Hub here will be a central facility situated strategically at major centers in all the states of the NER which will cater to agro horticultural crops based on the quantum and season. The major assessment criteria used to shortlist these are based on the following parameters:
 - Proximity to key production clusters in the state
 - Proximity to available transit nodes (rail/road/air)
 - Presence of local market/mandis

- This model will reduce dependence on 'middlemen' but it will, at the same time, contribute, rather than hinder the growth and employment in the region. It will help promote regulatory methods for procurement. The facility will have a grading and sorting line compliant with all export regulations. It will possess all logistical and human labour facilities necessary for smooth functioning. Primary amenities include: Loading and unloading area, conveyor belts and grading line, weighing apparatus, inspection and packaging line, processing area, store room and a modern cold storage with multiple chambers so as to be flexible when it comes to storage of any additional crops as well in future
- The aggregated produce will come to the 'Hub' from collection centers in cargo trucks. These will then be transported to the nearest transit node for export in reefer container vans.

Subsequently, the fresh produce can be exported fresh to international markets (or domestically) through nearest transit node. It can also be sorted and taken to the processing cluster in the vicinity from where the final processed product can be exported via the transit node. The entire model can be outsourced to a third party who will be hand held in the initial period by APEDA. Once the processes are frozen, it will become self-sustainable over a period of time. The hubs on a preferential basis can be established at locations where multiple commodities are cultivated or in the catchment area of a processing plant that is already working/ planned to be established. The ideal locations for the hubs based on the existing scenario are as follows.

Recommended state wise 'hubs' (Multi commodity procurement centre) and 'spokes' (collection centers)

Exhibit 65: Hubs in NER as per the suggested hub and spoke model

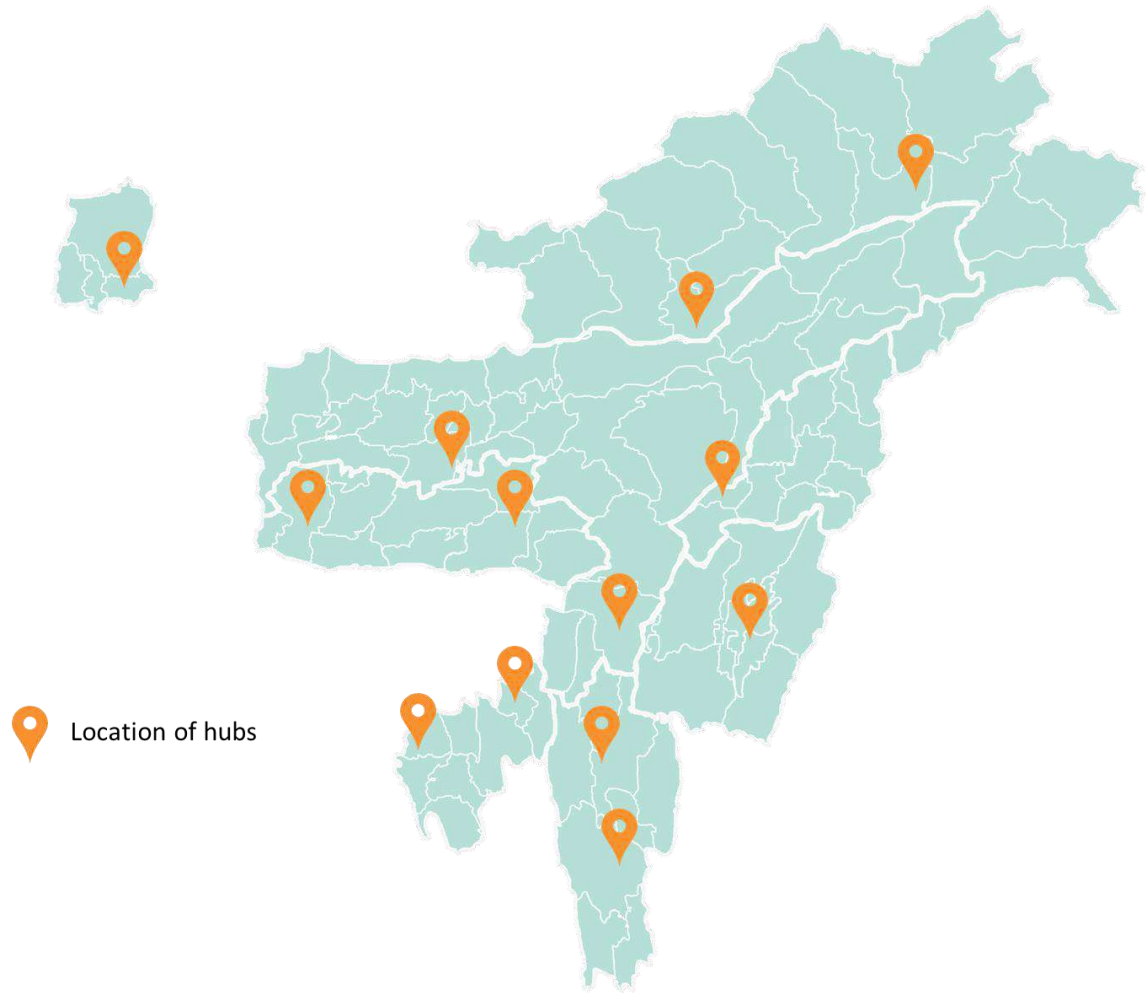
No.	State	Hub	Rationale
1	Arunachal Pradesh	Itanagar, Pasighat	-Itanagar is the state and administrative capital and is a major gateway to Guwahati via Tezpur -Pasighat is situated in plains with decent standards of roads to and from Pasighat -Major regional centre in Upper Arunachal Pradesh acting as a node for the districts in its proximity. -Major pineapple and orange growing regions in immediate vicinity -Proximity to Upper Assam and will have access to the Dholu Sadya Bridge in the near future thereby easing transport and saving time
2	Assam	Guwahati, Silchar	- Guwahati the largest city in the NER and the capital of Assam with large markets/mandis, airport, rail head and agriculture administrative bodies - Silchar is a key node in the Barak Valley division of Assam with plenty of orange, pineapple, and lemon growing regions surrounding it - Has an airport and is well connected to Guwahati - Is strategically located with uniform access to Manipur, Mizoram, Tripura, Nagaland as well as Bangladesh - Karimganj Land Custom Station

3	Manipur	Imphal	- State Capital and situated in the plain region right in the middle of the state, almost equidistant from all hilly districts - Optimal connectivity by road and air - Availability of Nilakuthi Food Park nearby as well as presence of Thangjam Agro Industries, the largest food processing unit in Manipur - At 100 kilometers from Land Custom Station, Moreh as well as en-route to neighbouring state capital Kohima which connects further to Dimapur (rail head)
4	Meghalaya	Shillong, Tura	- Shillong is the state and administrative capital of the state at just 80 kilometres from Guwahati. Shillong is just 81 kilometres from Dawki Land Custom Station - Tura is towards the far west of Meghalaya, bordering Bangladesh, which can serve as a hub for abundant pineapple growing in the region. Also, it connects to Goalpara in Lower Assam instead of going via Guwahati
5	Mizoram	Aizawl, Lunglei	- Aizawl is the state capital and home to all major agricultural markets and mandis in the state - Lunglei is located at far bottom of Mizoram and the farmers find it difficult to bring their yield up to Aizawl. A hub at Lunglei would help to facilitate and consolidate the produce in the major agricultural districts of Lawngtlai, Saiha, and Serchhip
6	Nagaland	Dimapur	- Dimapur is the commercial capital of Nagaland with the only rail head and airport in the state - Major transit junction for further connection to Guwahati and other parts of the NER - Abundant pineapple and Naga Chilli growing regions in the vicinity with processing units and an upcoming Agro and Food processing Special Economic zone (AFSEZ)
7	Sikkim	Gangtok	- State capital and most organized hub of the state with impetus on organic farming as well as availability of market facilities - Close proximity to Pakyong (upcoming airport facility) and well connected to Siliguri in West Bengal
8	Tripura	Agartala, Kumarighat in Unakoti District	- Agartala is the state capital and the largest city of Tripura, home to Integrated Check Post (ICP) sharing a border with neighbouring country Bangladesh - Optimal air and road connectivity. Upcoming rail link to Akhaura in Bangladesh under implementation - Kumarighat in Unakoti district is home to one of the most fertile pineapple and jackfruit belt of the NER as well as the Kumarighat Industrial Area which has several food processing units (can be leveraged further in terms of capacity and expanding product line)

			- Proximity to Manu Land custom station as well as rail head Kumar Ghat (MG)
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A pictorial depiction of the hubs suggested is given below:

Exhibit 66: Pictorial representation of the suggested hubs



Action Plan for enhancing supply chain efficiency

The Action plan states clearly the requirement of developing market infrastructure by means of a Hub and Spoke model. The infrastructure required in these facilities will include all the necessary machinery and equipment highlighted in next section. The following flow chart shows the key elements of the action plan.



Establishment of a core working group: The State Level Industrial Development Board in each state will be the nodal agency in charge of overseeing this activity and its subsequent implementation. Support will be given by State Agriculture and Horticulture Department in assessing factors such as soil, weather, topography etc. A designated team will be deployed who will be overlooking the entire process and engage with multiple chain actors. This team will be responsible for infrastructure assessment, manpower assessment, financial assessment, development and implementation of a marketing plan and stakeholder engagement.

Availability & procurement of Land for ‘Hubs’ and ‘Spokes’: This will be a concentrated effort in each state where the hubs are proposed to be set up. The Hubs will be at centers which make the supply chain feasible and smooth so as to boost the market connectivity and network optimally. The land for these hubs needs to be procured and allotted through coordination and policy level discussions between the governmental bodies. State wise industrial development agencies are as follows:

Exhibit 67: State wise industrial development agencies in NER

#	State	Name of Agency
1	Arunachal Pradesh	Arunachal Pradesh Industrial Development Financial Corporation Ltd

2	Assam	Assam Industrial Infrastructure Development Corporation
3	Manipur	Manipur Industrial Development Corporation Limited
4	Meghalaya	Meghalaya Industrial Development Corporation Limited
5	Mizoram	New Land Use Policy – Government of Mizoram
6	Nagaland	Nagaland Industrial Development Corporation
7	Tripura	Tripura Industrial Development Corporation
8	Sikkim	Sikkim Industrial Development & Investment Corporation Ltd.

Gaining Necessary Approvals: All necessary approvals need to be taken before deployment of resources in the implementation of this facility. These will primarily include:

- Confirm layout and project plan structure
- Planning and Land Use Department
- Pollution Control Board
- Right of way
- Necessary services for the facility – water, electricity, waste management etc.
- Connectivity options (rail/road)

Funding Probabilities: Various central level agencies are providing funds for development of marketing infrastructure. The state representatives and the core working group will link up with these agencies and procure funds for implementation of these facilities after necessary approvals and processes.

Infrastructure set up: The hubs will focus on setting up of infrastructure where produce from the collection centers will be brought in for further grading and packaging in a scientifically regulated manner. These centers will also house potential processing units and entrepreneurs over time as per the need and success of the facility in terms of yield and returns. The centers in every state will initially focus on one crop/product which, over time will be extended to others. This can be undertaken in a phase wise manner depending on the market dynamics. The hubs will be built in such a way that they are eligible for multi commodity handling. The facility will adhere to stringent packaging and grading guidelines.

State	Initial Product of focus
Arunachal Pradesh	Kiwi
Assam	Ginger
Manipur	Pineapple/Passion fruit
Meghalaya	Mandarin Orange
Mizoram	Banana
Nagaland	Pineapple
Tripura	Pineapple/Jackfruit
Sikkim	Ginger

Exhibit 68: State wise product to focus upon in NER

Each hub will house at least two reefer vans along with a cold storage. The reefer vans will connect the hub to the nearest logistics point for onward transfer of raw produce or processed food items. The cold storage will help in providing a practical way of preserving perishable foods in their natural state. Multi commodity cold storages will be provided with multiple chambers enabling them to store a wide range of fresh horticulture products together with respect to the storage compatibility requirements for

temperature, humidity, protection from odour and sensitivity to other gases like ethylene. The refrigeration system is designed to adjust and operate to a range of temperature and humidity conditions, depending on the compatibility between different types of fruits and vegetables. The manpower and labour requirements at the hub will be met through engagement with a 3rd party supplier on a contract basis.

Marketing Reach out: The proposed plan for setting up of such hubs at critical junctions in the state needs to be communicated to the farming community in an optimal manner to garner a positive and robust response. This will highlight the services on offer at these facilities which will enable entrepreneurial farmers to have a better idea and thereby facilitating them in decision making. Also, government Incentives coupled with assistance in all the legalities and documentation to be provided by the nodal agencies also will be highlighted to generate a proactive response.

These efforts will be done through the State Agricultural Marketing bodies who are already working with farmers at the grass root level in imparting training, formation of market committees, publicity of agricultural and horticultural produce in regulated markets as well as providing packaging and grading guidelines.

Possible Incentives

For Transportation - Transport subsidy which provides subsidy in the transportation cost incurred should be extended to all the entrepreneurs who operate out of the hubs established. The subsidy can be provided both for sourcing the raw materials as well as for distribution of finished goods. Implementation of such a mechanism will give a boost to players in the market to leverage the options at their disposal.

5.3 Optimization of marketable surplus

Given the optimum conditions for cultivation, different varieties of agricultural and horticultural produce are grown in the region in abundance. Due to lower consumption levels of these produce in the region, 80-90% of production is available as marketable surplus in different products. This advantage of the huge marketable surplus can be leveraged only by connecting the production regions in NER to the consumption markets. However, due to lack of such connectivity combined together with perishable nature of produce and bad infrastructure, a lot of produce gets waste in the region itself. As connecting NER to the consumption markets takes time, the key is to **process the produce closer to the production regions and thereby increase the shelf life as well as value and transport the processed products to the consumption markets.**

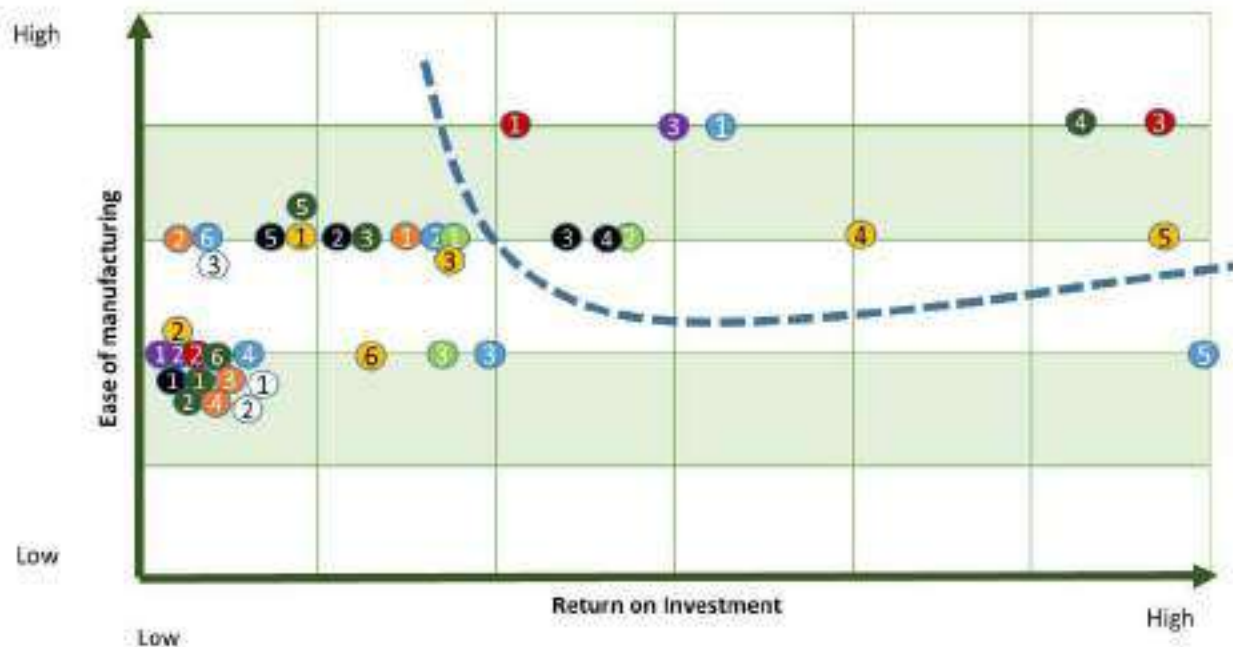
Roadmap for enhancing processing capabilities and value addition:

Already some small scale food processing units are present in the region. However, they are majorly involved in the preparation of products like pickles, jams, marmalades and squashes. Most of the products thus prepared are relevant only to the local markets but not to the international markets. They are also inconsistent in quality parameters and low on volumes and hence doesn't meet the demand and standards of international markets. This shows the need for the establishment of such processing units which are export oriented and are focused on the production of market relevant products. The strategy for the establishment of such processing units should rest on identifying the products which in the given conditions present in the region, should be easy to produce, possess demand in international markets and offer the best return on the investment. Ideal locations to establish the production plants, capacities to be installed, partnerships and models for operationalizing the plant also need to be identified. Identifying such opportunities and helping entrepreneurs venture into them will help in the utilization of surplus and solve the problem of glut/lack of markets. Covering all the above mentioned aspects is the road map which is discussed below.

Recommendation 1: Focus on low-hanging product processing opportunities that offer the best return on investment

A number of processed products can be prepared out of the 10 identified crops. The major products that can be produced are already mentioned under the product profiles of each crop. The exact products that are to be targeted are further identified based on the following parameters:

- **Ease of production:** The products that are shortlisted should be such that given the current conditions prevailing in the region and given the constraints in the region with respect to the availability of power, skilled labor, entrepreneurship etc. as well as the complexity in manufacturing, they can be easily produced. Each of the products identified are classified into three categories of product opportunity based on their current processing status and ease in the manufacturing process and mapped along their value addition levels.
- **Relevance to international markets:** The products that are shortlisted should be relevant to international markets and should have increasing international demand. The same is identified using the historic trends of the same/ similar products in the global markets.



- Return on investment (ROI): ROI is used to compare the efficiency of a number of different investments. The products that are shortlisted should provide better returns on the investment made. The same is again dependent on the product manufactured, plant capacity, investment required to establish the plant and the life of the plant.

For further refining the list, the following representation was made with barriers for manufacturing (can be technological, market access, availability of skills etc.) on one axis and the return on investment on the other.

Exhibit 69: Barriers for manufacturing vs return on investment for identified products.

① Canned jackfruit bulbs	① Dried lemon peel	① Canned pineapple/ tidbits	① Pickled/brined chillies
② Dried jackfruit slices	② Candied lemon peel	② Candied Pineapple pieces	② Sauces and spreads
③ Preserves/jams	③ Lemon juice concentrate	③ Pineapple juice concentrate	③ Seasonings
④ Fruit snacks			
⑤ Dried/Candied Kiwi	① Dried banana slices	① Candied orange peel	① Ginger Powder
② IQF Kiwi slices	② RTS Beverages/ Squashes	② Dried orange peel	② Dried ginger flakes
③ RTS Beverages/ Squashes	③ Banana Pulp/ Puree	③ Jams & marmalades	③ Dry ginger
④ Kiwi Pulp	④ Banana Powder	④ Orange juice concentrate	④ Ginger pickles
⑤ Kiwi juice concentrate	⑤ Banana snacks	⑤ IQF orange pieces	⑤ Ginger oil
⑥ Kiwi wine		⑥ Frozen pulp	⑥ Crystallized ginger
	① Processed rice flakes		
	② RTE snacks		
	③ Breakfast cereals		

From the above graph, top 10 products which are high on ease of manufacturing and high on ROI are selected for further interventions. Following are the details of the machinery required for manufacturing the identified products, ideal capacity/ size of the plant for NER, approximate cost of the plant and expected life of the plant. While identifying the capacity of the plant, preference is given to smaller capacity plants and it is recommended that depending upon the success of these plants, the same setup can be rolled out in another production cluster.

Exhibit 70: Top 10 processed products to focus upon in NER

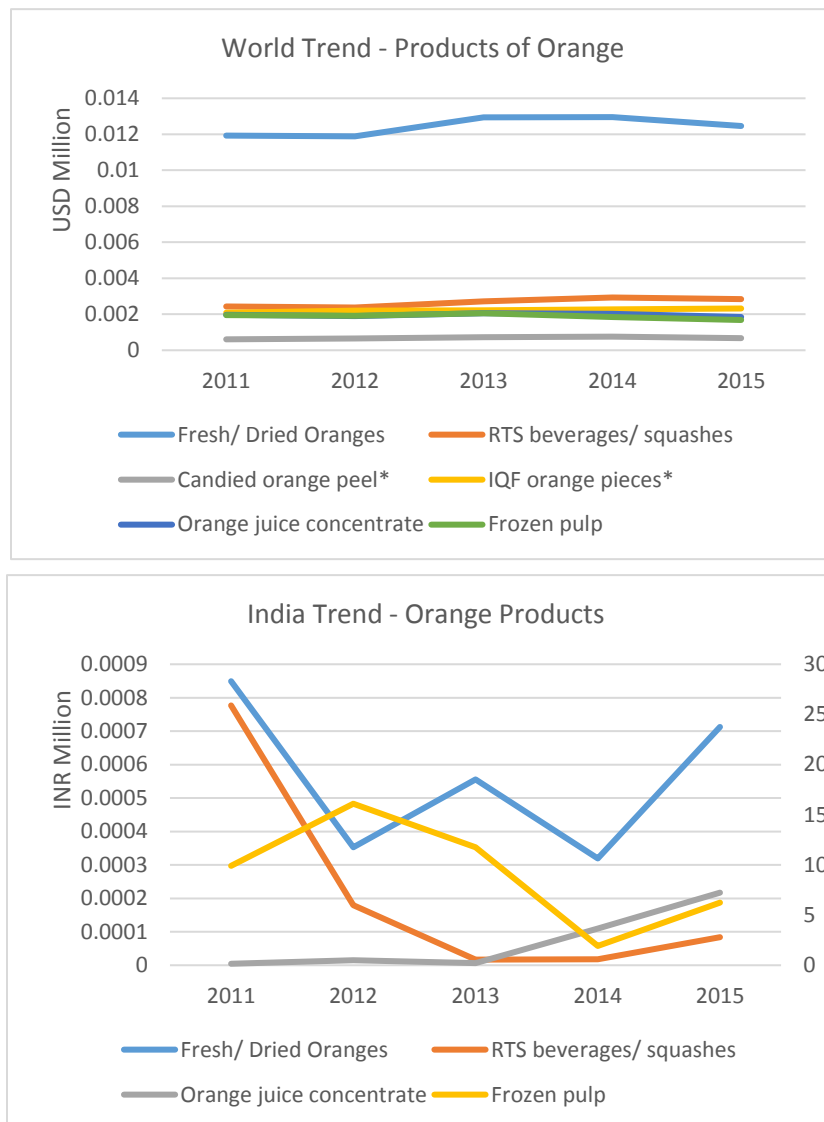
S.No	Product	Machinery required	Ideal capacity for NER (MT/annum)	Approx. cost of plant (INR million)	Life of plant (years)
1	Ginger powder	Drying and milling plant	3,000	32	10
2	Lemon juice concentrate	Juice and aseptic line	2,000	40	15
3	Canned pineapple	Canning line	3,000	65	8
4	Pineapple juice concentrate	Juice and aseptic line	5,000	65	15
5	Chilli sauces and spreads	Processing plant	300	65	10
6	Kiwi pulp	Juice and aseptic line	1,000	22	15
7	Kiwi juice concentrate	Juice and aseptic line	1,000	22	15
8	Banana Pulp/ puree	Juice and aseptic line	2,000	60	15
9	Banana Powder	Processing plant	2,000	35	10
10	Orange juice concentrate	Juice and aseptic line	4,000	67	15

The analysis for different identified products is as follows:

Oranges:

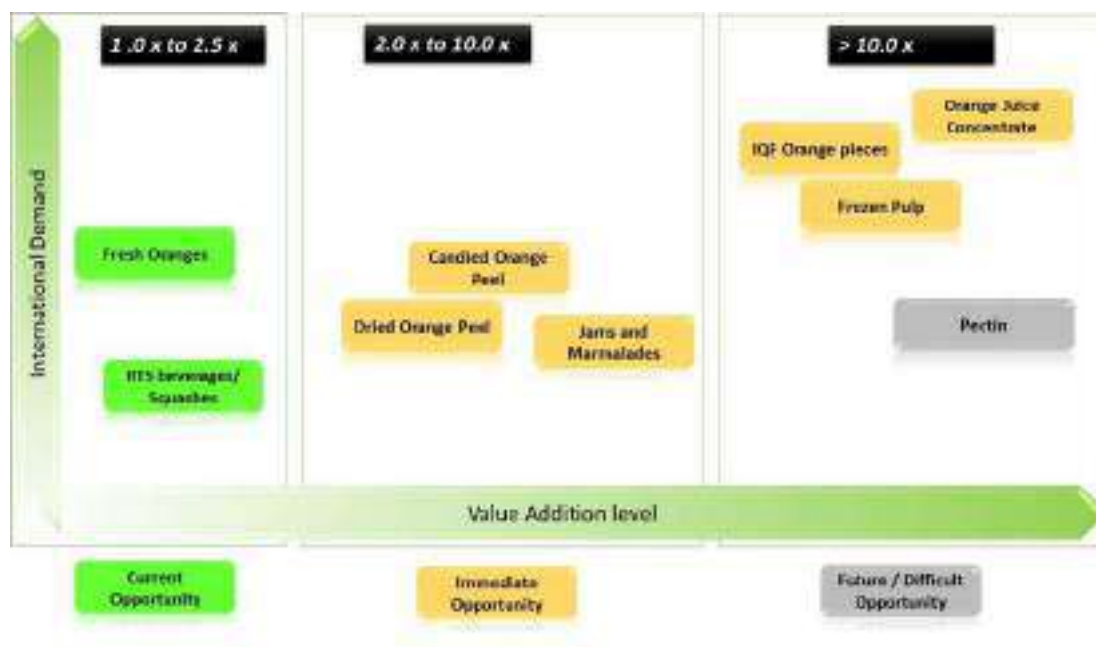
Globally oranges are traded in different forms which include oranges fresh/ dried, squash, frozen juice, juice not frozen with lesser than 20° brix and jams and marmalades prepared from oranges. Of these, the trade is heavily dominated by fresh/ dried oranges. However, the other products of orange also contribute to a significant amount of trade. In case of India, trade heavily happens in fresh/ dried oranges. The contribution of other products like juice concentrates, pulp or ready to sip beverages for the country's trade is minimal. The same can be observed from the below graph.

Exhibit 71: Export trends (value) for different products of oranges – World and India



Source: Sathguru Analysis, International Trade Center, APEDA AgriXchange, DGCIS

The following representation shows the value addition levels of different processed products of oranges mapped against their international demand. While some fresh oranges as well as ready to sip beverages are being exported from the region, the exports can be further increased by streamlining the operations. In terms of value addition, the immediate opportunity exists in moving into orange juice concentrate which is relatively easy to manufacture and also has significant international demand. For exporting IQF orange pieces and frozen pulp from the region, though there is no complexity in technologies, it requires the establishment of strong cold chain network. Hence they can be explored as long term options.

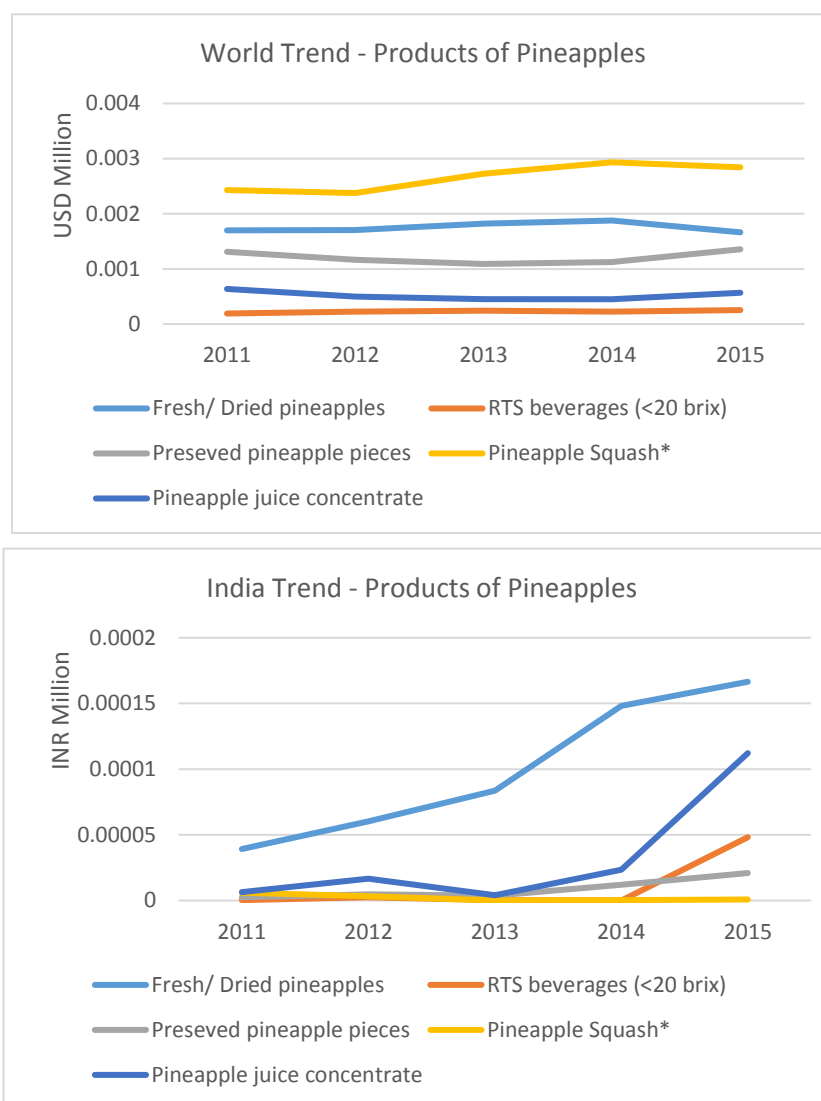


Product opportunities in oranges			
Product	Short term	Medium term	Long term
Oranges	Fresh oranges	Orange juice concentrate	IQF oranges & Frozen Pulp

Pineapple:

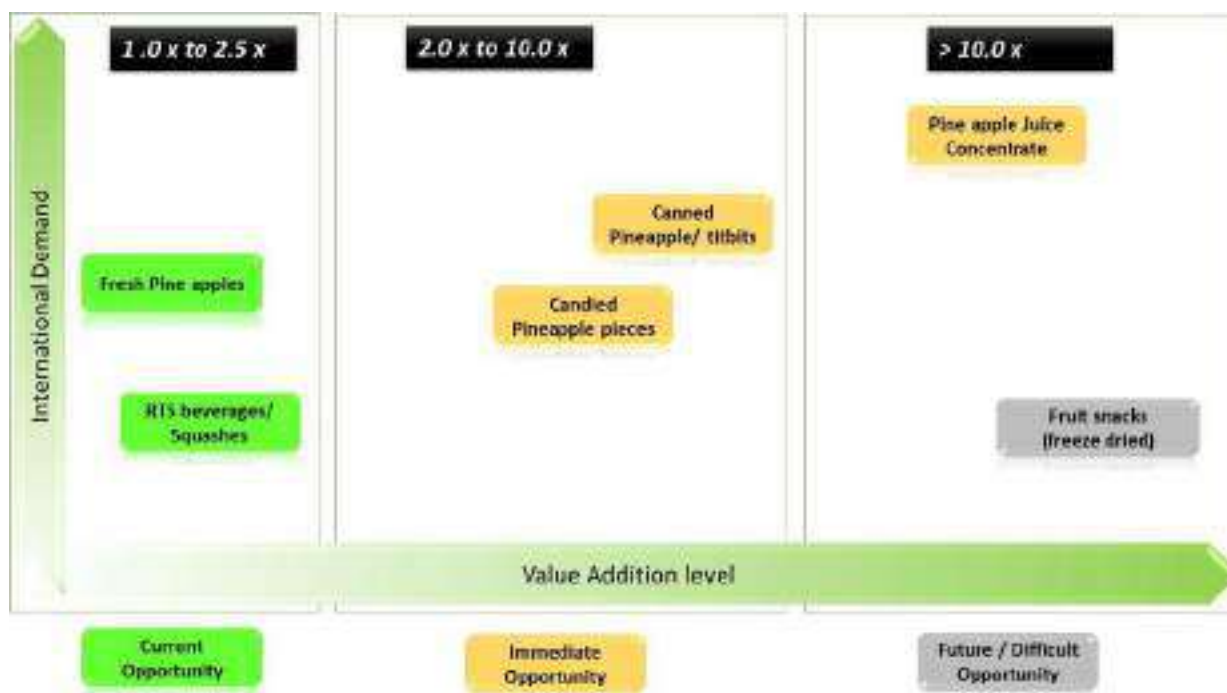
Similar to oranges, pineapples are traded internationally in different forms and can be majorly categorized into fresh/ dried pineapples, pineapple squash, canned/prepared/ preserved and juice concentrates of <20° brix and >20° brix. From the following graph which shows the international trends as well as trends in India, it is observed that along with fresh pineapples, there is also a significant demand in the international markets for canned/ preserved pineapples and juice concentrates. However, the exports of these products from India are quite low and thus exists an opportunity for NER.

Exhibit 72: Export trends (value) for different products of Pineapple – World and India



Source: Sathguru Analysis, International Trade Center, APEDA AgriXchange, DGCIS

The following representation shows the value addition levels of different processed products of pineapples mapped against their international demand. While some fresh pineapples as well as ready to sip beverages are being exported from the region, the exports of fresh pineapples from NER is not yet optimally explored. Given huge production of pineapples in the region, a boost to the exports can be provided by creating the necessary infrastructure for primary processing activities. In terms of value addition, the immediate opportunity exists in moving into canned pineapples and pineapple juice concentrate which are relatively easy to manufacture owing to high levels of automation in the processing lines and also has significant international demand.

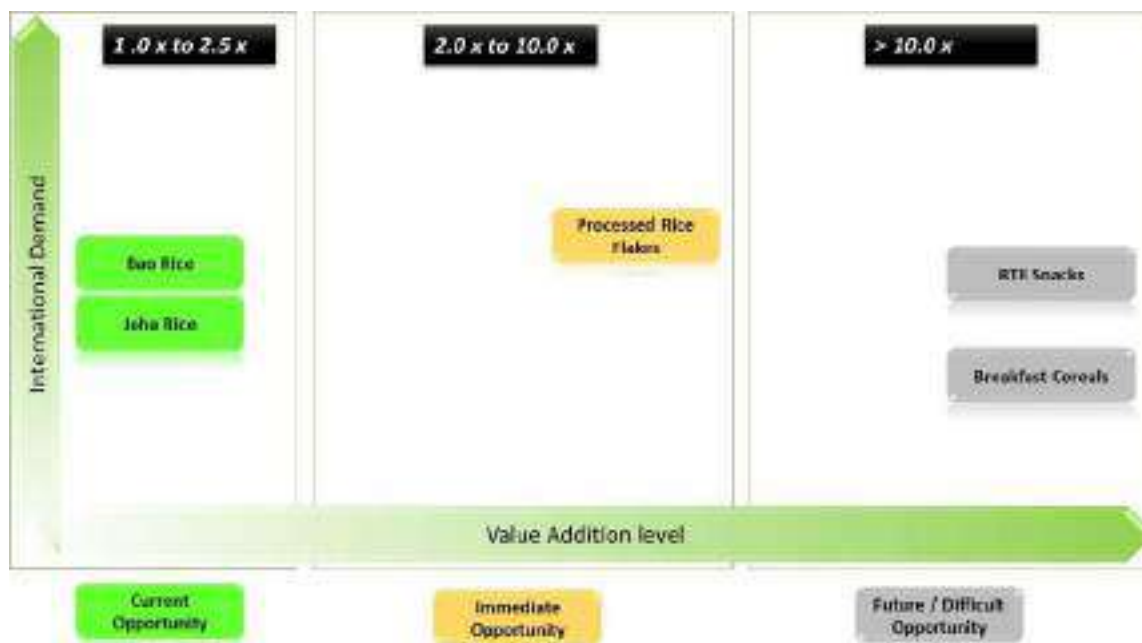


Product opportunities in pineapples			
Product	Short term	Medium term	Long term
Pineapples	Fresh pineapples	Pineapple juice concentrate & Canned pineapples	

Rice:

Rice is a staple crop for the people of NER and a number of varieties of rice are grown in the NER. Not all the varieties that are grown, possess potential for exporting to international markets. Some of the indigenous varieties which possess certain nutritional benefits have been identified for exports and the export market for these products is already established. These exports can be further increased only by educating the end customers through right branding and marketing exercises. However, since the region does not contain modern rice mills, establishing one will help the farmers in the region get better prices and assurance for their crop.

The following picture shows the value addition levels of different processed products of indigenous rice varieties mapped against their international demand. These indigenous varieties also pose difficulty of in processing them into processed products like snacks due to their high fatty acid and bran content. Also, owing to their inherent qualities these varieties are preferred in semi processed form i.e. milled rice.

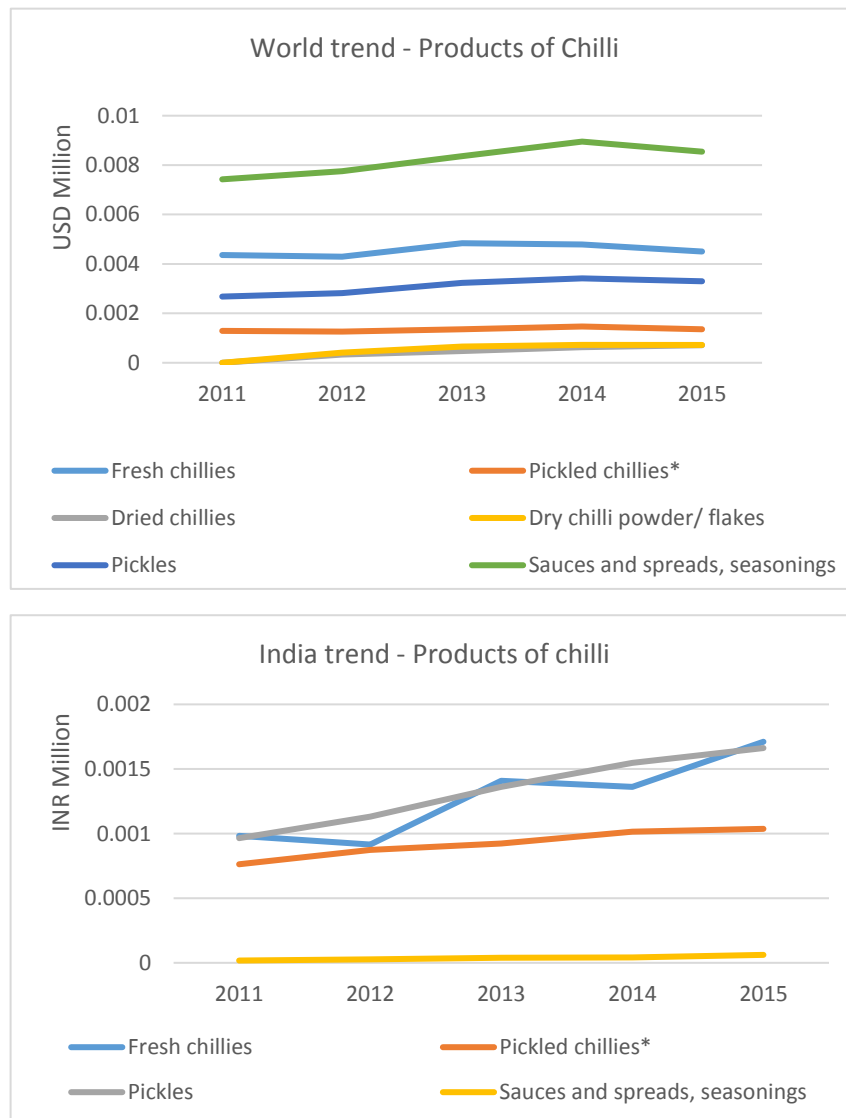


Product opportunities in rice			
Product	Short term	Medium term	Long term
Rice	Milled rice	-	-

Chilli:

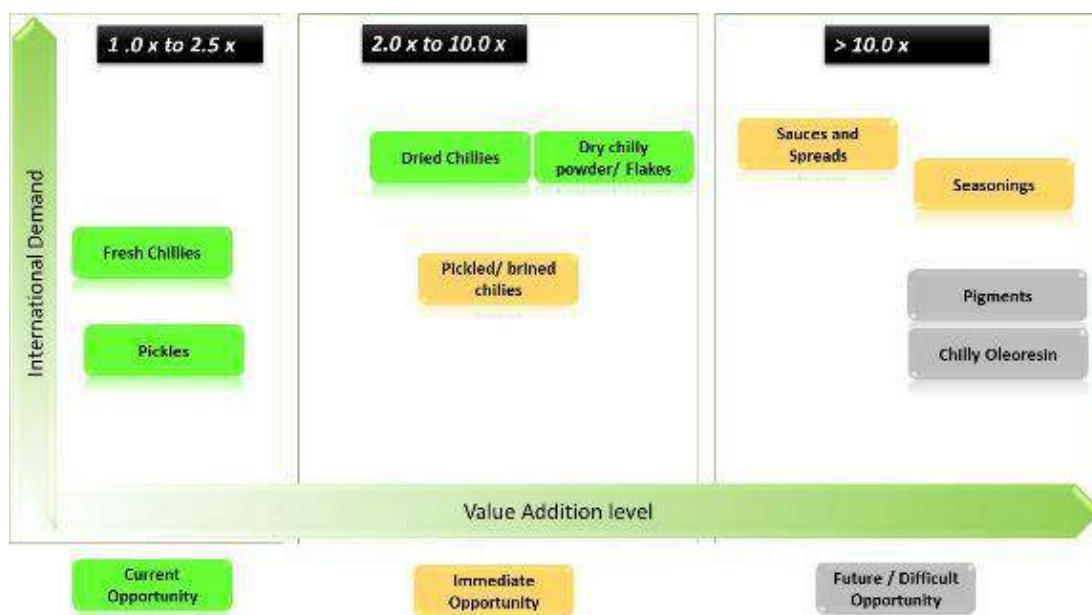
Similar to rice, some of the varieties of chillies that are produced in NER also possess unique characteristics which have demand in international markets. However, in case of chillies, the international demand as observed from the following graphs, is more for the processed products like sauces, seasonings, and spreads. On the contrary, sauces/ seasonings are the least exported items of chilli from India and hence has to be properly explored.

Exhibit 73: Export trends (value) for different products of Chilli– World and India



Source: Sathguru Analysis, International Trade Center, APEDA AgriXchange, DGCIS

The following representative picture shows the value addition levels of different processed products of chillies mapped against their international demand.



While some exports in chillies are happening to the neighboring countries, the real potential of the product can be explored if the unique proposition of the varieties can be tapped. For exploring the same sauces which are relatively easy to manufacture and are high in demand can be targeted. However so as to stay relevant to international markets, it is important to consider and replicate the ever evolving international flavor trends in the chilli sauces and dressings.

Seasonings are another neglected product in the region, despite the less complexity in processing, high international demand and the availability of other high quality and unique raw materials like ginger, turmeric, cardamom and bay leaf etc. Research should be encouraged in product development of seasonings relevant to different international cuisines and cultures.

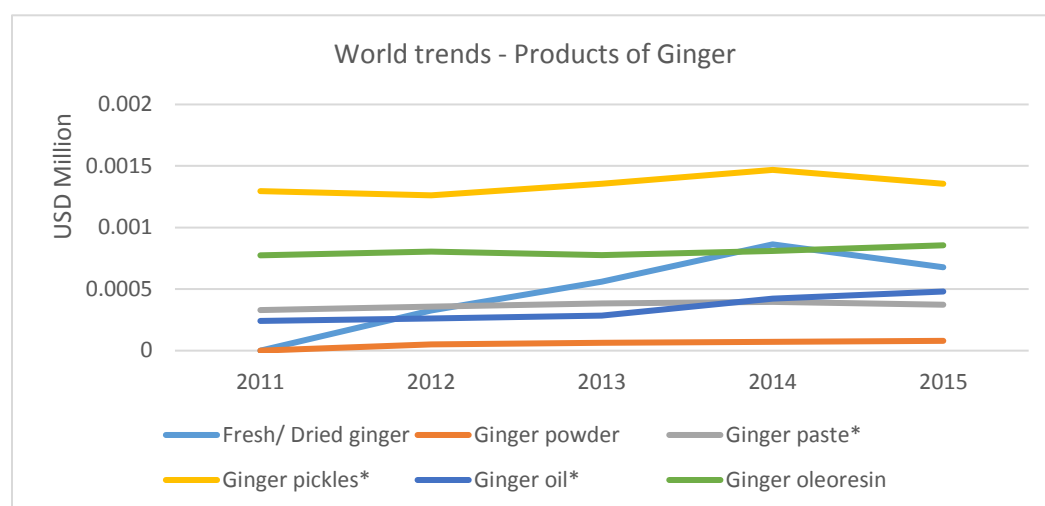
Product opportunities in chillies			
Product	Short term	Medium term	Long term
Chillies		Sauces/ Dressings	Seasonings

Ginger:

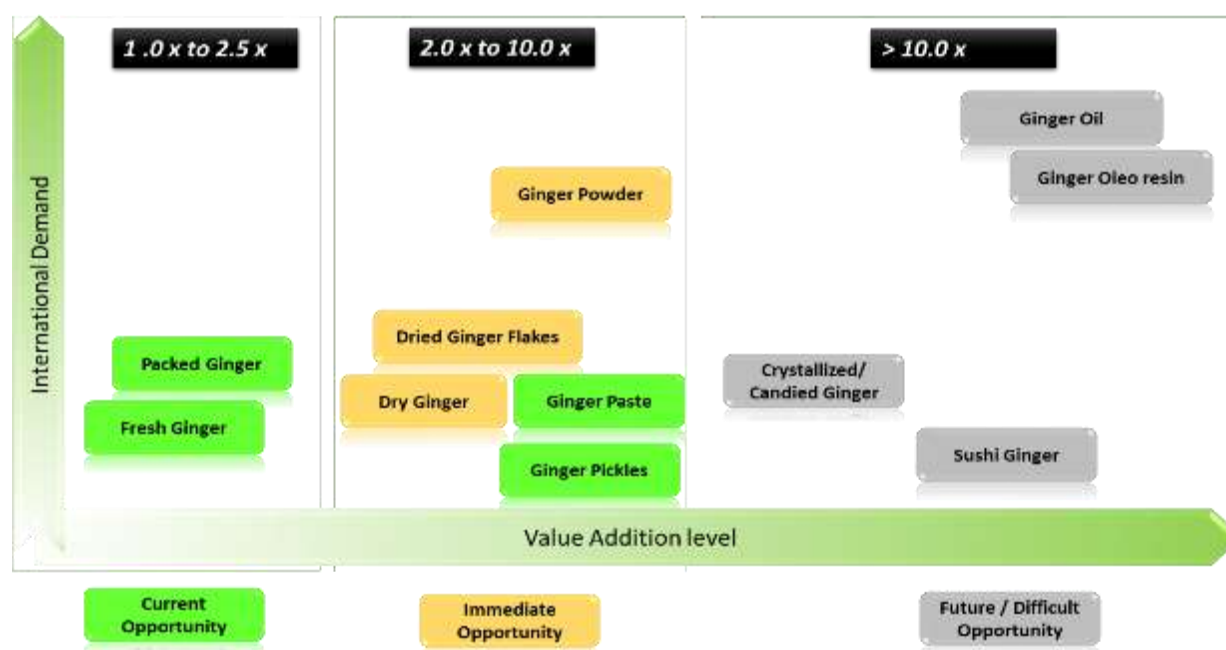
Ginger that is traded internationally in different forms and a number of processed products are prepared out of ginger. As evident from the following graphs, ginger which is traded in fresh/ dried form has the highest demand. However, oleoresins prepared out of ginger are other key products. Despite ginger being the key product from NER, the processing infrastructure in the region for ginger is abysmally low. Ginger currently is exported in a rudimentary manner to the neighboring nations and as a result, the demand for Indian ginger is also going down in these nations. The exports can be quickly increased by establishing infrastructure for primary processing.³¹ The following picture shows the value addition levels of different processed products of ginger mapped against their international demand.

³¹ * - data for respective parent categories only

Exhibit 74: Export trends (value) for different products of Ginger– World



Source: Sathguru Analysis, International Trade Center, APEDA AgriXchange, DGCIS



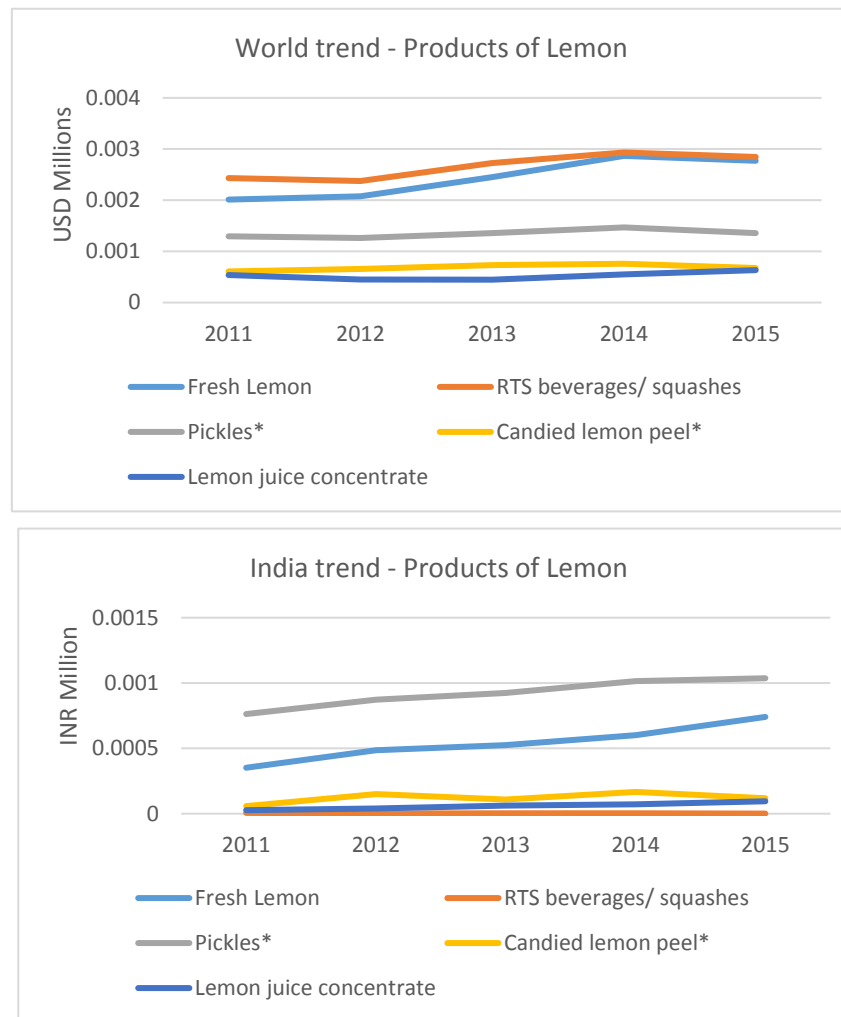
Among the different processed product that can be manufactured out of ginger, dried ginger powder is one immediate opportunity that is underexplored from the region. The product is of moderate international demand and relatively easier to manufacture. On the other side, even though ginger oil and ginger oleoresin offers high levels of value addition, the complexity in manufacturing and the requirement of high skill set leaves this to be explored in future. As already mentioned in the case of chilli, research has to be encouraged in the development of seasonings which have a mix of several spices.

Product opportunities in ginger			
Product	Short term	Medium term	Long term
Ginger	Ginger powder, Dried ginger flakes		Ginger oil and ginger oleoresin

Lemon:

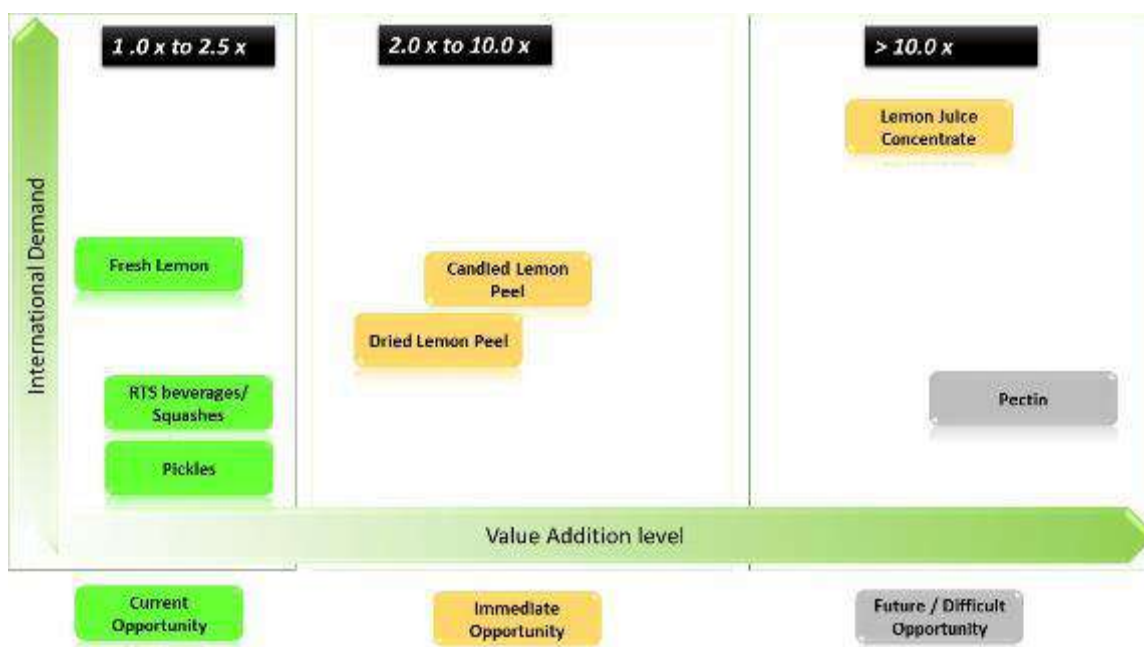
Similar to oranges, lemon is traded internationally in different forms and are majorly categorized into fresh/ dried lemons, pickles, juice concentrates, squashes, candied peels. The following graph shows the international as well as trends in India with respect to exports of these products. From the graph below, it is observed that fresh lemons are the largest traded product of lemon and has grown exponentially in the last 5 years. On the other side, the demand for lemon juice concentrate of >20° brix is also increasing steadily.

Exhibit 75: Export trends (value) for different products of Lemon– World and India



Source: Sathguru Analysis, International Trade Center, APEDA AgriXchange, DGCIS

The following figure shows the mapping of different processed products of lime with respect international demand and value addition levels.



With respect to NER, fresh lemon offers a good opportunity for export after sorting, grading and packing, but requires investments in cold chain infrastructure. The uniqueness of the flavor profile and high juice content of the local variety can be easily marketed. Lemon Juice concentrate offers a good value addition and export scope. The product is not dependent on cold chain and this offers a huge compensation for slow logistics in the region. This product is of good international demand and should be explored at present.

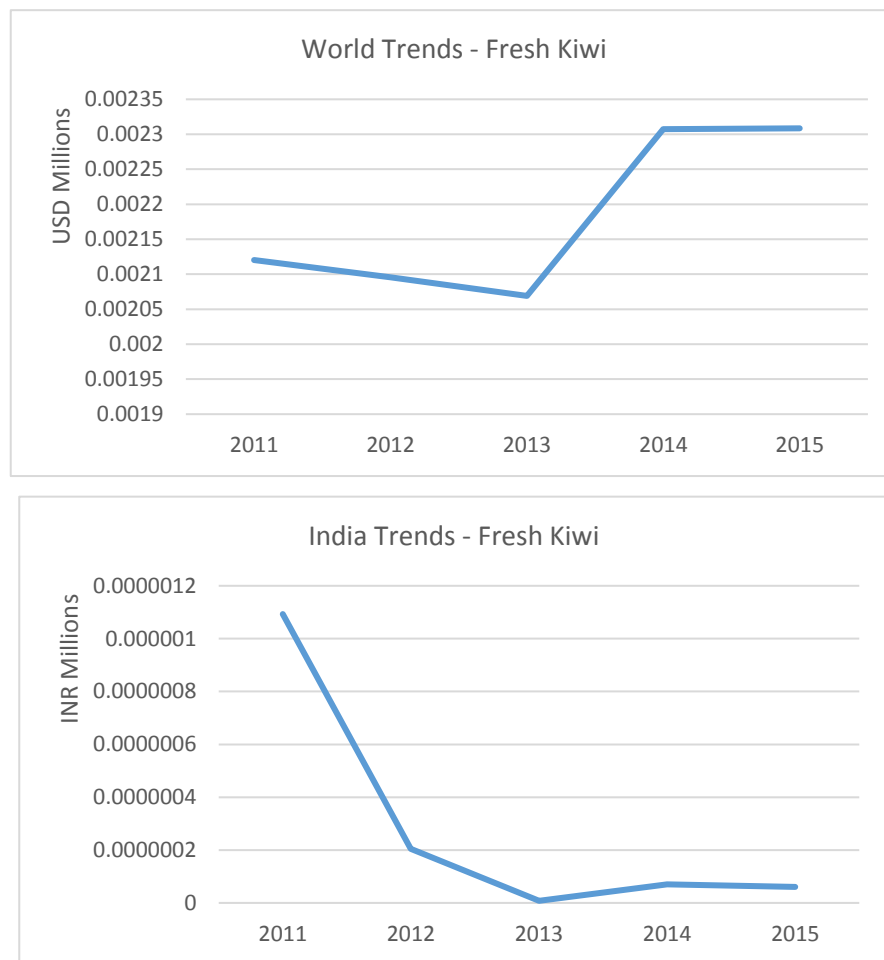
Product opportunities in Lemon			
Product	Short term	Medium term	Long term
Lemon	Fresh lemon	Lemon juice concentrate	

Kiwi:

In the international markets, kiwis are majorly traded in their fresh form and also as observed from the below graph the value of fresh kiwis that are traded is slowly increasing year after year. Annually around 14.6 lakh MT or 2.3 billion worth of fresh kiwis are traded internationally. Countries like New Zealand and Italy dominate the markets. Fresh kiwis after sorting, grading and packing offer a huge scope for exports owing to their exotic perception in the consumers. However, the current opportunity is relatively under explored owing to the difficulties in connectivity.

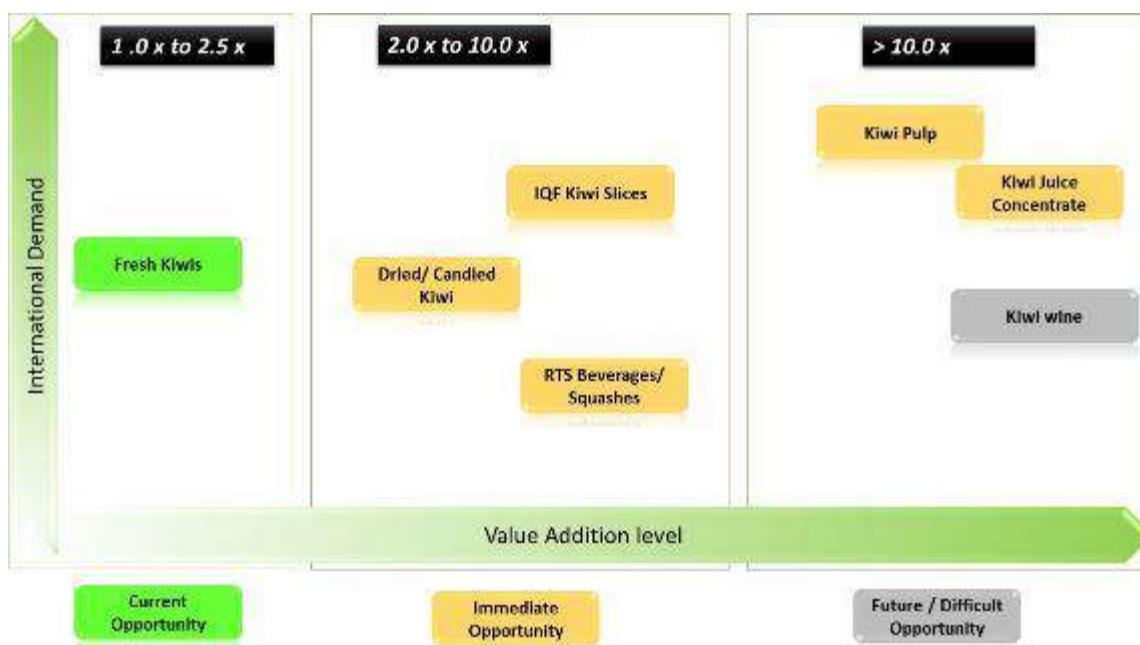
Kiwi pulp and juice concentrate offer a good potential for exports and can be stored at an ambient temperature which can compensate the higher transit duration. Kiwi wine which is currently being pursued also offers good scope for exports, but the skill level required for the production is a challenge to overcome and hence can be taken up as a long term opportunity.

Exhibit 76: Export trends (value) for fresh Kiwi– World and India



Source: Sathguru Analysis, International Trade Center, APEDA AgriXchange, DGCIS

The following figure shows the mapping of different processed products of kiwi with respect international demand and value addition levels.

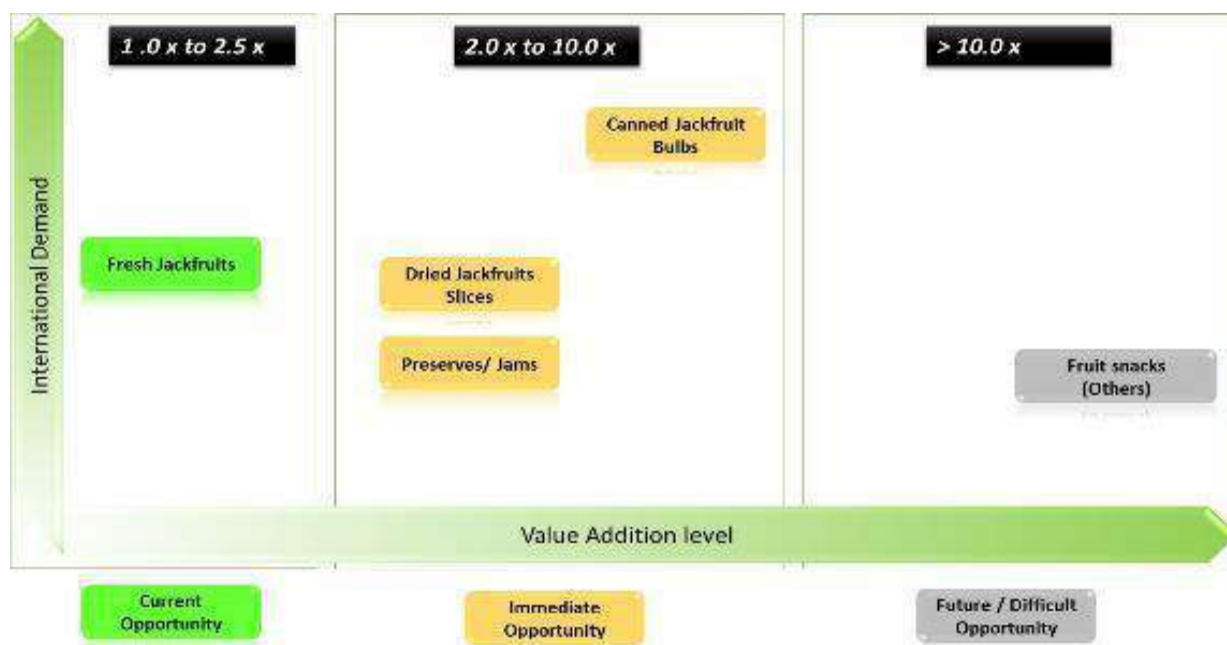


Product opportunities in Kiwi			
Product	Short term	Medium term	Long term
Kiwi	Fresh Kiwi	Kiwi Pulp/ Kiwi juice concentrate	Kiwi wine

Jack fruit:

Along with NER, the neighboring countries for India i.e. Bangladesh and Myanmar are also significant producers of jackfruit. As a result, apart from small unregulated trade that happens through the porous borders in NER, the exports in jackfruit are insignificant. Also as the fruit is voluminous and heavy, the export of fresh fruits to distant markets is highly impossible. Hence it is majorly the processed products of jackfruits that are traded in the international markets. The following figure shows the mapping of different processed products of jackfruit with respect to their international demand and value addition levels.

Facilities for processing jackfruits are nonexistent in NER. Canned jack fruit bulbs is a good opportunity to be explored owing to its multiple applications and fair demand in the international market. Since jackfruits are available in the same region with high pineapple production, products of pineapple can also be processed on the same line and require relatively low investment. Snack products from jackfruit like chips also offer fair demand in the international markets with high Indian diaspora.

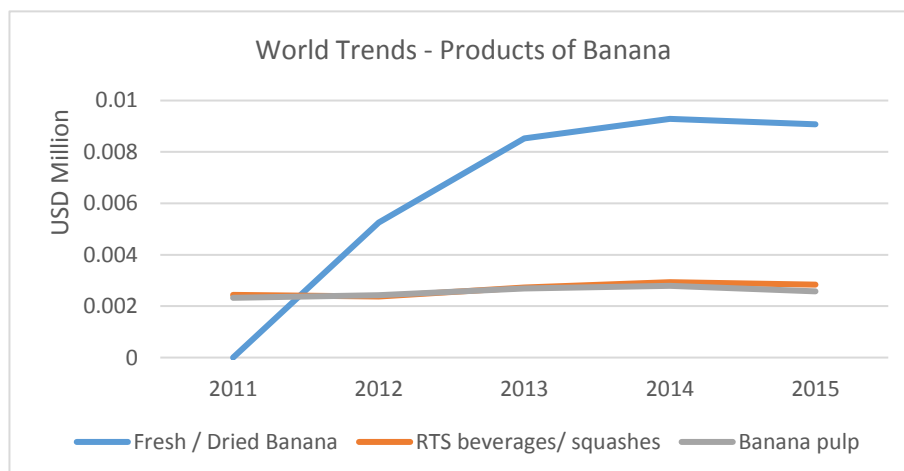


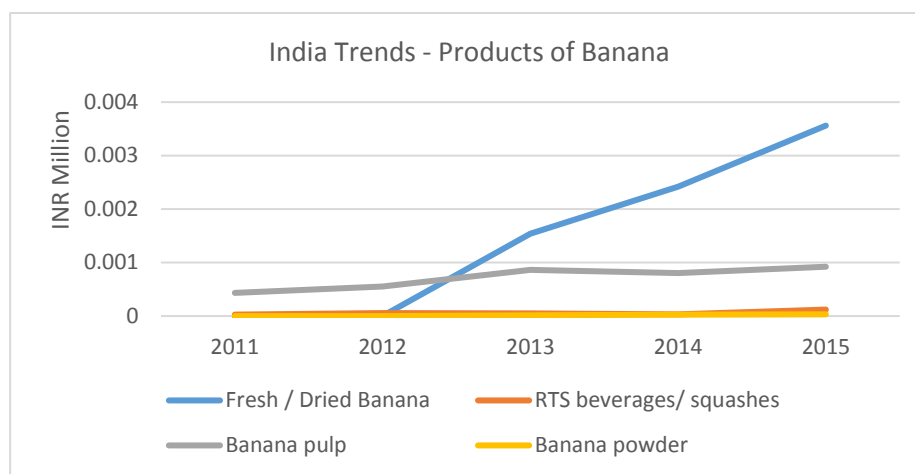
Product opportunities in Jackfruit			
Product	Short term	Medium term	Long term
Jackfruit	Jackfruit snacks	Canned jackfruit bulbs	

Banana:

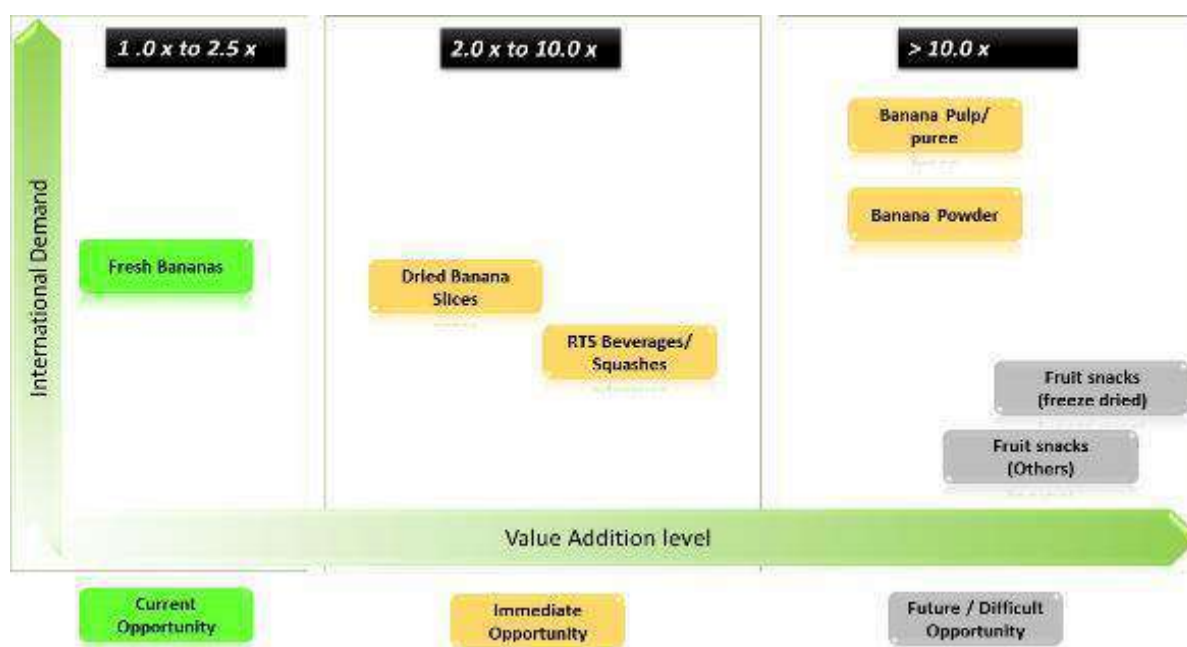
Banana is the most consumed tropical fruit in the world and is consumed in both fresh as well as processed forms. As observed from the following graphs, among the different products of banana, fresh banana is the one that is largely traded in the international markets followed by pulp. The following figure shows the mapping of different processed products of banana with respect to their international demand and value addition levels.

Exhibit 77: Export trends (value) for different products of Lemon– World and India





Source: Sathguru Analysis, International Trade Center, APEDA AgriXchange, DGCIS



Export of fresh bananas to premium markets from NER is currently tough owing to varietal diversity and production practices in the region. Among the processed products, considering that the produce from the region is an organic region, the banana powder is a relatively easier product to process and offers applications in many products and can be explored immediately. Banana pulp/ puree which is a stable product and finds applications in products like beverages and hence possess significant export demand. However one has to be careful to use varieties with an acceptable flavor profile to take up the puree production.

Product opportunities in Banana			
Product	Short term	Medium term	Long term
Banana	Fresh Banana/ Banana Powder	Banana pulp/ puree	

The suitability of varieties for different processing opportunities mentioned above and the interventions required for enabling the same is discussed in the following table.

Product	Varietal Significance	Interventions required
Pineapple	• Kew variety, which is currently produced in the NER is a suitable variety for canning. • MD-2 is a standard international variety that needs to be explored for fresh fruit exports. • This variety is being received well in the international market due to its superior flavor, high sugar content (17° Bx for ripe fruit) and low Acidity (0.4- 0.45 %) and resistance to internal browning. • The fruits are medium (1.5 to 2.0 Kg) with a long shelf life of about 30 days in controlled storage.	• Farmers currently are cultivating pineapples without much attention to the varieties, leading to a discontinuous supply of varieties that can be processed. Educating farmers and supplying adequate planting material to the identified clusters is a key step in determining the success of the processing clusters. • Pineapple research station, Vazhakulam, Kerala supplies germplasm of MD-2 variety and established a package of practices. Though agro-climatic conditions of NER seems to be suitable for MD-2, no prior trials are available to evaluate the product characteristics • Trial cultivation and subsequent transfer of technology can be taken up by Assam agricultural university, Department of Horticulture Assam and Meghalaya and Pineapple research station, Rhibhoi.
Banana	• Grand Naine – a Cavendish cultivar and Robusta are the important varieties of Banana that are currently dominating the international trade. • NER region is currently producing both the varieties.	• The trueness of the varieties is in question due to repeated vegetative propagation; Tissue-cultured planting material of true types should be supplied in adequate quantities. • Even though the varieties are present, farmers are unaware of the package of practices required for the export markets (e.g. covering of bunches with polythene covers); Training and monitoring groups of farmers for improving the cultivation practices in line with the export standards. • Training to farmers and exporters can be jointly carried out by APEDA and State Horticulture Departments, with

		continuous monitoring by the later entity.
Jackfruit	- Jackfruit cultivation, collection, and trade In NER is undertaken currently without any emphasis on the variety. - Varieties are not well defined in jackfruit and different types are known differently in different localities.	- Identification of jackfruit producing areas with homogenous variety and establishing a collection linkages. - Research on isolating a suitable variety with in the region or introducing improved cultivars like PP1. - Training to farmers to take up organized cultivation
Rice	- Export potential for rice in NER is limited to very specific varieties. Only Bao rice is cultivated in moderate scale. - With the increase in demand, there is a possibility of scale up problems for other varieties like Black/ Purple rice and Chokowa rice.	- Support and encouragement to farmers for the gradual increase of area under these varieties. - Research for yield improvement in these varieties is required.
Chillies	Chilli varieties like Naga king-Chilli, Cherry Peppers, and Bird's eye chilli are unique to the region, however, their cultivation is unorganized.	Development of package of practices and training the farmers.
Mandarins/ Oranges	- Mandarins and Oranges in the region are unique with high TSS and balanced flavor profile. - Rigor of the orchards is decreasing and due to lack of proper root stock	Research on identifying the right root stock material for increasing the lifespan of the orchards.

Recommendation 2: Adopt a clustered approach for production of shortlisted products for supply chain and production efficiency

Based on our primary analysis it is observed that some of the manufacturing plants established in the region are not functioning currently due to several reasons, one of them being the availability of raw materials. While the hub and spoke model procurement system if implemented properly solves a part of this problem, establishing a processing center in the production clusters will further alleviate the problem. Also given the bad situation of connectivity and road infrastructure in the region, establishing processing centers closer to the production clusters will reduce the wastages in the produce and thus also solve the problem of availability. Hence identification of ideal locations for production of the shortlisted products is the key and the details are as follows:

Ginger Powder:

- Existing Infrastructure: Assam Industrial Development Corporation (AIDC) along with the partnership of APEDA has setup a ginger pack house and processing plant in Amingaon region near Guwahati in Assam. This plant is yet to become operational and the leased company i.e. Seven Food Processing Private Limited opined that the operations can commence from next crop season. Other than this plant, currently the region lacks organized units to for the production of ginger powder. Two pack houses for grading and sorting ginger along with cold stores are coming up at Karimganj and Aizawl.
- Proposed plant locations: Referring to the map present in the ginger product profile, Karbi Anglong in Assam forms the ideal location for establishing first ginger powder plant. Located centrally between several states, this region has better road and rail connectivity. Depending upon success, subsequent plants can be established at Gangtok (Sikkim – Organic processing plant), Tura (Meghalaya), Churachandpur (Manipur) and Tuensang (Nagaland).
- Processing technologies: Production of ginger powder is relatively of lower complexity. It involves the following steps.



Advanced Drying technologies like combined drying systems with radiofrequency/ microwave assisted hot air drying should be explored for NER. These technologies are not very capital intensive and available in modular designs, making it easier to expand the capacity.

- Training and Skill development requirements:
 - For entrepreneurs:
 - Quality systems and food safety – GMP and GHP
 - Basics of food processing technologies – Drying technology
 - Basics of food laws and phyto-sanitary regulations
 - Documentation and export protocols
 - For implementing agencies
 - Supply chain management

Lemon juice and Orange juice concentrate:

- Existing Infrastructure: No organized food processing facility in the region is currently processing Lemon Juice concentrate. APEDA along with ASAMB is establishing a multi-commodity pack house in Karimganj, Assam. Citrus is one of the main commodity that can be exported from this pack house in fresh form.
- Proposed plant locations: Referring to the map present in the lemon and orange product profiles, Tamenglong in Manipur forms the ideal location for establishing lemon juice concentrate plant. Depending upon success, the subsequent plant can be established at Sibsagar in Assam. For oranges, Pasighat in Arunachal Pradesh forms the ideal location and the subsequent plant can be established at Shillong in Meghalaya.

- Processing technologies: Juice concentrates are manufactured by vacuum evaporation and aseptic processing. The projects are moderately capital intensive and little complex. However, cold chain infrastructure is not required for the end products.
- Training and Skill development requirements:
 - For entrepreneurs:
 - Quality systems and food safety – GMP and GHP
 - Basics of food processing technologies – Thermal processing and aseptic operations
 - Basics of food laws and phyto-sanitary regulations
 - Documentation and export protocols
 - For implementing agencies
 - Supply chain management

Kiwi Pulp and juice concentrate:

- Existing Infrastructure: Kiwi is majorly produced in the state of Arunachal Pradesh. However, currently, there is no infrastructure present in this state for processing kiwi.
- Proposed plant locations: Referring to the map present in the kiwi product profile, Ziro in Lower Subansiri district in Arunachal Pradesh forms the ideal location for establishing kiwi processing plant. Since there is also good demand for fresh kiwis in the domestic market, a pack house can be established at this location along with pulping unit so that the better grade kiwis can be packed and sent to domestic premium markets while lower grade fruits can be pulped and exported.
- Processing technologies: Juice concentrates are manufactured by vacuum evaporation and aseptic processing. The projects are moderately capital intensive and little complex. Cold chain infrastructure is required for handling fresh fruits. The end products as they are thermally processed does not require cold storage transport.
- Training and Skill development requirements:
 - For entrepreneurs:
 - Quality systems and food safety – GMP and GHP
 - Basics of food processing technologies – Thermal processing and aseptic operations
 - Basics of food laws and phyto-sanitary regulations
 - Documentation and export protocols
 - Requirements for Processing of Organic Food
 - For implementing agencies
 - Supply chain management

Fresh, canned pineapple and pineapple juice concentrate:

- Existing Infrastructure: A juice concentrate plant for pineapples was established under NERAMAC in Nalkata in Tripura but is currently non-functional. Pineapple India operates 3 plants out of NER and is currently producing canned pineapple, juice concentrate as well as pulp.

- Proposed plant locations: Referring to the map present in the pineapple product profile, Agartala in Tripura forms the ideal location for establishing pineapple processing plant with canning and aseptic juice concentrate line. The subsequent line can be established at Baghmara/Tura in Meghalaya. Since jackfruit is also grown in abundance in Tripura, the canning line of pineapple can also be used for canning jackfruit bulbs.
- Processing technologies: Juice concentrates are manufactured by vacuum evaporation and aseptic processing. The projects are moderately capital intensive and little complex. Cold chain infrastructure is required for handling fresh pineapples. The end products as they are thermally processed does not require cold storage transport.
- Training and Skill development requirements:
 - For entrepreneurs:
 - Quality systems and food safety – GMP and GHP
 - Basics of food processing technologies – Thermal processing and aseptic operations
 - Basics of food laws and phyto-sanitary regulations
 - Documentation and export protocols
 - Requirements for Processing of Organic Food
 - For implementing agencies
 - Supply chain management
 - Germplasm/ Varietal improvement and cultivation trials
 - Technology transfer- cultivation practices to farmers

Banana Powder & Banana Puree:

- Existing Infrastructure: Currently small quantities of fresh banana are getting exported to Nepal. No organized infrastructure is available in the region for processing of banana.
- Proposed plant locations: Referring to the map present in the banana product profile, Goalpara in Assam forms the ideal location for establishing a small banana processing plant. Subsequent lines can be established at Tezpur in Assam and Sercchip in Mizoram.
- Processing technologies: Banana pulp/ puree is processed by means of vacuum evaporation and aseptic processing while banana powder is produced by means of drying and milling/ spray drying. The project is moderately capital intensive and a little complex. Cold chain infrastructure is not required for the end products as they are thermally processed.
- Training and Skill development requirements:
 - For entrepreneurs:
 - Quality systems and food safety – GMP and GHP
 - Basics of food processing technologies – Thermal processing and aseptic operations, drying technologies.
 - Basics of food laws and phyto-sanitary regulations
 - Documentation and export protocols
 - Requirements for Processing of Organic Food
 - For implementing agencies

- Supply chain management
- Research institutes- Application studies of Banana products in various formulations (e.g.: Organic Banana powder/ Puree as ingredient in Baby food)

Chilli Sauces / Dressings/ Spreads:

- Existing Infrastructure: Currently no organized infrastructure is available in NER to process chilli into market relevant products. Local processing in the region is only limited to some traditional products.
- Proposed plant locations: Referring to the map present in the chilli product profile, multiple smaller processing units can be assisted in Assam, Manipur, and Nagaland.
- Processing technologies: Processing involves multiple unit operations like crushing, mixing and cooking with spices. Small and modular processing units which can be scaled up easily can be installed in the region.
- Training and Skill development requirements:
 - For entrepreneurs:
 - Quality systems and food safety – GMP and GHP
 - Basics of food processing technologies – Thermal processing and aseptic operations, drying technologies.
 - Basics of food laws and phyto-sanitary regulations
 - Documentation and export protocols
 - Formulations – relevant to international markets (e.g. products similar to Thai chilli sauces)
 - For implementing agencies
 - Supply chain management
 - Research institutes- Creation and standardization of relevant formulations from local varieties.

Recommendation 3: Staggered approach & customized partnership models to establish identified processing facilities.

So as to complete the projects on time without any delays and to run the projects successfully, it is important to identify right partners and right models of operation. Partners can be any organizations which can play a significant role during the lifetime of the project. They can be either an implementation partner who will play a key role in the implementation of the project or a financial partner who mobilizes financial resources required for the project or a technology partner who is instrumental in extending their help in the implementation of technologies. The past experiences in establishing certain key processing units in NER which ran into significant delays reiterates the importance of the same.

All the relevant state government organizations present in different states of the region can be the implementation partners for establishing the infrastructure. The state wise organizations that can be approached are as follows:

State	Implementation Partners
Arunachal Pradesh	Arunachal Pradesh Horticulture Produce Marketing & Processing Board (APHPM&PB), Arunachal Pradesh Export Infrastructures Development Agency (APEIDA)
Assam	Assam State Agricultural Marketing Board (ASAMB), Assam Industrial Development Corporation (AIDC)
Manipur	Manipur Industrial Development Corporation Limited, State SFAC
Meghalaya	Meghalaya Industrial Development Corporation Limited, Meghalaya Horticulture Department
Mizoram	New Land Use Policy Implementation Board (NIB)
Nagaland	Nagaland Industrial Development Corporation (NIDC)
Sikkim	Sikkim Industrial Development & Investment Corporation Ltd.
Tripura	Tripura Industrial Development Corporation
Entire NER	NERAMAC

A number of central government organizations run several schemes for promoting the establishment of infrastructure. Convergence of such schemes is required for establishment of such infrastructure. While APEDA can fund some of the establishments, funding for other establishments can be provided by organizations like MOFPI, NEDFi, NABARD, NEC, MDoNER etc. The states can also partly fund the projects from their RKVY or NMFP funds or from their allocations to state departments. All the agricultural universities and agricultural research centers can be the knowledge partners.

Since the participation of private sector in the food processing sector of the region is abysmally low, the public sector organizations have to play a major role in stirring up the sector and generate interest among the private. Different Public Private Partnership (PPP) models can be used effectively for achieving the same. Basis the current scenario in NER, the following models are recommended for the establishment of units and promotion of exports from the region.

- Lease, Operate & Transfer (LOT) model – where the public agency will be instrumental in creating the whole infrastructure and the private player takes it on lease and operates for a certain period of time and later transfers it back to the public agency. This model has to be promoted in the initial stages to demonstrate the opportunities available in the sector.
- Viability gap funding (VGF) – where the public agency funds a part (one time or deferred) of initial capital expenditure to support the establishment of the infrastructure. This model has to be promoted when the private sector realizes the opportunities present in the sector but the sector still offers some challenges i.e. the projects are economically justified but fall short of financial viability. Transport assistance also falls into this category.
- Technology upgradation funding – where the private agency realizes the opportunities present in the sector and starts operations in the sector but faces difficulties due to the advent of new technologies.

Based on the recommendations of the expert panel on the initial draft report, a state wise plan with targeting 1 or 2 products per state is suggested which is as follows.

State wise Plan

Arunachal Pradesh

Arunachal Pradesh has produced 3.06 lakh MT of fruits, 0.33 lakh MT of vegetables, and 0.36 lakh MT of spices in 2015-16. The major agricultural and horticultural crops of the state are Citrus (mandarin orange), Paddy, Pineapple, Banana, Kiwi, Apple, Ginger, and Potatoes. Nearly one-third of the net sown area in the state is under Oranges and the state is the largest producer of Kiwi fruit in India. The following table shows the key commodities that are grown in Arunachal Pradesh and their key production regions.

Exhibit 78: Key commodities grown in Arunachal Pradesh and their key production regions

Commodity	Production (2014-15) in MT	Key Production Regions
Ginger	57,000	Lower Dibang Valley
Oranges	182,100	Lohit, Roing, Upper Siang, West Siang, East Siang
Pineapple	70,000	Papum Pare, West Siang, Upper Subansiri, East Kameng, Lower Subansiri
Kiwi	5,000	West Kameng, Lower Subansiri

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

On the basis of return on investment (ROI) and demand analysis from all the possible products from selected commodities, kiwi pulp and juice concentrate are selected for promotion food processing and exports in these sectors. The processing plant is proposed to be located in Ziro valley and the same plant can be used for processing of other fruits available in the region like oranges and pineapple with minor modifications in the line. The following table shows the key specifications of the proposed plant.

Exhibit 79: Key specification of proposed kiwi processing plant- Arunachal Pradesh

Specifications	Details	
Location	Ziro valley Well connected location & Key kiwi growing region in the state	
Capacity	Kiwi Pulp – 100 MT/ year and Kiwi Juice concentrate of 100 MT/ Year - This requires conversion of approximately 800 MT of fresh kiwi fruits. - The plant will be in operation for around 60-90 days in a year and will be working for 8 hours a day. - Other fruits like oranges & pineapples can be processed during the lean time	
Area required	Approximately 8,000 square feet excluding the storage space requirements	
Catchment Area		Catchment Area
		Lower Subansiri
		West Kameng
Equipment required	- Controlled storage for raw materials - Fruit washer - Juice extractor and pulper - Filter and homogenizer - Sterilizer/ evaporation	

	• Aseptic filling system	
Approximate cost	INR 65 lakhs	
Partners for the project	MOFPI	Funding support
	Indarun, APHPMPB	Project owners, land, infrastructure
	APEDA	Support in creation of export linkages, transport assistance, market development assistance
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods

Timelines	0- 6 months	6-18 months	18-24 months
	• Project Inception • Selection of location • Feasibility study • Selection of private partner	• Design and layout finalization • Equipment ordering • Civil construction • Equipment installation	• Equipment trials • Stabilization of the line • Production trials • Commencement of production

Assam

The state of Assam is known for tea production and other important agricultural commodities include Rice, Wheat, Jowar, Bajra, and Maize in cereals and pulses like Arhar, Gram etc. The major horticultural produce includes Citrus fruits, Mango, Ginger, Turmeric, Banana, Grapes, Pineapple, Onion, Potato etc. From the ranking matrix among these commodities, it is deduced that Assam has a comparative advantage in the products of Ginger, Banana, Lemon and Oranges. The following table shows the key commodities of Assam and the key production regions.

Exhibit 80: Key commodities grown in Assam and their key production regions

Commodity	Production (2014-15) in MT	Key Production Regions
Ginger	142,093	Tinsukia, Golghat, Karbi-anglong, Udalguri, Sonitpur
Banana	865,669	Nagaon, Dhalai, Goalpara, Lakhimpur, Sonitpur
Lemon	104,533	Dibrugarh, Golaghat, Cachar, Chirang, Nalbari, Dima Hasao, Barpeta, Nalbari
Oranges	202,378 (Assam) 182,100(Arunachal Pradesh)	Assam: N.C. Hills, Kamrup (Rural), Tinsukia, Kamrup (Metro), Karbi Anglong Arunachal Pradesh: Lohit, Roing, Upper Siang, West Siang, East Siang

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

For Assam, from all the possible products from selected commodities, lemon and orange juice concentrate, banana puree and powder are selected for promotion food processing and exports in these sectors. The processing plant for lemon & orange juice concentrate is proposed to be at Dibrugarh while the processing plant for banana puree and powder is proposed to be at Tezpur. The following tables show the key specifications of the proposed plants.

Exhibit 81: Key specification of proposed lemon and orange juice concentrate plant- Assam

Specifications	Details			
Location	Dibrugarh • Central to Lemon, Orange/ Mandarin producing region • Nearer to Arunachal Pradesh for sourcing Oranges • Better road and Rail connectivity			
Capacity	Lemon juice concentrate – 300 MT/ year and Orange Juice concentrate of 300 MT/ Year • This requires conversion of approximately 2,000 MT of fresh kiwi produce to juice concentrate of 65° Bx. • The plant will be in operation for around 90 days each for orange and lemon in a year and will be working for 16 hours a day.			
Area required	Approximately 10,000 square feet excluding the storage space requirements			
Catchment Area		Catchment Area		
		<table><tr><td>Assam – Tinsukia</td><td>23,829 MT</td></tr><tr><td>Arunachal Pradesh – Upper Siang, West Siang, East Siang, Roing, Lohit</td><td>182,100 MT</td></tr></table>	Assam – Tinsukia	23,829 MT
Assam – Tinsukia	23,829 MT			
Arunachal Pradesh – Upper Siang, West Siang, East Siang, Roing, Lohit	182,100 MT			
Equipment required	• Controlled storage for raw materials • Fruit washer • Juice extractor and pulper • Filter and homogenizer • Sterilizer/ evaporation • Aseptic filling system			
Approximate cost	INR 78 lakhs			
Partners for the project	MOFPI	Funding support		
	AIDC	Project owners, land, infrastructure		
	APEDA	Support in creation of export linkages, transport assistance, market development assistance		
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods		

Timelines	0- 6 months	6-18 months	18-30 months
	• Project Inception • Selection of location • Feasibility study • Selection of private partner	• Design and layout finalization • Equipment ordering • Civil construction • Equipment installation	• Equipment trials • Stabilization of the line • Production trials • Commencement of production

Exhibit 78: Key specification of proposed banana puree and powder plant- Assam

Specifications	Details						
Location	Tezpur - Central area to key banana producing region in Assam; 2 lakh tons of production from the surrounding regions - Nearer to Guwahati, better road and waterways connectivity						
Capacity	Banana Puree – 1,400 MT/ year and banana powder of 350 MT/ Year - This requires conversion of approximately 2,000 MT of banana to puree of 20° Bx and another 2,000 MT of banana to banana powder - The plant will be in operation for around 180 days for puree production and 90 days for powder production operating for 16 hours a day.						
Area required	Approximately 10,000 square feet excluding the storage space requirements						
Catchment Area		<table><tr><th colspan="2">Catchment Area</th></tr><tr><td>Tezpur, Kamrup, Nagaon, Darrang, Sonitpur</td><td>2,00,000 MT</td></tr></table>		Catchment Area		Tezpur, Kamrup, Nagaon, Darrang, Sonitpur	2,00,000 MT
Catchment Area							
Tezpur, Kamrup, Nagaon, Darrang, Sonitpur	2,00,000 MT						
Equipment required	- Ripening chamber (optional) & Controlled storage for raw materials - Fruit washer - Pulp extractor and homogenizer - Pasteurizer / sterilizer - Aseptic filling system - Spray drier - Weighing and bagging machinery						
Approximate cost	INR 50 lakhs and ripening chamber costs around INR 30 lakhs						
Partners for the project	MOFPI	Funding support					
	AIDC	Project owners, land, infrastructure					
	NHB	Support for ripening chambers and controlled storage					
	APEDA	Support in creation of export linkages, transport assistance, market development assistance					
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods					

Timelines	0- 6 months	6-18 months	18-24 months
	- Project Inception - Selection of location - Feasibility study - Selection of private partner	- Design and layout finalization - Equipment ordering - Civil construction - Equipment installation	- Equipment trials - Stabilization of the line - Production trials - Commencement of production

Manipur

With a production of 2.44 lakh MT of fruits, 4.36 lakh MT of vegetables, 0.75 lakh MT of spices and 0.45 lakh MT of plantation crops (Tea, Arecanut, and Cashewnut), Manipur is one of the key contributors for horticulture in NER. Some of the key crops grown in the state are Citrus (Khasi Mandarin, Assam Lemon, Pomelo), Pineapple, Banana, Papaya, Passionfruit, Ginger, and Turmeric. The following table shows the key commodities that are grown in Manipur and their key production regions.

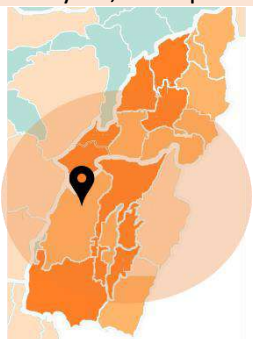
Exhibit 79: Key commodities grown in Manipur and their key production regions

Commodity	Production (2014-15) in MT	Key Production Regions
Oranges	43,000	Tamenglong, Churhandpur
Lemon	54,000	Ukhrul, Tamenglong, Churachandpur
Pineapple	142,160	Senapati, Thoubal, Churachandpur
Banana	96,360	Imphal West, Tamenglong
Ginger	34,200	Churhandpur

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

For Manipur, based on the return on investment and demand analysis, a plant for production juice concentrate of lemon, orange, and pineapple is proposed. Tamenglong area is proposed for establishing the same. The following table shows the key specifications of the plant.

Exhibit 80: Key specification of lemon, orange & pineapple juice concentrate plant- Manipur

Specifications	Details												
Location	Tamenglong - Central to Lemon, Orange/ Mandarin producing region in Manipur - Nearer to Assam border, facilitating easy shipment further outside to NER												
Capacity	Lemon juice concentrate – 100 MT/ year, Orange Juice concentrate of 300 MT/ Year and Pineapple juice concentrate of 300 MT/ year - This requires conversion of approximately 1,500 MT of fresh lemons and oranges to juice concentrate of 65° Bx. - Conversion of 2,000 MT of fresh pineapples to produce juice concentrate of 65° Bx. - The plant will be in operation for around 90 days each for orange and pineapple and around 60 days for lemon in a year and will be working for 16 hours a day.												
Area required	Approximately 12,000 square feet excluding the storage space requirements												
Catchment Area	 <table> <tr> <th colspan="2">Catchment Area (Pineapple)</th></tr> <tr> <td>Senapati, Thoubal, C.C. Pur</td><td>80,784 MT</td></tr> <tr> <th colspan="2">Catchment Area (Orange)</th></tr> <tr> <td>Tamenglong, C.C. Pur</td><td>34,928 MT</td></tr> <tr> <th colspan="2">Catchment Area (Lemon)</th></tr> <tr> <td>Ukhrul, Tamenglong, C.C. Pur</td><td>35,253 MT</td></tr> </table>	Catchment Area (Pineapple)		Senapati, Thoubal, C.C. Pur	80,784 MT	Catchment Area (Orange)		Tamenglong, C.C. Pur	34,928 MT	Catchment Area (Lemon)		Ukhrul, Tamenglong, C.C. Pur	35,253 MT
Catchment Area (Pineapple)													
Senapati, Thoubal, C.C. Pur	80,784 MT												
Catchment Area (Orange)													
Tamenglong, C.C. Pur	34,928 MT												
Catchment Area (Lemon)													
Ukhrul, Tamenglong, C.C. Pur	35,253 MT												
Equipment required	- Controlled storage for raw materials - Fruit washer												

	• Juice extractor • Filter and homogenizer • Sterilizer/ evaporation • Aseptic filling system	
Approximate cost	INR 110 lakhs	
Partners for the project	MOFPI	Funding support
	MANDICO	Project owners, land, infrastructure
	APEDA	Support in creation of export linkages, transport assistance, market development assistance
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods

Timelines	0- 6 months	6-18 months	18-30 months
	• Project Inception • Selection of location • Feasibility study • Selection of private partner	• Design and layout finalization • Equipment ordering • Civil construction • Equipment installation	• Equipment trials • Stabilization of the line • Production trials • Commencement of production

Meghalaya

Meghalaya's is one of the key states in production of horticultural crops like Citrus (Khasi Mandarin, Assam Lemon, Pomelo), Pineapple, Banana, Papaya, Passionfruit, Ginger, Turmeric, Cabbage, Brinjal, Peas, Cauliflower, Tomato, and Potato. From the ranking matrix among these commodities, it is deduced that Meghalaya has a comparative advantage in the products of Ginger, Banana, Lemon and Oranges. The following table shows the key commodities that are grown in Meghalaya and their key production regions.

Exhibit 81: Key commodities grown in Meghalaya and their key production regions

Commodity	Production (2014-15) in MT	Key Production Regions
Ginger	65,166	Ri-Bhoi, West Garo Hills, East Garo Hills, South Garo hills
Oranges	42,084	East Khasi Hills, Jantia Hills, West Khasi Hills, West Garo Hills
Pineapple	121,420	Ri-Bhoi, East Garo Hills, West Garo Hills
Banana	87,774	West Garo Hills, North Garo Hills, Ri-Bhoi

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

A processing plant for pineapple canning and juice concentrate and another for ginger powder are proposed for the state of Meghalaya. Both the plants are proposed to be established in Ri-bhoi. The specifications of the plants are mentioned in the tables below.

Exhibit 82: Key specification of proposed pineapple canning and juice concentrate plant- Meghalaya

Specifications	Details
Location	Ri-Bhoi • Key Pineapple producing region in Meghalaya (45,000 MT) and from Assam.

	• The region is also key Banana and Orange producing region inclusive of Kamrup district of Meghalaya		
Capacity	Canned Pineapple – 500 MT/ year and Pineapple juice concentrate of 300 MT/ year • This requires conversion of 2,000 MT of fresh pineapples to produce juice concentrate of 65° Bx. • The plant will be in operation for around 120 days in a year and will be working for 12 hours a day. • The plant can be used for processing of other fruits in the region with minor modifications in the line. (Ex: Banana, oranges)		
Area required	Approximately 10,000 square feet excluding the storage space requirements		
Catchment Area		Catchment Area	
		Ri-Bhoi	45,000 MT
		East & West Garo hills	40,000 MT
Equipment required	• Controlled storage for raw materials • Fruit washer • Juice extractor • Filter and homogenizer • Sterilizer/ evaporation • Aseptic filling system For Canned Pineapple – • Fruit preparation area • Syrup preparation equipment • Can forming line • Exhausting machine and retort		
Approximate cost	INR 100 lakhs		
Partners for the project	MOFPI	Funding support	
	MIDC, MBDA	Project owners, land, infrastructure	
	APEDA	Support in creation of export linkages, transport assistance, market development assistance	
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods	

Timelines	0- 6 months	6-18 months	18-24 months
	- Project Inception - Selection of location - Feasibility study - Selection of private partner	- Design and layout finalization - Equipment ordering - Civil construction - Equipment installation	- Equipment trials - Stabilization of the line - Production trials - Commencement of production

Exhibit 83: Key specification of proposed ginger powder plant- Meghalaya

Specifications	Details									
Location	Ri-Bhoi • Key ginger producing region. • Centrally located to ginger producing region of surrounding states. • Better road connectivity.									
Capacity	Phase I – 500 MT/ year • This requires conversion of 2,500 MT of fresh ginger (80% moisture content) to produce ginger powder with 10% moisture content. • The plant will be in operation for around 100 days in a year and will be working for 12 hours a day. • Basis the availability of ginger from other regions, production can be extended to another 60 days. • Milling capacity of approximately 600 kg/h of dry ginger • It is a modular and scalable unit and can be replicated at other locations • Phase II – 1800 MT/ year									
Area required	Approximately 5,000 square feet excluding the storage space requirements									
Catchment Area		<table><tr><th colspan="2">Catchment Area</th></tr><tr><td>Ri-bhoi</td><td>10,851 MT</td></tr><tr><td>East & West Garo Hills</td><td>33,000 MT</td></tr><tr><td>Kamrup, Karbi Anglong</td><td>27,000 MT</td></tr></table>	Catchment Area		Ri-bhoi	10,851 MT	East & West Garo Hills	33,000 MT	Kamrup, Karbi Anglong	27,000 MT
Catchment Area										
Ri-bhoi	10,851 MT									
East & West Garo Hills	33,000 MT									
Kamrup, Karbi Anglong	27,000 MT									
Equipment required	• Drying plant – Hybrid with microwave/ RF assisted • Pulverizer/ hammer mill • Dust separator • Weighing and bagging machines • FFS/ pouch packaging machines • Other utilities									
Approximate cost	INR 41 lakhs									
Partners for the project	MOFPI	Funding support								
	MIDC, MBDA	Project owners, land, infrastructure								
	Spices Board	Support in processing equipment, technical support from internal pool of experts								
	APEDA	Support in creation of export linkages, transport assistance, market development assistance								
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods								

Timelines	0- 6 months	6-18 months	18-24 months
	• Project Inception • Selection of location • Feasibility study • Selection of private partner	• Design and layout finalization • Equipment ordering • Civil construction • Equipment installation	• Equipment trials • Stabilization of the line • Production trials • Commencement of production • Phase II – 40th month

Mizoram

The main horticultural crops of Mizoram include mandarin orange, banana, passion fruit, grapes, pineapple, papaya, chayote etc. The state produces around 3.44 lakh MT of fruits, 2.60 lakh MT of vegetables, 0.64 lakh MT of spices and 0.1 lakh MT of plantation crops. Following are the key crops grown in the state and their key production regions.

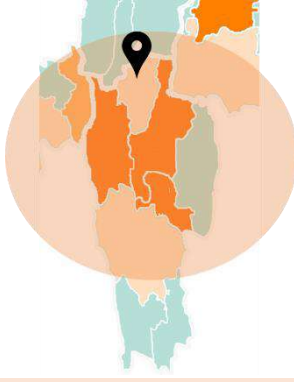
Exhibit 84: Key commodities grown in Mizoram and their key production regions

Commodity	Production (2014-15) in MT	Key Production Regions
Oranges	40,430	Serchhip, Aizawl, Kolasib, Mamit, Champhai
Lemon	25,600	Mamit, Serchhip, Kolasib, Aizawl
Pineapple	30,140	Serchhip, Kolasib, Aizawl
Banana	140,920	Serchhip, Aizawl

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

A processing plant for lemon and orange juice concentrate is proposed for the state of Mizoram. The plant is proposed to be established in Kolasib. The specifications of the plant are mentioned in the table below.

Exhibit 85: Key specification of proposed lemon and orange juice concentrate plant- Mizoram

Specifications	Details	
Location	Kolasib - Key lemon and orange producing region. - Located on the border of Assam and closer to Karimganj which is a hub for exports	
Capacity	Lemon juice concentrate of 300 MT/year and Orange juice concentrate of 300 MT/year - This requires conversion of 2,000 MT of fresh produce to produce juice concentrate of 65° Bx. - The plant will be in operation for around 90 days each in a year for processing of orange and lemon and will be working for 16 hours a day. - Based on the demand the plant can be used for processing of other fruits in the region with minor modifications in the line. (Ex: Pineapple)	
Area required	Approximately 10,000 square feet excluding the storage space requirements	
Catchment Area		Catchment Area (Orange)
		Aizawl, Serchhip, Mamit, Kolasib, Lunglei 41,200 MT
		Catchment Area (Lemon)
Equipment required	- Controlled storage for raw materials - Fruit washer - Juice extractor - Filler and homogenizer	Aizawl, Serchhip, Mamit, Kolasib, Lunglei 26,000 MT

	• Sterilizer/ evaporation • Filling system	
Approximate cost	INR 78 lakhs	
Partners for the project	MOFPI	Funding support
	ZIDCO	Project owners, land, infrastructure
	APEDA	Support in creation of export linkages, transport assistance, market development assistance
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods

Timelines	0- 6 months	6-18 months	18-30 months
	• Project Inception • Selection of location • Feasibility study • Selection of private partner	• Design and layout finalization • Equipment ordering • Civil construction • Equipment installation	• Equipment trials • Stabilization of the line • Production trials • Commencement of production

Nagaland

In the hill state of Nagaland, agriculture is the prime contributor to economy of the state. The main crops grown in the state include Rice, Millets, Maize, Pulses, Ginger and horticultural crops like Pineapple, Oranges, Banana, and Passionfruit. Plantation crops like Coffee, Tea and Cardamom are grown in the hilly regions of the state. Nearly 80 % of the cropped area is under Rice cultivation, which is carried out under distinctive cultivation methods like “Jhum” and terraced cultivation. Following are the key crops grown in the state and their key production regions.

Exhibit 86: Key commodities grown in Nagaland and their key production regions

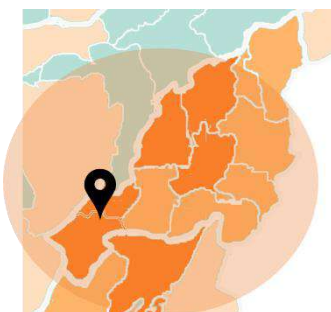
Commodity	Production (2014-15) in MT	Key Production Regions
Pineapple	147,384	Dimapur, Peren, Mokokchung, Wokha, Kohima
Oranges	56,186	Mokokchung, Wokha, Kohima, Kiphire
Ginger	33,020	Mon, Tuensang, Phek
Passionfruit	17,779	Kohima, Wokha, Mokokchung, Tuensang

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

A processing plant for pineapple canning and pineapple, orange and passion fruit concentrate is proposed for the state of Nagaland. The plant is proposed to be established in Dimapur. The specifications of the plant are mentioned in the table below.

Exhibit 87: Key specification of pineapple, orange & passion fruit juice concentrate plant- Mizoram

Specifications	Details
Location	Dimapur • Centrally located in the production region of the identified commodities • Relaxed restriction on land procurement • An agro and food processing SEZ is present • Well connected with road and railways and is also closer to Assam border

Capacity	Canned pineapple of 500 MT/year and Pineapple juice concentrate of 300 MT/year, Orange juice concentrate of 100 MT/ year and Passion fruit concentrate of 50 MT/year - This requires conversion of 2,000 MT of fresh pineapples, 800 MT of oranges and 450 MT of passion fruit to produce juice concentrate of 65° Bx. - The plant will be in operation for around 120 days for pineapple, 60 days for oranges and 30 days for passion fruit in a year for 12 hours a day.		
Area required	Approximately 10,000 square feet excluding the storage space requirements		
Catchment Area		Catchment Area (Pineapple)	
		Dimapur, Peren, Wokha	65,000 MT
		Catchment Area (Oranges)	
		Dimapur, Peren, Wokha, Mokokchung, Kohima	31,000 MT
		Catchment Area (Passion Fruit)	
		Kohima, Wokha	6,000 MT
Equipment required	- Controlled storage for raw materials - Fruit washer - Juice extractor - Filler and homogenizer - Sterilizer/ evaporation - Filling system For Canning - Fruit preparation area - Syrup preparation equipment - Can forming line - Exhausting machine and retort		
Approximate cost	INR 100 lakhs		
Partners for the project	MOFPI	Funding support	
	NIDC	Project owners, land, infrastructure	
	APEDA	Support in creation of export linkages, transport assistance, market development assistance	
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods	

Timelines	0- 6 months	6-18 months	18-30 months
	- Project Inception - Selection of location - Feasibility study - Selection of private partner	- Design and layout finalization - Equipment ordering - Civil construction - Equipment installation	- Equipment trials - Stabilization of the line - Production trials - Commencement of production

Sikkim

The landlocked state of Sikkim is embraced with natural resources like perennial water sources, diverse soil profile, extremely varied climate and wide ranging topographical and agro-ecological conditions providing an immense scope for agricultural diversification. In the net sown area of about 65,000 hectares in the state, main crops grown include rice, maize, and buckwheat in cereals, oranges and pears among fruits, ginger, cardamom and turmeric in spices and peas, beans and tomatoes in vegetables. Floriculture is also a growing sector in the state with a significant increase in the area under cultivation of flowers like roses, gerbera, orchids and Anthurium etc. as they are generating better incomes to the farmers. Sikkim being the pioneer in certified organic agriculture and with its own organic certification agency, SSOCA offers tremendous potential for exporting processed products to the niche markets. Following are the key crops grown in the state and their key production regions.

Exhibit 88: Key commodities grown in Sikkim and their key production regions

Commodity	Production (2014-15) in MT	Key Production Regions
Ginger	52,532	West Sikkim, South Sikkim, East Sikkim
Orange	18,992	East Sikkim, West Sikkim, South Sikkim

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

A ginger powder processing plant is proposed for the state of Sikkim. The plant is proposed to be established in Rangpo. The proposed processing plant can also be used for processing other spices that are grown in the state like large cardamom, turmeric, and bay leaf. The specifications of the plant are mentioned in the table below.

Exhibit 89: Key specification of proposed ginger powder plant- Sikkim

Specifications	Details				
Location	Rangpo - Centrally located to ginger producing regions in the state - Closer to Siliguri corridor making it easy for transporting the finished goods				
Capacity	Ginger powder of 500 MT/ year capacity - This requires conversion of approximately 2,500 MT of fresh ginger with 80% moisture content to ginger powder with 10% moisture content - The plant will be in operation for around 100 days in a year for 12 hours a day. - Basis the availability of ginger from other regions, production can be extended to another 60 days - Milling capacity of approximately 600 kg/hour (dry ginger).				
Area required	Approximately 5,000 square feet excluding the storage space requirements				
Catchment Area	 <table> <tr> <th colspan="2">Catchment Area</th></tr> <tr> <td>West Sikkim, South Sikkim, East Sikkim</td><td>52,500 MT</td></tr> </table>	Catchment Area		West Sikkim, South Sikkim, East Sikkim	52,500 MT
Catchment Area					
West Sikkim, South Sikkim, East Sikkim	52,500 MT				

Equipment required	• Drying plant – Hybrid with Microwave/ RF assisted • Pulverizer/ Hammer mill • Dust separator • Weighing and bagging machines • FFS/ Pouch packaging machines • Utilities	
Approximate cost	INR 100 lakhs	
Partners for the project	MOFPI	Funding support
	SIDCO	Project owners, land, infrastructure
	Spices Board	Support in processing equipment, technical support from internal pool of experts
	APEDA	Support in creation of export linkages, transport assistance, market development assistance
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods

Timelines	0- 6 months	6-18 months	18-24 months
	• Project Inception • Selection of location • Feasibility study • Selection of private partner	• Design and layout finalization • Equipment ordering • Civil construction • Equipment installation	• Equipment trials • Stabilization of the line • Production trials • Commencement of production

Tripura

Major horticultural crops grown in Tripura are Pineapple, Jackfruit, Litchi, Orange, Banana, Potato, Tomato, Cauliflower, Cabbage, Ginger, and turmeric. The state produces 8.08 lakh MT of vegetables, 8.19 lakh MT of fruits, 0.48 lakh MT of spices and 0.44 lakh MT of nuts from a cultivable land of 2.77 lakh hectares. Following are the key crops grown in the state and their key production regions.

Exhibit 90: Key commodities grown in Tripura and their key production regions

Commodity	Production (2014-15) in MT	Key Production Regions
Pineapple	93,856	Dhalai, South, North, Unakoti, West, Gomati
Jackfruit	417,741	South Tripura, North Tripura, Gomati and Dhalai

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Tripura has the second highest share of Pineapple production in the NER after Assam and is the second highest producer of Jackfruit after Kerala. Both the fruits play an important role in the economic improvement of the farmers and the processing of these commodities will spur the food processing and streamline the supply chain activities.

A plant for canning pineapples and jackfruit bulbs along with pineapple juice concentrate is proposed for the state. The plant is proposed to be established in Agartala. The specifications of the proposed plant are mentioned in the table below.

Exhibit 91: Specifications of canned pineapple & jackfruit, pineapple juice concentrate plant–Tripura

Specifications	Details		
Location	Agartala - Better connectivity - Availability of raw materials and free access to markets - Easy to ship finished goods		
Capacity	Canned pineapple of 500 MT/ year capacity, pineapple juice concentrate of 300 MT/ year and canned jackfruit bulbs of 100 MT/year - This requires conversion of approximately 2,000 MT of fresh pineapples to juice concentrate of 65^o Bx. and 1,000 MT of fresh jackfruit. - The plant will be in operation for around 120 days in a year for processing pineapples and 60 days in a year for jackfruits at 12 hours a day. - On the basis of demand, the plant can be used for other fruits produced in the region. - Separate fruit preparation area is required to prevent cross contamination of flavors and to simplify the process.		
Area required	Approximately 10,000 square feet excluding the storage space requirements		
Catchment Area		Catchment Area (Pineapple)	
		West Tripura	66,000 MT
		Catchment Area (Jackfruit)	
		South Dist, Gomati, Sephaijala	53,000 MT
Equipment required	- Controlled storage for raw materials - Fruit washer - Juice extractor - Filler and homogenizer - Sterilizer/ evaporation - Filling system For Canning - Fruit preparation area - Syrup preparation equipment - Can forming line - Exhausting machine and retort		
Approximate cost	INR 105 lakhs		
Partners for the project	MOFPI	Funding support	
	TIDC	Project owners, land, infrastructure	
	APEDA	Support in creation of export linkages, transport assistance, market development assistance	
	Private Partners	Setting up the plant and equipment, processing operations, marketing and sale of the finished goods	

Timelines	0- 6 months	6-18 months	18-24 months
	• Project Inception • Selection of location • Feasibility study • Selection of private partner	• Design and layout finalization • Equipment ordering • Civil construction • Equipment installation	• Equipment trials • Stabilization of the line • Production trials • Commencement of production

In the proposed action plan, locations of the processing infrastructure are planned in the individual states on the basis of parameters like availability of the raw material, scope for expansion, alternate crops that can be processed, availability of transport infrastructure and ancillary industries. The selected locations are chosen to fulfill as many criteria as possible. The proposed infrastructure comprises of smaller modular units to process only a minor quantity of the raw material available in the region. These processing units are meant to act as inception points to catalyze the food processing in the region and there by promoting exports once they gain scale and visibility in domestic and international markets.

A multitude of steps are required in order to plug gaps in the current system and to create a channel for exports from the proposed infrastructure. The three key challenges need to be overcome are- creating a visibility for the product in the market, creation of market linkages and logistics. In order to address these challenges, the following five strategic actions are required.

Aggregation of products to centralized locations: Aggregation of similar products to a location central to the processing areas is required. Such a centralized location should be well connected and have storage infrastructure in place. This helps in pooling a sizeable volume for marketing and enhancing the scale of operations. Three such pooling warehouses can be installed in the region after the feasibility assessment.

Leveraging organic status: Since the volume of processing is low, pooling of produce from certified organic farms and processing them by keeping the “Organic” identity intact, should be encouraged. Organic products like juice concentrates, pulps can be used to make further processed products like RTS beverages, jams in the downstream. They offer the advantage of being low volume and high value in the market.

Business development and Market Linkages: Agencies like NERAMAC should take up the marketing of the products, as these smaller units lack the resources to effectively carry out the marketing activities. They should also help in identifying the bulk buyers for the products.

Creation of export linkages: APEDA can filter and scout for any importers looking for products like those from NER/ Organic products and help in connecting them to the processors in the NER. It can also help by converging existing schemes for export development.

Expanding the processing infrastructure: Upon successful implementation and streamlining of phase 1 of the processing infrastructure creation, further expansion of processing capacities of the modular units should be taken up in-order to grow the food processing and agri-exports from the region.

Recommendation 4: Promote entrepreneurship by establishing incubation centers

Many of the times it is not just plain inadequacy of infrastructure in the northeast region. In the past, with the help of grants and aid from different agencies, several food processing units have been established in the region. Majority of them are being run by governmental agencies and are not running in a profitable manner or closed down due to various reasons. This shows the need for encouraging private participation in such projects. There are several models of Public- Private Partnership (PPP) with varying amount of participation of public and private partners and the right model depending upon the project needs to be selected.

One of the ways to promote private participation in the region is by establishing incubation centers in the region and thus encouraging entrepreneurship. During our primary survey, it is observed that there are a lot of people who are aware of the opportunities present in the region and are willing to venture into them. They possess good understanding about their local markets but have a limited understanding of international markets and methodologies to access them, development of market relevant products and taking them to markets, market linkages and regulatory requirements etc. In the current scenario, small training sessions (2-3 day programs) were being conducted by different organizations in the region and this is certainly not helping in promoting entrepreneurship from the region. The incubation centers if established in the region will certainly help in bridging the identified gaps and will result in a number of startups emerging from this region.

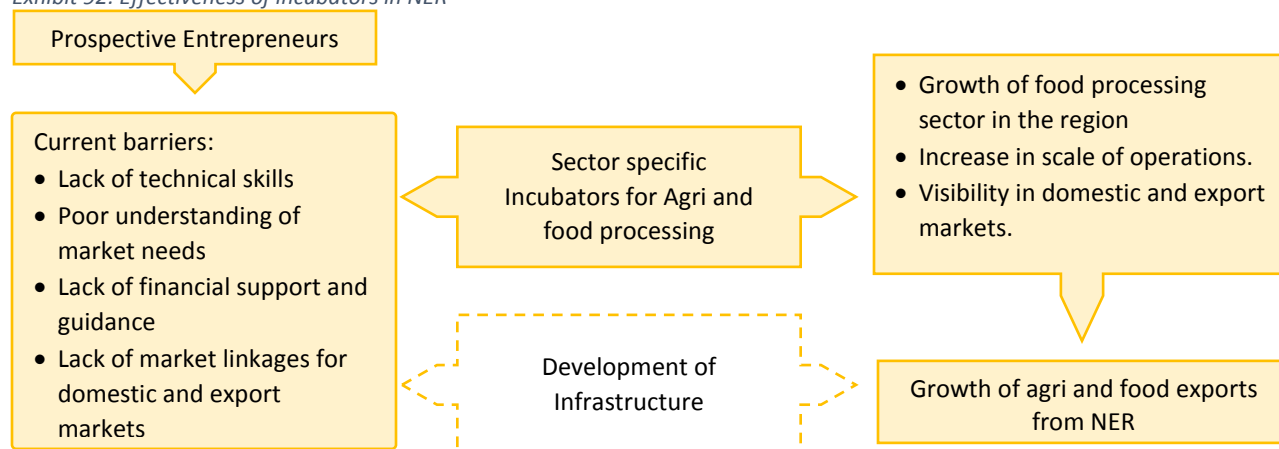
Rise in the unemployment levels is one of the major challenges across the region which is mainly due to lack of opportunities in the labour market. Across the world, it is observed that the major part of new jobs are created in new and small enterprises and thus promoting them will help in job creation, innovation as well as economic development. With growing rate of technological changes, expansion, globalization and consolidation of markets, ever changing legal and regulatory policies and changing consumer preferences are making it increasingly difficult for new enterprises to sustain and compete. New enterprises face a majority of these challenges during their early stage and any support during this stage will tremendously increase the probability of their survival. Business incubators are increasingly becoming a popular economic development tool to catalyze the success rate of the new enterprises.

Business incubators are facilities where a number of new businesses can locate and operate at much lower overheads than in a conventional space where market rates prevail. The incubators provide the businesses, common facilities such as physical space, access to common infrastructure and shared services to facilitate operations and impart skills training, provide business advisory to assist the businesses. Incubators are generally targeted towards small firms which may lack technical, managerial or financial ability. Such firms are nurtured by the incubators till they have the capability to sustain on their own. The success of a venture cannot be guaranteed by the incubators, however, for small businesses they can significantly increase the chances for their survival. Incubators are not a one-stop solution for all the economic problems of the region however, they can be an integral part of broad economic development strategy.

Many incubators have been setup across the country and the states of Tamil Nadu (30) and Karnataka (16) are leading from the front in this aspect. Most of these incubators are sector specific, catering to

sectors like agribusiness, life sciences, pharmaceuticals, electronics, IT, renewable energy, ICT, education, e-commerce, waste management etc. while some of the incubators are sector agnostic. Majority of these incubation centers are established in association with educational institutions/ universities, research centers, and industrial parks and are being operated by them. In NER only 2 incubation centers are operational and both of them are in the state of Assam. One of them is being operated by IIT Guwahati and focuses on IT, healthcare and renewable energy while the other is being operated by Center for Innovation Incubation and Entrepreneurship which is sector agnostic.

Exhibit 92: Effectiveness of incubators in NER



Given the vast expanse of the region and the plethora of opportunities the region provides, it is suggested that 4-5 incubation centers with a focus on agricultural and horticulture processing can be established in the region. There are several institutes of national repute like ICAR-NEH, IIM Shillong, NRCP- Guwahati, CIH – Medziphema, AAU etc. operating in the region and the proposed incubation centers can be established in association with these institutes.

Overview of the incubator program:

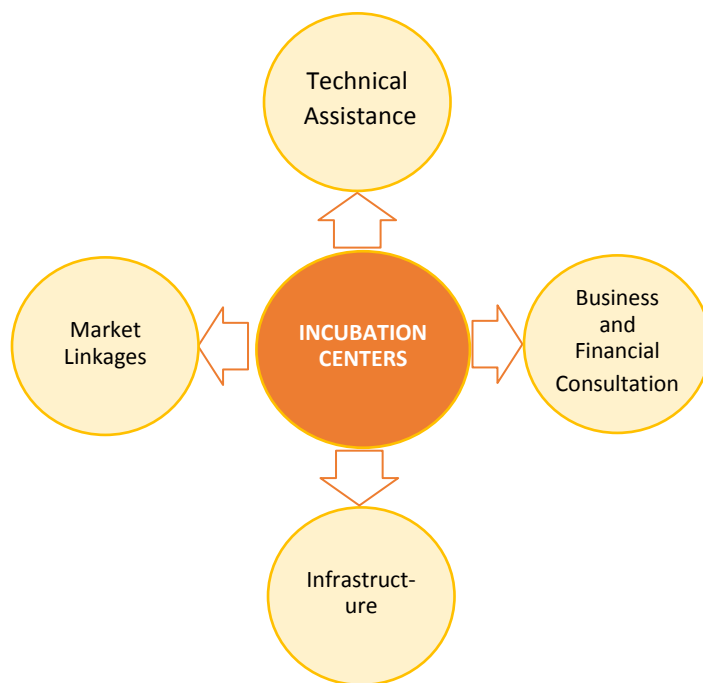


Exhibit 93: Pillars of incubator program

foremost step in driving this program.

This should cover-

- Access to technical training- simplified and practical oriented short-term and bridge courses in product specific technologies.
- Assistance in choosing the right product formats and technologies; support in product and process development.
- Support in Quality assurance, food safety, and regulatory aspects; claim validation and certification of products
- Analytical support for testing and standardizing the products.
- Packaging development and shelf life studies.
- Sensory and consumer trials, market studies; clinical studies
- Assistance in Technology licensing and filing of Intellectual property rights.

The obligation of technical assistance should be of the identified technical partnering institute and/ or relevant government body (e.g.: Agricultural University, State department of horticulture and food processing)

B. Market Linkages:

Even though the NER is having rich agri and horticultural production, current inefficient market linkages are preventing the complete realization of the produce value. Creation of effective linkages to both

The strategy of the proposed incubator program should address the four major factors that are required to drive the growth of entrepreneurship in food processing sector in the region. The incubation centers should provide support by means of:

A. Technical Assistance

Lack of sector specific technical skills can be attributed as a prime factor that is hindering the growth of entrepreneurship in the NER. Currently, most of the small food processing units/ entrepreneurs are limited to producing traditional, low value and local foods, often failing to understand the customer requirements in domestic and export markets. Therefore, training and support on the technical front should be the

domestic and export markets thus will play a crucial role in the development of food processing sector and all the agricultural stakeholders at large. Support in creation of market linkages should be extended by means of:

- Guidance through industry experts from private sectors. Participation can be requested from large companies/ retail chains/ export traders in sourcing the products if the prescribed quality standards are met by the local entrepreneurs. This will create a confidence in the participants and catalyzes the whole industry.
- Networking events between entrepreneurs, traders, large processing companies, retail partners from other parts of the country.
- Promotion of products through current government channels like NERAMAC and state government outlets.

C. Infrastructure:

One of the main constraint, particularly for the early stage entrepreneurs and small scale industries is the intensive capital requirement on equipment and other infrastructure for manufacturing their products in the initial stages. Unlike established food processing companies having dedicated R&D centers and pilot plants, they cannot assume such high risk on equipment and other infrastructure requirements. Thus creating a common infrastructure in the Incubator facility for usage on lease basis for conducting trials will create a positive stir and many entrepreneurs can come forward to test their product ideas. The infrastructure should comprise of pilot plants for respective product categories, processing technologies, testing facilities and other common infrastructure. Detailed infrastructural requirements are presented in the subsequent part of the chapter.

D. Business and Financial Consultation:

Most of the small entrepreneurs, particularly in the region are not exposed to business realities and market dynamics of the external markets and are not well aware of the financial aspects of running an organized business. Business and financial consultation aspect of the incubator should focus on helping them by:

- Preparing business plans, establishing and registering companies, allied legal support.
- Costing and pricing of the products, financial models for projecting the growth.
- Support in identifying the available financial support under various government programs, support in rising debt and other funding options like PE-VC funds.

The business partnering entity in the incubator program will be mandated to support these activities.

Role of different agencies

Currently, a lot of developmental activities are being carried out by various government agencies in the NER. Many of these support programs are coinciding with each other and often these agencies are limited by their organizational mandate, thus limiting the realization of the support extended by them to the fullest extent. Owing to the complexities in the region, the agencies are required to extend their support for creating a well-balanced impact for the development of food processing sector in the region by

addressing the major short falls. The following table shows the role that is to be played by different agencies for successful implementation of the incubation program.

Exhibit 94: Role of different agencies for successful implementation of incubation program

Agency	Key role
MOFPI	Developing food processing sector is the key Mandate of MoFPI and the support is requested from MoFPI in terms of- • Financial support for establishing Incubators in the north eastern region. • Establishment of infrastructure in the incubator facility. • Possible convergence of existing schemes.
APEDA	While promotion of exports is the primary mandate of APEDA, From NER exports can be developed with growth in food processing sector. APEDA should extend support by • Establishing common infrastructure for a dual objective of both promoting food processing and exports by converging assistance through infrastructure development scheme. • Facilitation of market linkages for export markets and network building.
State Governments	The state government will play a crucial role in keeping the whole incubator program alive. The support from state government should comprise of: • Allocation of Land for incubators and erection of civil structures. • Support in the share of initial capitalization of the incubator body. • Supply of utilities (electricity, water) at subsidized cost to the incubator facility. • Development of support infrastructure (e.g. roads leading to the incubator facility) • Mapping and allocation of existing equipment with state departments.
MDoNER NABARD NEDFI NHB Industry Bodies	• Support in establishing the Incubator • Convergence of financial support to the participants (e.g. Food processing fund of NABARD) • Creation of common infrastructure by various trade bodies (e.g. Spices Board) for the promotion of processing and exports in respective categories.
FSSAI	The support from FSSAI should be expected and limited to – • Providing training to the participants in the incubator program on the aspects of facility and product registration, food safety and other relevant aspects.

Layout of Incubator

Common processing area:

The common processing area comprises of the pilot plants for processing various agri and horticultural commodities into value added products. The technologies are selected to cover various unit operations involved in the processing of the major agri and horticulture produce available in the region. The common processing area further comprises of any or all of the sections on the need basis.

Pre-processing area: This area comprises of equipment to facilitate the primary level of operations like pre-cleaning, sorting and grading, size reduction and for storage of raw materials in cold

Hot processing area: This is area comprises of various processing pilot plants for conversion of raw material to products. Depending on the commodity to be processed these can range from pulping, canning, milling, blending, evaporation, cooking, baking to freezing etc.



Packaging area: The processed products are packed in the packaging area on suitable modular equipment's like Aseptic bottling line, Form fill seal (FFS) and vacuum packaging lines. Secondary packaging will also be carried out in the same area in a designated zone. Cold and ambient storage spaces are allocated in this area for storage of finished goods.

Laboratories:

Test Kitchen and Product development laboratory: In this zone, the initial development of the prototypes will be carried out. This area consists of lab scale equipment to support various unit operations like drying, milling, blending and evaporation etc. and bench top equipment to carry out food processing operations like cooking, baking, frying and pulping etc.

Analytical Laboratory: Physical and chemical analysis of prototypes, raw material, and final products will be carried out for nutritional analysis, standardization and quality assurance.

Micro-biology Laboratory: For carrying out the microbial analysis of the raw materials and finished goods and establishing food safety parameters.

Administrative Infrastructure:

Apart from the administrative workspace for the employees of the incubator, designated office spaces will be made available to the participants in the incubator program. These work spaces will be well furnished, well connected with the internet and comprise of meeting spaces for business meetings. A library and training center will be created for capacity building and create access to technical and business information.



Typical activity flow in incubators

Identification and Screening of the Participants for Incubation program:

In the Incubation program, the participant uptake is taken up on a semiannual basis through open calls. Uptake of twice a year will help to keep the program running throughout the year while retaining the operational simplicity as the batches will be at two distinctive stages of the program. If required at a later

stage, upon streamlining the program, a number of participants and basis the availability of resources, the frequency of uptake can be increased.

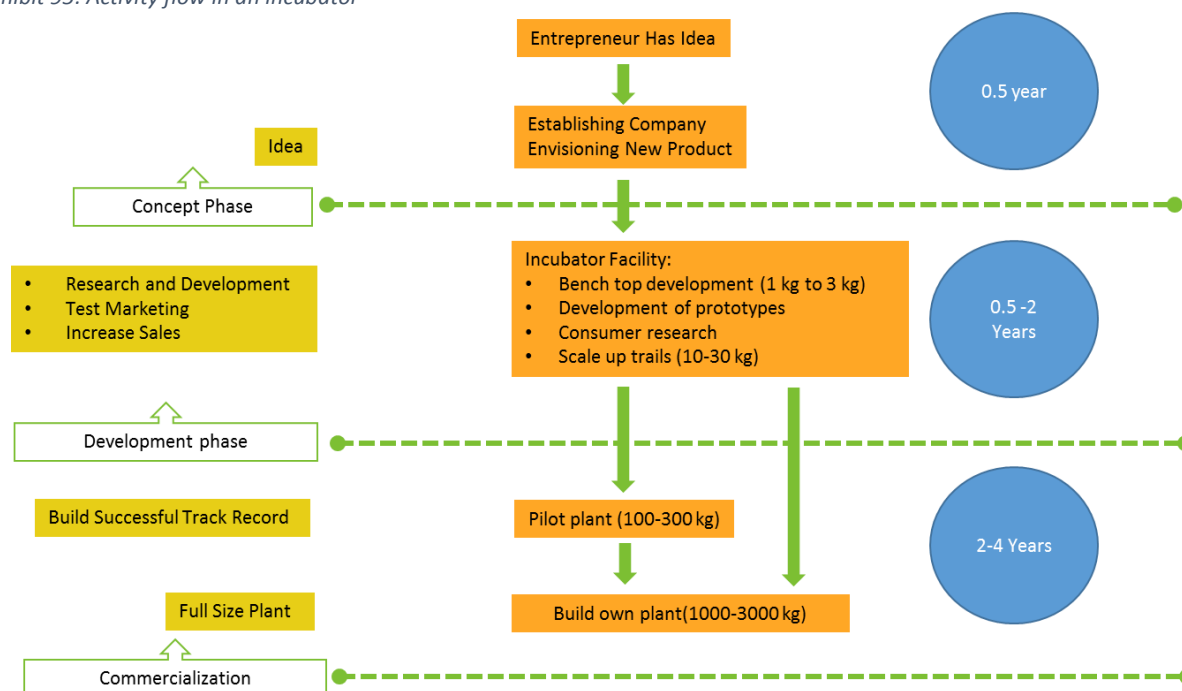
Prospective entrepreneurs are encouraged to approach the incubators with their business ideas and they will be scrutinized for the soundness and business viability of the idea, understanding of the subject. The participants in the incubator program are required to test the concept or product idea and this stage will be a prerequisite or a part of application process. In this stage, any ideas that require further refinement will be put on hold and will be asked for submission in the subsequent call, after further improvements. For any viable shortlisted ideas, if inadequacy is noticed in the skillset, the participants will be directed to complete short term bridge courses which are preselected at certain institutes like Central Food Technological Research Institute (CFTRI), Department of Agriculture and Food Engineering- Indian Institute of Technology (IIT) Kharagpur, Indian Institute of Crop Processing Technology (IICPT), National Institute of Food Technology, Entrepreneurship and Management (NIFTEM), Assam Agricultural University (AAU) etc. Financial support for such training can be extended as a part of the grant amount from the incubation.

Development and Commercialization:

After absorption into the incubation program, the participants will be familiarized about the operational, management guidelines and ways of working of the Incubator organization. In the development phase, proof of concepts for the ideas will be generated by the participant entrepreneurs/ companies for testing and refined further till they attain a marketable form. The prototypes which have crossed the consumer/ sensory testing will be taken up for scale up process. Up on successful scale up, the products are test marketed for the Initiation of commercial phase. In the commercial phase the production is carried out in the pilot plants and marketed in the limited catchment area, with the objective to improve the market linkages of the product and If required any modification to the product basis product feedback. The pilot plants will be made available to the participant entrepreneurs for a limited period of the time, after which they are expected to build their own processing plants for commercial production.

The same mechanism can be extended to existing small companies if they want to try new technologies or product formats from the local agricultural and horticultural produce. This will greatly reduce the risk of high investments on the small companies and helps to promote the food processing in the region. The following diagram shows the typical activity flow in an incubator.

Exhibit 95: Activity flow in an incubator



Action plan for establishing incubators in NER:

In the proposed action plan it is advised to start 2 incubation centers in the near term of 1 to 2 years and 2 more in the long term. Location of the proposed incubation centers is selected on the basis of the presence of suitable Institutions in the region, connectivity, and availability of various agricultural and horticultural commodities.

Exhibit 96: Specifications of incubation center for fruits and vegetables processing

Incubation Center 1: Common facility for processing of fruits and vegetable processing	
Location	Shillong • Availability of diverse horticultural produce • Better connectivity; • Location of ICAR-NEH, IIM-Shillong
Partnering Agencies	• ICAR-NEH • IIM- Shillong • Department of Horticulture, Meghalaya These three agencies comprise of best pool of experts and experience available in the region. A special purpose vehicle (SPV) should be created in order to establish and run the Incubator.
Supporting partners	• Meghalaya Basin Development Authority (MBDA) - for convergence of possible financial support. • Pineapple research Center, Rhibhoi- for need based technical support and capacity building.
Infrastructure requirements	
Area	Approximately 30,000 to 35,000 square feet

Equipment and pilot plants (100-300 kg/day)	• Pulping and Aseptic processing pilot plant • Canning line • Thermal processing and cooking: steam kettles and filling lines • Frozen food pilot plant (IQF line) • Drying equipment- Conventional, hybrid and spray drying systems • Mixing and blending equipment • Bottling and packaging machines
Product formats	Canned fruits and vegetables, Dehydrated fruits and vegetables, aseptic fruit pulp, IQF fruits, RTS fruit beverages, fruit powders, Soups, and sauces etc.

Exhibit 97: Specifications of incubation center for cereals and spices processing

Incubation Center 2: Common facility for processing of cereal and spice products	
Location	Jorhat
Partnering Agencies	• Assam agricultural university (AAU) – Pool of technical and agribusiness experts.
Infrastructure requirements	
Area	Approximately 25,000 square feet
Equipment and pilot plants (100-300 kg/day)	• Drying line- Conventional and Hybrid • Thermal processing- Retort, steam kettles • Milling and grinding line • Extruder plant • Flaking line • Packaging machines • Mixing and blending equipment
Product formats	Breakfast cereals, snacks, traditional foods, RTE Foods, spice powders, seasonings, sauces, and ketchups etc.

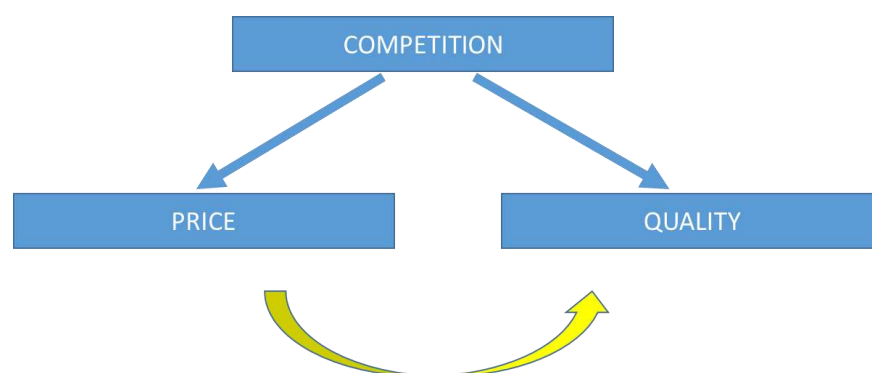
Exhibit 98: Specifications of incubation center for meat processing

Incubation Center 3: Common facility for processing of meat and meat products	
Location	Guwahati
Partnering Agencies	• College of veterinary science- Guwahati • National research center on Pig (NRCP)- Guwahati
Infrastructure requirements	
Area	Approximately 50,000 square feet
Equipment and pilot plants (100-300 kg/day)	Location 1: Captive processing line for processing of pork Location 2: Processing line for other meat animals • Mini abattoir • Animal dressing and cutting tables • Sausage processing line • Smoking equipment • Canning line • Thermal processing- retort line • Frozen food line – Blast freezing equipment • Packaging line- shrink packing and vacuum packing lines

Product formats	Packed meat cuts, smoked meat, sausages, canned meat, RTE meat products, Frozen meat products etc.
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5.4 Improving quality and reaching international markets

Maritime transport is key to any region's economy as around 90% of international trade happens through sea routes. Due to landlocked nature of NER, the region is heavily dependent on neighboring nations of Bangladesh, Myanmar, Bhutan, Nepal and China for its exports. The exports from the region, though small in quantities compared to trade from another part of India, is primarily to the neighboring nations through Land Customs Stations (LCS) established in different states. But the majority of these neighboring nations are relatively poorer economies compared to India and are price sensitive markets. Hence the trade is based majorly on the quantities that are exported rather than the quality of the products. This is also one of the reasons for the underdevelopment of food processing industry in NER.



Given the variety and exoticness of the products that are available in NER, it is required to enable the region to **slowly move away from the price sensitive markets to quality conscious markets** where the produce fetches better prices. For this process, it is key to identify

the countries where there is a demand for the produce from NER, map the quality requirements of those countries and establish systems which can enable the trade. Given the logistics issues of the region, which are here to stay at least for some more period, detailed planning is required for reaching those markets. Also since these markets are the most sought out ones, details about market entry and sales strategy to compete with other exporting nations also need to be defined. Covering all the above aspects is the following road map.

Road map for reaching premium international markets:

Recommendation 1: Identify countries where there is a demand for the produce from NER

Identifying markets where there is a significant demand for the produce from NER and helping exporters in reaching those international markets will help not only in promoting the exports from the region but also in the overall growth of the region. For the identified crops, the export markets which are low hanging and can be easily targeted are identified and following are the details of the same.

Immediate term: Catering to premium international markets requires adherence to strict quality standards. Currently, the exports to the neighboring nations from NER are done in a most rudimentary way. To improve the quality of the current systems that are in place to be on par with the requirements of international markets needs time and effort and the recommendations on procurement and processing help in achieving the same. Hence for the immediate term, the focus should be on getting the systems in

place and in the meanwhile trying to improve volumes of exports to the neighboring nations. The following table shows the top 5 destinations for exports of targeted products from India.

Exhibit 99: Top 5 destinations for exports of targeted products from India

Product Name	Top 5 destinations for India Exports				
	1	2	3	4	5
Orange (Khasi Mandarin)					
Fresh/ Dried Oranges	Bangladesh	Nepal	UAE	Russia	Bhutan
RTS beverages/ squashes	USA	UAE	-	-	-
Candied orange peel*	France	US	Malaysia	UAE	Canada
IQF orange pieces*	Saudi Arabia	Netherlands	UAE	UK	Belgium
Orange juice concentrate	Myanmar	Iraq			
Frozen pulp	USA	New Zealand	Japan		
Pineapples					
Fresh/ Dried pineapples	Qatar	Maldives	Nepal	Oman	Saudi Arabia
RTS beverages (<20 brix)	Netherlands	US	Germany	Malaysia	-
Preserved pineapple pieces	Netherlands	USA	Germany	Canada	Italy
Pineapple Squash*	Hungary	Saudi Arabia	Nepal		
Pineapple juice concentrate	UAE	Netherland	Germany	US	Korea Republic
Chilli					
Fresh chillies	UAE	UK	Bangladesh	Qatar	Bahrain
Pickled chillies*	UK	US	UAE	Germany	Australia
Dried chillies	Vietnam	Thailand	Sri Lanka	Malaysia	Indonesia
Dry chilli powder/ flakes	UAE	USA	Saudi Arabia	UK	Qatar
Pickles	USA	UAE	Canada	UK	Australia
Sauces and spreads, seasonings	Malaysia	Singapore	United States	UAE	UK
Ginger					
Fresh/ Dried ginger	Bangladesh	Pakistan	USA	Saudi Arabia	New Zealand
Ginger powder	USA	UK	South Africa	Australia	Netherlands
Ginger paste*	Saudi Arabia	UAE	USA	UK	Qatar
Ginger pickles*	UK	US	UAE	Germany	Australia

Ginger oil*	USA	Germany	France	UK	Hong Kong
Ginger oleoresin	USA	UK	South Africa	Germany	Korea Republic
Candied ginger*	Nepal	Tanzania	Benin	UAE	Cameroon
Lemon					
Fresh Lemon	UAE	Saudi Arabia	Maldives	Nepal	Kuwait
RTS beverages/squashes	Maldives	Nepal	Netherlands	UAE	Singapore
Pickles*	UK	US	UAE	Germany	Australia
Candied lemon peel*	France	US	Malaysia	UAE	Canada
Lemon juice concentrate	UK	Japan	Korea Republic	UAE	Sweden
Kiwi					
Fresh Kiwi	Nepal	Maldives	-	-	-
Jackfruit					
Fresh jackfruits*	Nepal	Qatar	UAE	Maldives	Saudi Arabia
Dried jackfruit slices*	UAE	Saudi Arabia	USA	Australia	Canada
Preserves/ Jams	USA	Nepal	UAE	UK	China
Banana					
Fresh / Dried Banana	Japan	UAE	Iran	Saudi Arabia	Oman
Banana pulp	UK	USA	Nepal	UAE	UK
Banana powder*	Japan	UAE	Nepal	Saudi Arabia	Iran
	Key market				

Medium term: From the above table, it is observed that Middle East nations due to low agricultural production in the region are one of the major importers of a number of agricultural produce. Also in the recent past, due to their highly efficient seaports and logistics systems and low import duties, these nations emerged as trading hubs by re-supplying material to all the ME nations as well as parts of Europe and North African countries. Also, the sanitary and phytosanitary standards of these nations are not as stringent as EU and US. Hence for the medium term, the Middle East nations can be a target for NER products.

Long term: Because of the sheer sizes of the economies as well as the volumes of trade that happens annually, EU and the US are the most sought for premium markets in the world. On the same front, they also have the most stringent sanitary and phytosanitary requirements for the goods they import. Also products.

Recommendation 2: Focus on establishment of infrastructure for enabling the exports to international markets

Given the bad conditions of connectivity in the region, focusing on the establishment of support infrastructure which will promote exports from the region is the need of the hour. With respect to investments in infrastructure, the case study of China's bridgehead strategy for developing its Yunnan province which is mentioned below can be considered for the development of infrastructure in NER.

Exhibit 100: Case study – Development Strategy – Lessons from Yunnan Province of China

Case Study: Development Strategy –Lessons from Yunnan Province of China

Yunnan province in China and North East India are similar to each other in more than one ways. Similar to NER, Yunnan province which is located in South-west China has for long been an impoverished and land locked region with a difficult terrain. It is home for people of several different minority groups and has been the focus of different secessionist movements. The province shares a 4060 km long border with Myanmar, Laos, Thailand and Vietnam. The region is rich in natural resources and is hub for agriculture.

Following a concerted effort from the government of China to develop this province, the region emerged as a gateway for China to South and South East Asia. Unlike NER, the region has already emerged as a developed economy with much to export while NER have still remained largely backward. China's bridgehead strategy, which was outlined way back in 2009 was the reason for this achievements and NER can certainly learn lessons from the same.



Billions of yuan have been spent on developing roads, rail and river transport infrastructure in the province, to connect it with the neighbors. A new airport was opened and today a number of flights connect Kunming in the province to other Asian cities. A huge refinery connected by a long oil-and-gas pipeline to Kyaukpyu on Burma's Rakhine coast was also established which helped in reducing the costs on importing oil from Middle East. The food processing industry as well prospered as investments started pouring into the tea and coffee plantations in the region. Tourism started booming with large number of foreign tourists flocking the land.

Similar policy in NER with investments in ramping up the Act East policy in the Northeast and develop road-rail-air connectivity with Southeast Asian nations and will help India in countering the strategic moves of China.

Due to difficult terrain, development of roads and railways takes time. As major cities in the region are already connected by airports/ airstrips, the focus should be on the development of trade from them.

- *Enable trade by providing support infrastructure at Land Customs Stations* – Upgrade them to Integrated Check Posts (ICPs): This will allow quick and smooth movement of goods between the nations. Pangsau Pass in Arunachal Pradesh, Moreh in Manipur, Zokhawthar in Mizoram, Agartala in Tripura, Karimganj in Assam and Dawki in Meghalaya are the key 6 Land Customs Stations through which majority of the goods are transferred as on today. Priority should be given to convert these customs stations into ICPs and also to connect them strongly with the key production areas.
- *Establishing a food testing laboratory*- A National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited food testing laboratory is proposed to come under Assam Industrial Development Corporation (AIDC) in Nalbari district of Assam. But given the tough terrain of NER, 2-3 more laboratories can be established in other states depending upon the demand.
- *Establishment of perishable cargo centers at airports in the region* – As most of the targeted products are perishable in nature, one needs a perishable cargo center at the airports for better handling of the produce. The government had already approved construction of a perishable cargo center at Guwahati. However, two more centers can be established at Imphal in Manipur and Agartala in Tripura.

Recommendation 3: Mapping the sanitary and phytosanitary requirements of major export markets

The following table shows the key phytosanitary requirements of major export markets like US, Japan, EU and GCC countries and the interventions required for NER to target them.

Exhibit 101: Sanitary and Phytosanitary requirements of major export markets³²

Phytosanitary requirements of major export markets
<i>The United States of America</i> • In addition to the quarantine and phytosanitary measures in practice USDA, recently proposed Food Safety Modernization Act (FSMA) which brings in sweeping changes in the current systems and these are to be adhered by the Importers in the US which in turn will greatly affect the exporters. • The two relevant rules to the total seven proposed rules are- ○ Produce safety rule – a risk based approach that addresses food borne outbreaks and fatalities linked to the fresh produce ○ Preventive controls for human food- A risk based approach to eliminate or reduce possible hazards in the supply chain by means of employing relevant process controls.

³² USDA, USDA, GCC guide for control on imported foods, EU food regulations, JAS

- At present before the rollout of FSMA completely, phytosanitary and regulatory standards are administered by Plant Protection and Quarantine (PPQ) program USDA- Animal and Plant Health Inspection service and US-Food and Drug Administration.
- In order to export to the US, the commodity has to be absorbed through Commodity Import Approval Process. The exported Commodities are to comply with individual standards laid in Chapter III—Animal and Plant Health Inspection Service, Department Of Agriculture; Part 319- Foreign Quarantine Notices.
- Subparts covering the commodity manuals details the Quarantine notices and rules and regulations phytosanitary requirements of respective crops. E.g.: Subpart – Rice
- Subpart – Fruits and Vegetables. - Product specific requirements for the commodities permitted from all countries or Specific countries. (e.g. Mango From India- Irradiation requirements)
- For Processed Food items the regulations are applicable form Chapter 5- Foods, colors and cosmetics. Respective food categories are covered under rules and regulations by subchapters. E.g.: Subchapter 578 – Processed grain.
- All processed foods apart from regulations need to comply with the food safety guidelines as per the FSMA.

Interventions for NER

- Every food operator is mandated to be qualified as PCQI (Preventive Controls Qualified Individual) to implement “Preventive Controls for Human Food” under FSMA
- Currently, the awareness about FSMA is very poor in the exporters.
- Training on understanding the exceptions, inclusion the FSMA.
- Commodity specific Technical training to the exporters.
- Development of commodity specific export manuals in local languages.
- Lack of testing facilities- to establish food testing laboratories at reasonable costs for establishing MRL’s.

Japan

- The phytosanitary requirements for exporting Fruits, Vegetables and Processed foods to japan are mainly governed by- Plant protection act, Food sanitation act, Measurement act, Health promotion act, Japan Agricultural Standards (JAS) Law and Product liability act.
- All exports to Japan should confirm to the following requirements:
 - o Labeling Requirements: Specific requirements for Recombinant products- specific labelling is not required if recombinant component is less than 5 % or destroyed during processing
 - o Organic products: only products those meet JAS organic standards.
 - o Containers and packaging: Specific labels for promoting sorted collection
 - o Food safety and quarantine Requirements: The general requirements and standards set by Ministry of Health, Labor and Welfare (MHLW), Japan applies to all types of foods including imported foods
 - o Compliance to residual limits for pesticides, chemical residues and other contaminants as set by MHLW.

- Sanitation protocols for products from specific origins-(e.g. Vapor heat treatment for mango from Asian countries)
 - JAS - animal and plant quarantine regulations
- The phytosanitary documents required for exports are-Import notification, Health Certificate, Results of Examination, Sanitation certificate, Documents showing the ingredients, additives and the manufacturing process (Manufacturer Certification)

Interventions for NER

- Training on organic production methods specific to JAS.
- Training on documentation.
- Creation of testing facilities
- Creation of facilities for sanitation controls in integrated pack houses.

European Union (EU)

- The EU sanitary and phytosanitary requirements mandate the regulations for goods being imported into the EU. The regulations are divided into two broad categories which overlook all the specific requirements of phytosanitary certification:
 - Official controls to ensure verification of compliance with feed and food law, animal health and animal welfare rules.
 - Specific rules for the organization of official controls on products of animal origin intended for human consumption
- Exported food commodities must comply with the following regulations:
 - General principles and requirements of food law, traceability -Regulation (EC) No 178/2002-Section 4
 - General rules on the hygiene of foodstuff, microbiological standards for food stuff.
- The exported commodities should comply with Specific requirements:
 - Control of contaminants in foodstuffs- Commission Regulation (EC) No 1881/2006- setting maximum levels for certain contaminants in foodstuffs sets maximum levels for certain contaminants in food to be placed on the EU market.
 - Control of pesticide residues in plant and animal products intended for human consumption- Imports of plant and animal products must comply with such MRLs as stated in Regulation (EC) No 396/2005. (OJ L-70 16/03/2005)
 - Health control of foodstuffs of non-animal origin covering the following aspects- General foodstuffs hygiene rules according to Regulation (EC) No 853/2004 (OJ L-139 30/04/2004), General conditions concerning contaminants in food; Special provisions on Genetically Modified (GM) food and novel food of Regulation (EC) No 1829/2003(OJ L-268 18/10/2003), General conditions of preparation of foodstuffs; Official control of foodstuffs.
 - Plant health control- covering the aspects of Import Bans; Phytosanitary certificate and/or phytosanitary certificate for re-export, Customs Inspection and plant health checks, Importers Register, Advance notice on imports.

- Labelling for foodstuffs covering the aspects of - Labelling of Genetically Modified (GM) food and novel food, foodstuffs for particular nutritional purposes, Labelling of food additives and flavorings, materials intended to come into contact with food, Labelling of particular foodstuffs.
- *Marketing standards for fresh fruit and vegetables for India*- Imports from India into the European Union (EU) of the stated products must comply with the EU-harmonized marketing standards comprising of Inspection of marketing standards (EC) No 543/2011 (OJ L-157 15/06/2011) covering minimum quality and maturity requirements, Tolerance, Marking of origin of produce.
- *Products from organic production (EC) No 1235/2008 (OJ L-334 12/12/2008)* mandates the requirements for fresh and processed food commodities to be considered as organic products.

Interventions for NER

- Training on EU specific organic production methods and documentation.
- Testing facilities
- Training on labeling requirements.
- Exporters currently are not aware of systems like BRC, SQF which are sometimes mandated by the importers.
- Development of Quarantine Pest and Insect atlas specific to region and commodity.
- Development of product specific manuals for marketing standards.

GCC countries

- UAE, Bahrain, Saudi Arabia, Oman, Qatar, and Kuwait are the current member states of GCC, which use the harmonized GCC standards – to regulate the imports in the member countries.
- The GCC guide for control on imported foods reckons the Phytosanitary and food safety requirements for export of food commodities. The GCC standards are built on a risk based food control system.
- Respective declarations to be carried for food safety aspects are listed under Health attestations.
- Respective declarations to be carried for Phytosanitary aspects are listed under Phytosanitary attestations.
- Halal attestations for determining the compliance of food commodities under Halal certifications.
- Import prohibition of certain food commodities
- Labeling requirements for member countries of GCC.
- Food Additive Regulations- covering halal aspects, and for new to market products- declarations like the addition of food coloring, preservatives, antioxidants and non-nutritive sweeteners is restricted
- Pesticide and Other Contaminants; in the absence of GCC standard respective member country standard to be employed.
- Other Regulations and Requirements: All imported food products must be accompanied by: A health certificate issued by the appropriate government agency, attesting to the product's

fitness for human consumption, A Halal slaughter certificate issued by a GCC approved certification agencies, Country of Origin Certificate

Interventions for NER

- Training to exporters on dual language label requirements.
- Training on Halal Certification for various product groups, export of restricted food commodities

Recommendation 4: Branding of agricultural produce for better returns

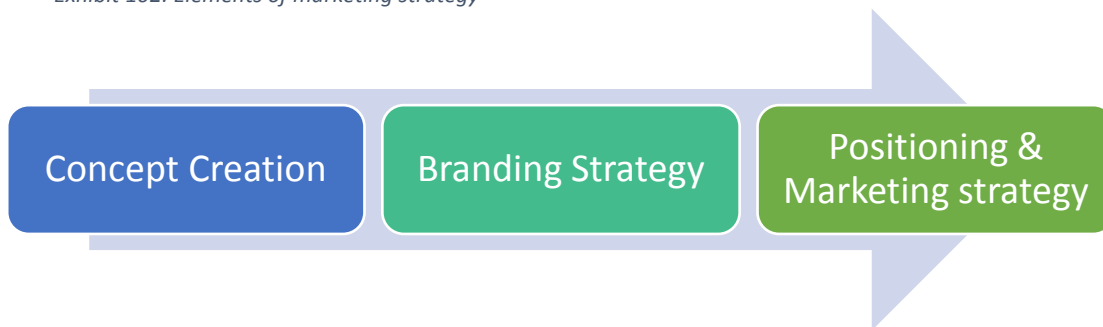
Branding, food processing and investments in the supply chain will ensure **that the farm produce gets the** right value. With a number of countries competing in the international markets developing a brand helps in adding value to the product and can also provide the basis for non-price competition.

Historically most of the unprocessed agriculture/horticulture produce are marketed as commodities and are unbranded except for the ones that are marketed by multinational companies. However recently, exporters from different countries (South Africa – Cape Brand, Israel – Carmel brand) broke the trend by branding their produce. Later many countries plunged and started branding their most valuable produce. NER made some progress by obtaining Geographical Indication (GI) for 10 products. However, except for Sikkim, no other state made any progress with regards to branding. Promoting NER products under a single brand umbrella will not help create markets not only in the international markets but also in the domestic markets.

Marketing Effort

- A dedicated marketing and visibility campaign for the products from the NER needs to be implemented which will help in increasing the awareness for the same in the target customer segments. These could range from large enterprises to small enterprises/start-ups or directly customers themselves. The three key elements of the marketing strategy are mentioned in the following picture.

Exhibit 102: Elements of marketing strategy



Concept Creation

- The clear benefits of the products coming out of the NER need to be highlighted to the potential consumers. A set of attributes/values that make it unique and valuable is to be logically framed and made visible. Key considerations here will include:
 - a) Benefits of organic products and agricultural produce in general from the NER in terms of flavour, soil quality, and environmental impact
 - b) Potential benefits for the NER in terms of employment generation, economic boost etc
 - c) Helps in keeping ground water and water bodies clean as no pesticides or chemicals are involved
 - d) Boost to entrepreneurship
 - e) Adequate usage of natural resources
 - f) Creation of an integrated, environmentally sound, safe and economically sustainable agriculture production system.

Branding Strategy

- Promoting NER products under a single brand umbrella will not help create markets not only in the international markets but also in the domestic markets.
- Organic certification along with Agmark or other quality certifications should be pursued.
- The product should be branded under a dedicated brand name and marketed in the potential domestic markets (Tier 1 and 2 cities) as well as exported to potential foreign countries. For this, identification and collaboration with other existing players in the marketing and retail domain is suggested
- A Brand Ambassador should be brought on board who is from the region and has an emotional and cultural outreach across the demographics of the NER

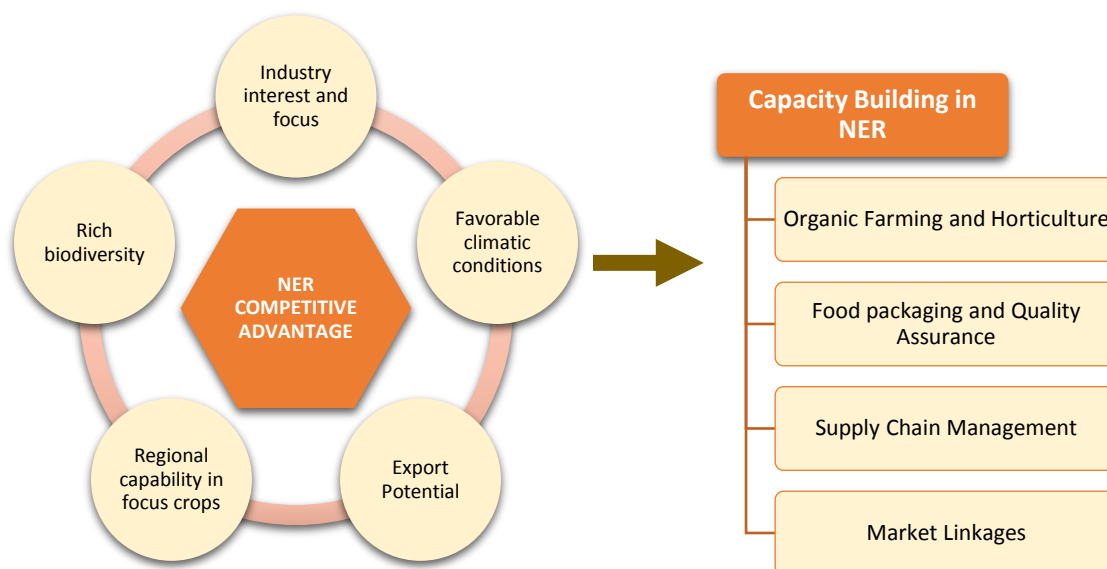
Positioning and marketing strategy

- The Organic Mission board suggested in the action plan will have a dedicated marketing committee deputed to oversee the efforts related to marketing and branding of the produce from the NER.
- Dedicated facilities should be created at various centers in the state where domestic population and tourist inflow is more so as to make them aware of the potential of yield coming out of the NER. Retail outlets starting from the state capital and then the district headquarters should be set up first.
- Billboards at all major airports in the region, especially Guwahati, Imphal, Dibrugarh, and Agartala should be installed highlighting and making people aware of the organic products.
- Local outlets to cater to the need of such products and provide publicity for the same. This ensures accessibility of all products to cater to the need of the buyers.
- Local markets, mandis and 'haats' should have separate outlets (the way NERAMAC has outlets across the NER at various markets and institutions) which highlight the organic value of the product.

- As the organic products will be priced a tad premium, their major domestic markets will include metros where people have a higher degree of disposable income comparatively. Delhi, Kolkata, Mumbai, Bangalore and Hyderabad should be targeted initially before moving on further and onto other Tier II cities. This will help to provide publicity within India as well as internationally as these cities are international gateways into India.
- Approach exporters from India and importers from countries with potential markets to establish trade links so as to get assured returns and orders for the yield produced in the NER.

5.5 Capacity Building and Skill Development

Lack of trained manpower in the region has led to underutilization of existing infrastructure and garnered a poor response to the support programs of the government. A large part of the success of the proposed action plan depends largely on the technical and management skills of the personnel involved. The NER has an abundant labour pool who are well versed in English and seeking employment opportunities as well. However, specialized skills and abilities are found to be lacking, thereby restricting their growth and opportunities. Individuals who have had some training exposure may not be found to possess the necessary skill set which is optimal to execute industry level operations. In tandem with the implementation of the action plan, it is envisaged to have a holistic ecosystem in place complimented with trained professionals and market linkages. Hence, it becomes imperative that focus is laid on skill development in the region as it has to go hand in hand with the execution of infrastructure and supply linkages in the NER. The Hubs will serve as centers for imparting relevant training to individuals and businesses in the region. These training programs will focus on multiple domains which will mainly include supply chain management, food processing, organic farming, horticulture, packaging, distribution et al. MOU's can be signed with various agricultural universities in the region, mainly, Assam Agriculture University, Central Agricultural University Manipur, and Nagaland University so as to aid in curriculum development and stakeholder sensitization. Also, inputs from the regional Industrial Training Institutes (ITIs) can be taken.



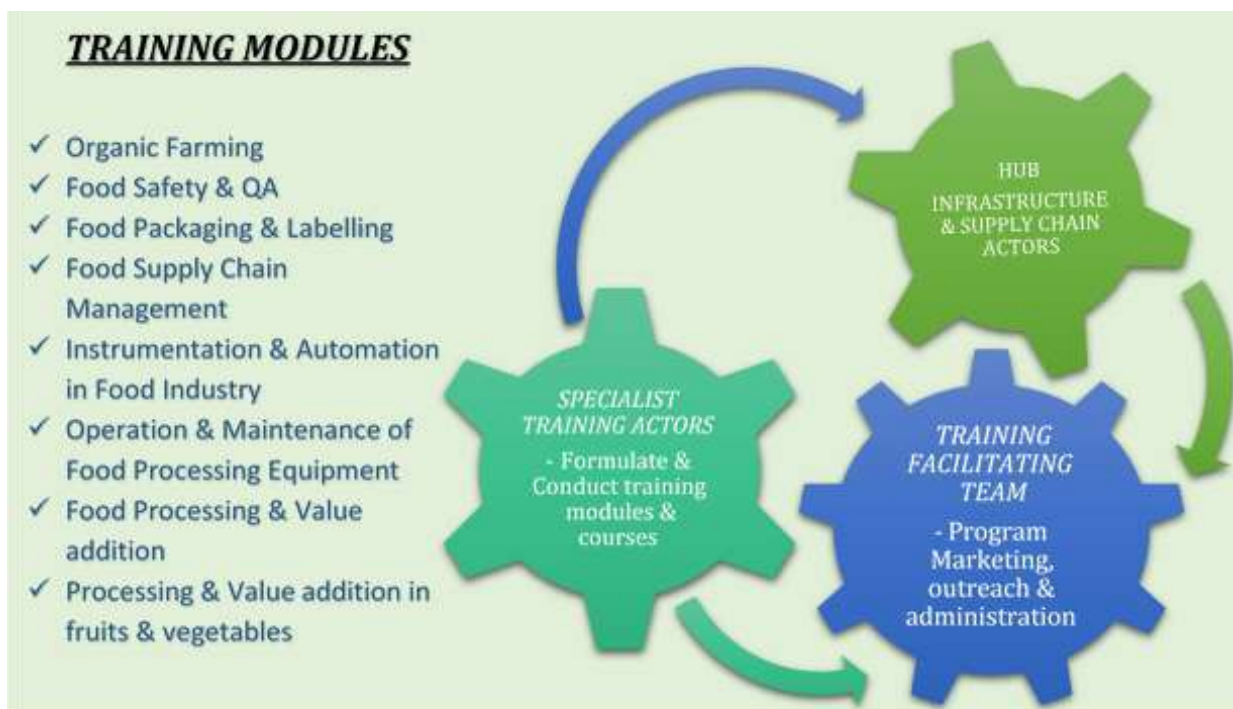
Objectives

- Administer suitable hands on training programs to develop a relevant human resource to cater to the needs of the market and food industry evolving within the NER.
- Conduct training programs conducive to the existing as well as upcoming infrastructure within the NER that could drive the basic growth and exposure.
- Augment the availability of trained human resource, and forge employability thereby controlling emigration.
- Meet the industry need for trained and skilled resources not only at the state level but for the entire NER so as to emerge as a hub for developing industry-ready human capital

Prospective Partners

Multiple educational/training facilities in the NER can play a key role in imparting training in the region. Some examples are-

- *Indian Institute of Entrepreneurship (IIE), Guwahati, Assam*
- *Central Institute of Horticulture, Medziphema, Nagaland*
- *National Research Center on Pork, Guwahati, Assam*
- *Indian Council for Agricultural Research- NEH, Shillong, Meghalaya*
- *Assam Agricultural University, Jorhat, Assam*



All modules will span over varying durations (2 weeks – 8 weeks) depending on the course and curriculum configured as well as the facilities and beneficiaries furnished for the same.

Training Modules

Training Module - Organic Farming: The entire NER is blessed with the agro climatic conditions which make it conducive for organic farming. Rich biodiversity with ample scope for on farm production of organic manure, rich soil with high organic content as well as conducive climate and terrain are major factors contributing to this. The action plan proposes leveraging of the organic potential of the region as it can contribute to the foreign market demand thereby boosting export potential from the region for the identified crops. The capacity building here will also cover officials so as to update them on knowledge and techniques of organic farming relevant to the NER. Other stakeholders will include field supervisors, field executives, ICS inspectors, internal auditors, an organization related to organic certification companies, NGOs in the field of organic farming and others. The major identified sub segments relevant to organic farming that the action plan envisages catering to include:

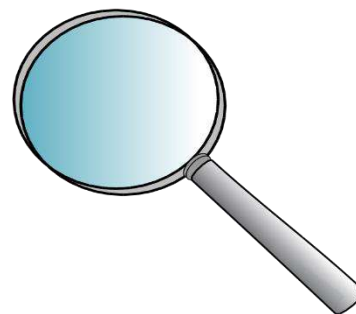


- a) Various composting techniques with usage of bio fertilizer
- b) Integrated Nutrition Management
- c) Harvesting and storage of organic products
- d) Marketing of organic products

e) Package of practices for organic farming

Renowned institutes such as Centre for Organic Farming (in Imphal) and All India Organic Farmers Society can be brought on board to impart training related to organic farming owing to their rich body of work in the sector.

Training Module - Food Safety & Quality Assurance: The units which will come up within the hubs will primarily be food processing units involved in the production of value added products which can be exported to foreign countries. It is mandatory to meet the export guidelines and regulations in order to export the agri and food commodities stringent quality assurance program should be in place and all the exporters should adhere to it. This calls for the need for training in Export standards, Good Manufacturing Practices and guidelines.



Risk management, internationally agreed definitions, frameworks, and process of risk management, risk analysis, risk assessment, risk management and risk communication. Food Safety and Standards - Agricultural Marketing – Production and Operations Management, commodity markets and Futures, trading - retail management

Training Module - Food Packaging and Labelling: The Hubs are proposed to implement pack houses with dedicated packaging and grading lines as well as cold storage facilities. The training here will focus on operation and maintenance of modern as well as traditional packaging methods, determination of appropriate packaging requirement for a food material.



Different forms of packaging such as rigid, semi rigid and flexible forms, retort able pouches – packaging, system for dehydrated foods, frozen, foods, fresh fruits and vegetables, meat, fish etc. amongst a catalogue of other relevant products

Visits to established packaging facilities should also be conducted to give a hands on practical experience to the beneficiaries.

Packaging and labeling laws and regulations – general guidelines on giving declarations - SWMA, FSSAI guide lines, Ingredients, AgMark rules etc. should be covered as well.

Training Module - Food Supply Chain Management

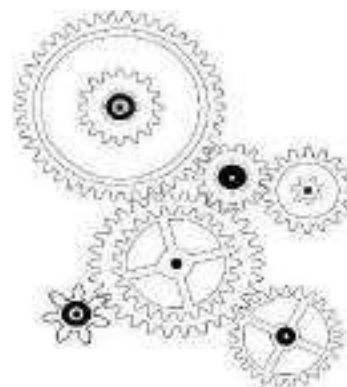
The Hubs will be connected to 'spokes' which are collection centers in each state where it will interface with the farmers to procure yield and bring it to the Hub facility.



Important aspects of strategic logistics planning process and intrinsic logistics systems such as supply chain, logistics, Evolution of logistics concept, Logistical mission and strategic Issues, Logistics in India, importance of logistics management, strategic logistics planning process, Operational objectives, Components of logistics management, Functions of logistics management, integrated logistics system, agribusiness environment & policy - Agricultural Production Management - Business Ethics & Global Business Environment should be covered. Aspects of post-harvest food management such as cold chain technologies viz. dry ice, gel packs, eutectic plates, liquid nitrogen, quilts, reefers refrigerated containers should also be covered.

Training Module - Instrumentation & Automation in Food Industry:

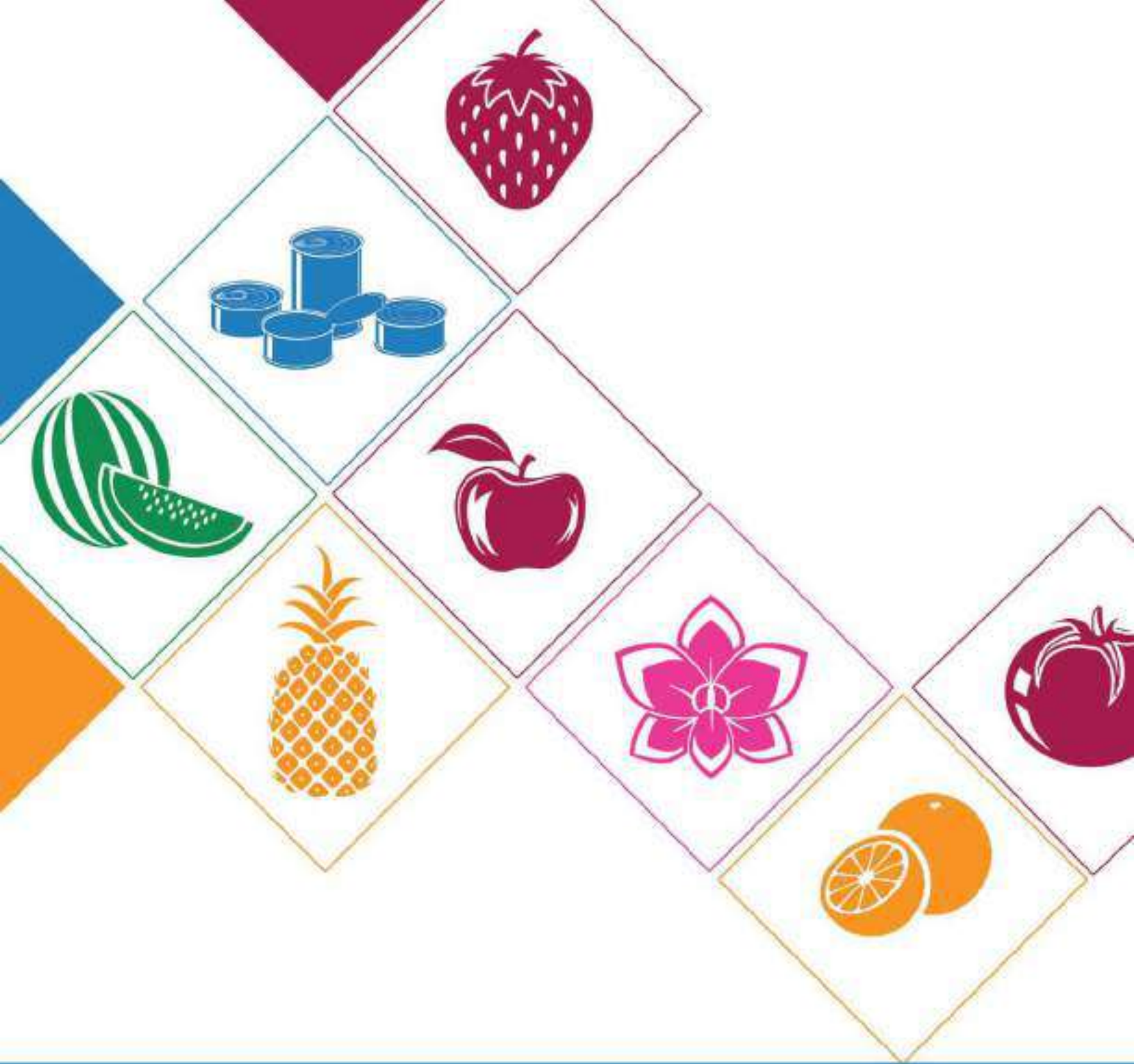
Packaging and grading involve large amounts of instrumentation and logistics. It is essential to develop proficiency in such domains required in the food industry by means of monitor sensors and control systems with the food processing machines. Also, suggestions for future expansion and modification to the existing instrumentation, managing crisis situations arising due to instrumentation failure etc.



Training Module - Operation & Maintenance of Food Processing

Equipment: Basic training for management and maintenance of food processing equipment should be imparted under this module.

Business Facilitation Centre – BFC: New entrepreneurs and farmers choosing to venture into farming should be provided handholding support upon registering with the group & assisted with land procurement if required as well. Also, type of crop to be grown, inputs required & other crop advisory services should be provided by the Business Facilitation Centre. A similar concept has been implemented by NEDFI in all the states of the NER as well. The farmers will have full access to experts who will help in forming linkages & engage with personnel from other geographies. Also, advice for services in land procurement, accessing inputs & resources, procuring manpower, address required legalities if required should also be made available. Business plans assessment to ensure fixed returns on investments should be emphasized. Incubation support & linkage to the financial institution should help to ensure security for low income groups with weak collateral credentials.



ANNEXURES



Annexure A: Support data for Ranking Matrix

	Current production levels of the product in the region	Marketable surplus in the region	Current exports from the region	Comparative advantage for NER	Integration of activities for exports	International demand for the product	Competition in international markets	Economic value of the product	Premium for organic	Total
	20%	15%	10%	15%	5%	15%	10%	5%	5%	100%
Orange	4	5	2	4	2	3	3	3	3	3.5
Pineapple	5	5	1	5	1	2	2	3	3	3.45
Rice	2	2	3	5	3	5	4	3	4	3.4
Chilli	2	2	2	5	3	5	4	4	4	3.35
Ginger	5	5	2	4	2	2	2	2	2	3.35
Lemon	3	5	1	5	3	3	3	2	2	3.30
Kiwi	4	5	1	3	1	4	1	4	4	3.25
Flowers	3	3	2	4	2	4	2	5	1	3.05
Jackfruit	5	5	1	2	1	2	2	3	2	2.95
Banana	3	4	2	2	3	3	3	2	4	2.90
Litchi	2	5	1	4	1	2	3	4	4	3.05
Passion Fruit	2	4	1	4	1	3	3	4	3	2.85
Honey	1	4	1	4	1	3	3	5	5	2.80
Grapes	1	1	2	1	2	5	1	4	4	2.05
Arecanut	4	1	1	1	3	2	2	2	2	2.05
Cabbage	2	4	1	1	1	2	2	2	2	2.00
Cashewnut	1	2	1	1	1	4	2	4	4	2.00
Papaya	2	3	1	1	1	2	3	2	2	1.95
Mango	1	1	1	1	1	3	4	4	4	1.90
Apple	1	1	1	1	1	5	1	4	4	1.90
Cauliflower	2	3	1	1	1	2	2	2	2	1.85
Maize	1	1	1	1	1	5	1	2	4	1.80
Brinjal	1	2	1	1	1	3	3	2	2	1.75
Peas	1	2	1	1	1	3	2	3	3	1.75
Guava	1	1	1	1	1	3	3	3	3	1.70
Okra	1	3	1	1	1	2	2	2	2	1.65
Onion	1	1	1	1	1	4	1	3	3	1.65
Tomato	1	3	1	1	1	1	1	2	4	1.50
Potato	1	1	1	1	1	1	1	1	2	1.05

Annexure B: Incentive Schemes for the NER

Central Subsidy Schemes

Transport Subsidy Scheme

The scheme was introduced to develop industrialization in the remote, hilly and inaccessible areas of the NER (as well as other similar geographies in the country) by providing for subsidy in the transportation cost incurred by the industrial units so that they could stand competition with other similar industries, which are geographically located in better areas. The subsidy ranges between 50% and 90% of the transport cost for transportation of raw material and finished goods to and from the location of the unit and the designated rail-head. For movement of goods within the NER the subsidy is 50%. The subsidy is eligible to a unit for a maximum period of five years from the date of commencement of commercial production. NEDFI is the nodal agency for the implementation of this scheme.

Central Capital Investment Subsidy Scheme, 2007

All new industrial units as well as existing units which intend to go for substantial expansion and are located anywhere in NER are eligible for capital investment. Under this scheme, all eligible industrial units located anywhere in the NER are eligible for capital investment subsidy at the rate of 30% of their investment in Plant and Machinery or additional investment in Plant and Machinery. This is applicable to units in the private/joint/cooperative sector as well as the units set up by the state governments concerned of the North Eastern Region. The limit for automatic approval of subsidy at this rate would be Rs.1.5 crore subsidy under this Scheme. NEDFI is the nodal agency responsible for the implementation of this scheme.

Central Interest Subsidy Scheme, 2007

All new industrial units as well as existing units which go in for substantial expansion and are located anywhere in NER are eligible for this scheme. Eligible industrial units located anywhere in the NER are given an interest subsidy to the extent of 3% on the working capital advanced to them by the Scheduled Banks or Central /State financial institutions, for a maximum period of 10(ten) years from the date of commencement of commercial production. NEDFI is the nodal agency responsible for the implementation of this scheme.

Agency bodies at Central Government Level:

Horticulture Mission for North East and Himalayan States

A subset of Integrated Development of Horticulture (MIDH), this scheme focuses on improving productivity of horticultural crops in the NER and Himalayan region. It focuses on Research & Development (R &D), Production and productivity Improvement, Production & Distribution of Planting Material, establishment of New Gardens, Mushroom Production, Rejuvenation/Replanting of senile Plantation/Canopy Management, Creation of Water Resources, Protected cultivation, Precision Farming Development and Extension through PFDCs, Promotion of INM/IPM, Organic Farming, Good Agricultural Practices, Centre of Excellence for Horticulture, Human Resource Development in Horticulture, Pollination Support through Beekeeping, Horticulture Mechanization, Technology Dissemination through Demonstration/FLD, Integrated Post Harvest Management, Cold Chain Infrastructure, Creation of Market Infrastructure and Processing & value Addition.

Ministry for development of North Eastern Region (mDoNER)

A dedicated Central Ministry of Development of the Northeastern Region in 2001 (granted status of fully-fledged ministry in 2004). MDoNER was created for the purpose of facilitating the relations and the work between the Central Ministries and Departments and the State Governments of the NER mainly with regard to economic development. Its broad functions and responsibilities includes: Non-Lapsable Central Pool of Resources (NLCPR), North Eastern Council (NEC), Coordination with the Central Ministries and the State governments of the NE states, Capacity Building, Advocacy and Publicity, International Cooperation and Enterprises of the Department. At the mDoNER level, multiple agencies are functioning which provide incentives such as:

North Eastern Council (NEC)

Instituted in 1973, the nodal agency for the economic and social development of the North Eastern Region which got designated as a Regional Planning Body in 2002. Till 2012, the NEC has invested INR 10745 crore in the region. NEC is an advisory body which indulges in discussing matters in which the NER which may have a common interest and advise the Central Government as to the action to be taken on any such matter. This mechanism was implemented so as to take care of the economic and social planning of these states, as well as to provide mediation in the event of inter-State disputes

NEC SCHEMES IN AGRICULTURE AND ALLIED SECTORS:

#	Sector	Activities done
1	Apiculture (NER Project on Apiculture Development)	▪ Project to overcome traditional beekeeping practices and encourage apiculture as a means of living ▪ Established bee keeping nurseries in Assam ▪ Training cum demonstration unit in Assam ▪ Central Honey processing unit (50MT capacity) ▪ Setting up of Commercial apiaries by the trained entrepreneurs are subsidized by NEC and KVIC on a 50:50 cost sharing basis
2	Intensive Cultivation/Plantation in the NER	▪ Promote intensive crop cultivation based on agro climatic conditions ▪ Specific focus on high value crops, spices, medicinal plants etc. ▪ Being supported by Registered Cooperative Societies ▪ Current status - suspended
3	Cultivation and production of Ramie Fibre in Arunachal Pradesh	▪ Strong fiber known as 'Reha' in Assam. Product of a high cellulose content plant ▪ The scheme for Ramie launched in 1997 specifically focuses on increasing employment, promote industrialization to enhance rural economy and provide alternative for Jhum cultivation
4	Integrated agriculture development in NER	▪ Lack of indigenous food production driving cause for this scheme ▪ Approved schemes to bring more area under cultivation focusing on crops such as turmeric, apple, strawberry, Arecanut, mushroom, vermi compost promotion, etc.
5	Establishment of cold storage units	▪ Focus on Setting-up of cold storage, rural godowns/ collection centers near the production centers or at central locations ▪ During the 10th plan, the Council has funded projects for Establishment of Cold Storage at Gosaigaon, Assam and for setting-up of Cold Storages at Dimapur, Nagaland, Satchand, Tripura

North Eastern Development Finance Institution (NEDFi)

NEDFi came into being in 1995 and got registered as an NBFC in 2002 with the RBI. It provides advisory services to stakeholders and financial assistance to micro, small, medium and large enterprises for setting up industrial, infrastructure and agri-allied projects in the North Eastern Region of India and also Microfinance through MFI/NGOs. As of 2015, NEDFi has disbursed over INR 2710 crore spanning over 4000 different projects in the region. NEDFi also promotes the NE at various forums and platforms and also promotes R&D.

NEDFi has a business facilitation center in every state of the NE. Here, experienced mentors provide handholding support to potential entrepreneurs. This BFC provides guidance in managerial, technical, financial, commercial & marketing and even for preparation of Detailed Project Report (DPR) and credit linkages in places where professional experts are unavailable.

North Eastern Regional Agricultural Marketing Corporation Ltd. (NERAMAC)

NERAMAC came into being in 1985 to support farmers and facilitate market linkages to enhance and improve the agriculture scenario in the region. NERAMAC is primarily involved in processing and marketing of agricultural products in the NE. NERAMAC helped local food processing units by marketing their products in identified domestic markets through its own retail outlets. NERAMAC intervenes in sourcing, procuring and marketing different Agro-Horticultural Commodities produced by the farmers of pineapple, ginger, banana, chillies, black pepper, cashew nuts etc. and minor forest produces like hill grass. It also supports the farmers with agricultural inputs like seeds, fertilizers etc. NERAMAC also assists farmers producing planting materials under Horticulture Mission Schemes by marketing their produces.

NERAMAC also implements training programs specifically Fruit Preservation Training Programme for growers/entrepreneurs who intend to set up micro processing facilities. This program provides general awareness in food processing covering regulations, agro food processing industries management, quality/system etc. These programs are modeled for fruit and vegetable processing.

Upcoming projects:

- 1) Central Packaging Centre, Guwahati
- 2) Multi-fruit Processing Plant at Silchar, Assam
- 3) Restructuring & Modernization of the Pineapple Juice Concentration Plant, Nalkata (Tripura)

Department of Agriculture, Cooperation and Farmer's welfare

The Department of Agriculture and Cooperation (DAC) is one of the three constituent Departments of Ministry of Agriculture, other two being Department of Animal Husbandry, Dairying & Fisheries (DAHD&F) and Department of Agricultural Research and Education (DARE). Its main goal is promoting growth and boost agricultural growth in the country by means of various schemes and guidelines. Relevant ongoing schemes includes:

#	Sector	Particulars
1	Agricultural Marketing	▪ Agri-Tech Infrastructure Fund (ATIF) ▪ Integrated Scheme for Agricultural Marketing (ISAM) ▪ Rural Godowns Scheme ▪ Terminal Market Complex Scheme ▪ Development of Agricultural Marketing Infrastructure, Grading and Standardization (AMIGS)
2	Crops & National Food Security Mission	▪ Mission for Integrated Development of Horticulture (MIDH). ▪ National Horticulture Mission (NHM) ▪ Horticulture Mission for North East & Himalayan States (HMNEH). ▪ National Bamboo Mission (NBM) ▪ National Horticulture Board (NHB) ▪ Coconut Development Board (CDB) ▪ Central Institute of Horticulture (CIH), Dimapur, Nagaland ▪ Directorate of Cashew nut & Cocoa Development
3	Integrated Nutrient Management	▪ Mission Organic Value Chain Development for North Eastern Region ▪ Soil Health Management (SHM) Under National Mission for Sustainable Agriculture (NMSA) ▪ National Project on Management of Soil Health and Fertility
4	Rain-fed Farming System	▪ Sub-Mission on Agroforestry (SMAF) Under National Mission for Sustainable Agriculture (NMSA) ▪ Pradhan Mantri Krishi Sinchayee Yojna ▪ National Watershed Development Project for Rain-fed Areas (NWDPA)
5	Cold Storage	▪ Credit linked back-ended subsidy of 40% (general states) and 55% (hilly and scheduled states) of capital cost of the project for a maximum storage capacity of 5000 MT per project at the rate of Rs 6,000 per MT. Rs 32,000 per MT for 5,000 MT in case of CA storages.

National Horticulture Board

The NHB was set up by the Government of India to promote and boost the horticultural scenario in India by means of developing horticultural belts, infrastructure, nurseries, post-harvest management infrastructure, marketing of produce, promotion of field trials, technology transfer etc.

Schemes under NHB:

#	Name of Scheme	Particulars
1	Horticulture Commercial Scheme	Focuses on credit linked projects relating to establishment of commercial production units in open field as well as under protected conditions and projects on Post harvest Management and primary processing of products ▪ Commercial Horticulture Development in open field conditions on project mode - Credit linked back-ended subsidy @ 40% of the total project cost limited to Rs 30.00 lakh per project in general areas and @ 50% of project cost limited to Rs. 37.50 lakh in NE Region, Hilly and Scheduled areas. ▪ Commercial Horticulture Development in protected cover on project mode - Credit linked back-ended subsidy @ 50% of the total project cost limited to Rs 56.00 lakh per project as per admissible cost norms for green

		houses, shade net house, plastic tunnel, anti-bird /hail nets & cost of planting material etc.
		▪ Integrated Post Harvest Management projects
2	Cold Storage Scheme	▪ Credit linked projects relating to Cold Storages including Controlled Atmosphere (CA) and their modernization are eligible for assistance under this component. Subsidy need not be credit linked for the institutions like Public Sector Units, Panchayats, cooperatives, registered societies/trust and public limited companies provided they can meet remaining share of the project cost out of their own resources. Such projects will have to be appraised by appraising agency approved by NHB ▪ Assistance will be given as subsidy @ 35% of the capital cost of project in general areas and 50% in case of NE, Hilly & Scheduled Areas for a storage capacity above 5000 MT up to 10000 MT
3	Market Information Service for Horticulture Crops	▪ To collate and maintain data and information on wholesale prices, arrival, yield in various markets of the country for fruits, vegetables and flowers specifically ▪ 100% cost of the study shall be borne by the Board
4	Horticulture Promotion Service	▪ Specialized studies and surveys are carried and study / survey reports shall be brought out for use by targeted beneficiaries ▪ 100% cost of the study shall be borne by the Board

Ministry of Food Processing Industries (MoFPI)

The Ministry of Food Processing Industries is concerned with formulation and implementation of the policies & plans for the food processing industries within the overall national priorities and objectives. It focuses on policy and developmental support for formulation and implementation of policies for food processing sector with overall national priorities and objectives and facilitating creation of a conducive environment for healthy growth of the food-processing sector. Relevant schemes by MoFPI include:

#	Scheme	Particulars
1	Mega Food Park	▪ Mechanism to link agricultural production to the market by bringing together farmers, processors and retailers so as to ensure maximizing value addition, minimizing wastage, increasing farmers' income and creating employment opportunities particularly in rural sector ▪ Focus on cluster approach to develop horticultural processing units ▪ The scheme envisages a onetime capital grant of 50% of the project cost (excluding land cost) subject to a maximum of Rs. 50 crore in general areas and 75% of the project cost (excluding land cost) subject to a ceiling of Rs. 50 crore in difficult and hilly areas i.e. North East Region including Sikkim, J&K, Himachal Pradesh, Uttarakhand and ITDP notified areas of the States.
2	Cold Chain Scheme	▪ Aims to provide integrated cold chain and preservation infrastructure facilities without any break from the farm gate to the consumer covering pre-cooling facilities at production sites, reefer vans, mobile cooling units as well as value addition centres which includes infrastructural facilities like Processing/Multi-line Processing/ Collection Centres, etc. for horticulture, organic produce, marine, dairy, meat and poultry etc.

		- Can be sought by individuals, groups of entrepreneurs, cooperative societies, Self Help Groups (SHGs), Farmers Producer Organizations (FPOs), NGOs, Central/State PSUs etc. with business interest in cold Chain solutions - Financial assistance(grant-in-aid) of 50% the total cost of plant and machinery and technical civil works in General areas and 75% for NE region including Sikkim and difficult areas (J&K, Himachal Pradesh and Uttarakhand) subject to a maximum of Rs.10 crore
3	R&D, QA, Codex and Promotional Activities	Available to: Central/state governments and its organizations/Universities(including deemed universities) - eligible for grant-in-aid of entire cost of laboratory equipment required for labs and 25%of the cost of technical civil works to house the equipment and furniture and the fixtures associated with the equipment Implementing agencies and private organizations - eligible for grant-in-aid of 50% of cost of laboratory equipment and 25% of the cost of technical civil works to house the equipment and furniture and fixtures associated with the equipment
4	Value Added Centre Scheme	25% of the cost of plant and machinery and technical civil works for setting up such centre subject to a ceiling of Rs.50 lakhs in general areas and 33.33% subject to a maximum of Rs.75 lakhs in difficult areas is provided.
5	Packaging Centre scheme	25% of the total cost of plant and machinery and technical civil work in General Areas and 33.33% in Difficult Areas, subject to maximum of Rs.2 cores, is provided for establishing packaging centre independently and in food parks (where the packaging centre is not already a part of the common facilities).

National Bank for Agriculture and Rural Development (NABARD)

NABARD was set up in 1982 to promote sustainable and equitable agriculture and rural prosperity through effective credit support, related services, institution development and other innovative initiatives. NABARD provides investment credit in the following domains:

- Dairy Entrepreneurship Development Scheme
- Commercial production units of organic inputs
- Rural godowns
- Agriculture Marketing and Infrastructure Grading and Standardizations
- Agriclinic and Agribusiness Centres Scheme
- Agricultural Marketing Infrastructure

National Co-operative Development Corporation (NCDC)

Subsidy at the rate of 20% and 25% of the project cost for Under Developed (UD) and Least Developed (LD) states for setting up of new cold storages, CA/Modified Atmosphere (MA) stores, expansion/modernization of existing cold storages with sorting and pre-cooling facilities.

At State Government Level

#	State	Scheme & particulars
1	Meghalaya	▪ Basic Agriculture Training Centre - Provides free short term vocational training for educated unemployed youths in agriculture enterprises ▪ Farmers Training Institute scheme- Farmers are imparted free specialized training at the center including in farmers field. Exposure programs and field tours are also conducted for farmers group ▪ Spices Development scheme- <i>Ginger, Turmeric</i>, Black Pepper, Cardamom, Coriander, Cinnamon and Chillies - Subsidy of inputs and implements to farmers for sale at 50percent subsidy ▪ Fruit processing scheme - For utilization of surplus fruit and vegetables and conversion of the same to marketable processed products like jam, jelly, squashes, thereby creating a market for fruit growers through organized procurement of surplus fruits and vegetables from farmers and conversion of the same to value added products. ▪ Scheme for development and maintenance of Orchard cum Horti Nurseries – Impart training, awareness program, extension, technology support, subsidy on inputs for production and multiplication of good, high yielding, diseased free planting materials for distribution to farmers ▪ Scheme for plantation Development (Arecanut, Cashewnut, Coconut) – One year assistance programme to the farmers, 33percent subsidy for purchasing of planting materials, poly pipes. Financial assistance at 50 % subsidy for construction of Arecanut bookage tank ▪ Floriculture Development Scheme - Provide good quality flower planting material at 50% subsidy and low cost poly house free of cost ▪ Scheme for Organic Manures including Vermicompost and Compost Pit - Establishing Vermicompost units free of cost for farmers including supply of bio-fertilizers at 50% subsidy.
2	Tripura	▪ Scheme for production of planting materials & development of Progeny orchard To rejuvenate and making all these orchards viable for production of quality planting materials for augmentation of planting materials requirement of the state ▪ Scheme for Development of Horticulture in Tripura - Focuses on increasing production & productivity of different popular fruits like Mango, Mosambi, Banana & Pineapple, encouraging watermelon as a cash crop, encouraging round the year vegetable cultivation
3	Mizoram	▪ Organic Farming Scheme – Funding for organic market development, composting units, vermi culture, organic certification are available. ▪ ATMA (SAMETI) Scheme – Agriculture Technology Management Agency are district level institutions to impart extension services to farmers.

Annexure C: Cold Storage Infrastructure in the NER

#	State	District	Capacity (MT)	Commodity
1	Arunachal Pradesh	West Kameng		
		Bhalukpong	5000	Multi commodity
2	Assam	Barpeta		
		Cooperative Cold Storage, Barpeta	3000	Multi commodity
		North Cachar		
		Kay Dee Cold Storage, Ltd, Ramnagar, Silchar	5000	Multi commodity
		Sri Lalit Cold storage (P) Ltd, Silchar	5000	Multi commodity
		Dhubri		
		Gouripur Cold Storage, Gouripur	60	Multi commodity
		Hat Singhmari Cold Storage, Man Kashar	60	Multi commodity
		Gokhani Cold Storage, Dhubri	2000	Multi commodity
		Golaghat		
		Balajee Cold Storage, Dergaon	3600	Multi commodity
		Kamrup		
		Reliable Cold Storage (P) Ltd, Changsarai, Guwahati	5000	Multi commodity
		Citra Cold Storage, Changsarai, Guwahati	2666	Multi commodity
		Krishna Associates, Cold Storage, Khanpara, Guwahati	2500	Multi commodity
		Eden Cold Storage (P) Ltd, Khanpara, Guwahati	2400	Multi commodity
		WAMUL Cold Storage, Khanpara, Guwahati	180	Multi commodity
		Town Milk Supply Scheme, Khanpara	1250	Multi commodity
		Asst. Director, Sericulture, Khanpara, Guwahati	60	Multi commodity
		Govt. Cold Storage, Zoo Road, Guwahati	100	Multi commodity
		Kamrup Cold Storage Co., Zoo Road, Guwahati	1800	Multi commodity
		Warehouse Cum Cold Storage, Burnihat	500	Multi commodity
		Singhimari Cold Storage, Singhimari	500	Multi commodity
		North East Cold Storage, Lokhra, Guwahati	5000	Multi commodity
		Nalbari		
		Cooperative Cold Storage, Nalbari	4000	Multi commodity
		Tinsukia		
		Tinsukia Cold Storage, M/s. Assam Cold Storage	2200	Multi commodity
		Mahabir Cold Storage	7000	Multi commodity
		Hailakundi		
		Hailakundi Veg. Coop Society Limited, Hailakundi	5000	Multi commodity
		Dey's Cold storage Private Limited, Hailakundi	5000	Multi commodity
		Sonitpur		
		Indraprastha Cold Storage (P) Ltd, Bhairabpad, Tezpur	4000	Multi commodity
		Karimgunj		
		Barak Cold Storage	5000	Multi commodity
		Cooperative Cold Storage, Golakgunj	2400	Multi commodity
		Nagaon		
		North East Central Cold Storage, Kaliabore	4500	Multi commodity

		Dep Jyoti Ice & Cold Storage (P) Limited, Dimru Guri	4000	Multi commodity
		Cooperative Cold Storage	3000	Multi commodity
3	Manipur	Imphal East		
		Nilakuthi Food Park	NA	Multi commodity
4	Meghalaya	East Khasi Hills		
		Meghalaya S. A.M.B. Cold storage, Mawing, Shillong	1000	Multi commodity
		West Garo Hills		
		Meghalaya S.A.M.B. Cold Storage,	1000	Multi commodity
		Ri Bhoi		
		N.L. Cold Storage	1200	Multi commodity
5	Mizoram	NA		
6	Nagaland	Dimapur		
		MARCOFED Cold storage, Dimapur	1500	Multi commodity
		Doulo Builders & Suppliers Co (P) Ltd,	5000	Multi commodity
7	Tripura	Khowai		
		Teliamura	500	Potato
		Sipahijala		
		Melaghar	3500	Potato, Fruits, Vegetables
		South Tripura		
		Baikhora	2000	Potato, Fruits, Vegetables
		Satchand	1000	Potato, Fruits, Vegetables
		Belonia	2000	Potato, Fruits, Vegetables, Betel Leaf
		Harina	5000	Multi Commodity
		Gomati		
		Amarpur	1000	Potato, Fruits, Vegetables
		Unakoti		
		Kumarghat	2000	Single
		Sherowali	5000	Multi Commodity
		Haflong	3000	Potato
		West Tripura		
		Khumtaya 1	3000	Single
		Khumtaya 2	2000	Single
		Others		
		CWC	1000	Single
		Bhuturia	2000	Single
		Agt. Food Processing	24500	-

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Annexure E: Import Export Data - Land Customs Stations/Integrated Check Posts (11-12 to 15-16)

			Export of agricultural commodities from different Land Customs Stations (LCS) - NER (2015-16)		
Moreh - Manipur			Ghasuapara - Meghalaya		
Commodity	Qty (MT)	Value (INR)	Commodity	Qty (MT)	Value (INR)
Wheat Flour	4999.50	134986500	Ginger	10.50	207270
Dry Chilli	448	33600000			
Dry Grapes	268.14	44243100	Mankachar - Assam		
			Commodity	Qty (MT)	Value (INR)
Dawki - Meghalaya			Ginger	187	2529184.00
Commodity	Qty (MT)	Value (INR)			
Betel Leaves	81.87	197543.55	Hatisar - Assam		
Bay Leaves	48.98	186105.86	Commodity	Qty (MT)	Value (INR)
Ginger	60.58	726394.07	Rice	15829.475	279383387
Tomato	175.23	1282832.68	Maize	207.806	2875287
Cabbage	4.25	24545.88	Potato chips	4922*	2657840
Radish	1.9	12250.5	* Cartons		
Orange	18.7	181844.39	Old Ragnabazar - Tripura		
			Commodity	Qty (MT)	Value (INR)
Mahendraganj - Meghalaya			Pomegranate	3	72427
Commodity	Qty (MT)	Value (INR)	Apple	14.44	373525
Ginger	1342	24886573	Orange	388.826	7782638
Betel Nut	763	9348646			
			Sutarkandi - Assam		
			Commodity	Qty (MT)	Value (INR)
			Tomato	23.605	437689
			Ginger	873.707	15572196
			Betel Leaf	0.89	49662
			Orange	619.388	7339817
			Apple	401.421	10094384
			Banana	3	16456
			Mango	15.836	315548
			Pomegranate	16.23	391059
			Karimganj - Steamerghat - Assam		
			Commodity	Qty (MT)	Value (INR)
			Ginger	4178.986	76035859
			Orange	1155.107	22302730
			Mango	2.16	38880
			Betel Leaves	25.513	1352189
			Tomato	12.525	249191
			Grapes	2.763	69075.00
			Manu - Tripura		
			Commodity	Qty (MT)	Value (INR)
			Banana	2.50	14723
			Apple	7.65	195258
			Pomegranate	2.50	43017
			Agartala - Tripura		
			Commodity	Qty (MT)	Value (INR)
			Vegetable seeds	0.15	76645.43

Export of agricultural commodities from different Land Customs Stations (LCS) - NER (2014-15)

Moreh - Manipur		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>
Wheat Flour	5042.3	1109.19
Pulses	4208.7	2525.22
Peas	200	74

Dawki - Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>

Mahendraganj - Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Ginger	1589.5	283.77146
Betel Nut	36.5	4.10676

Ghasuapara - Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>

Mankachar - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>
Wheat	12	1.8798
Ginger	7	1.51962

Hatisar - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>
Rice	448665.0 6	1522.09844
Maize	5681.788	764.70943

Old Ragnabazar - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>

Sutarkandi - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>
Tomato	8	85000
Ginger	2,460.59	43323000
Citrus	1.82	27000
Orange	10.968	135000

Karimganj - Steamerghat - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>
Ginger	4302.454	69470000
Orange	800.764	10138000
Mango	6.784	115000
Betel Leaves	11.244	592000
Tomato	27.534	413000

Manu - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>
Banana	21.00	109000
Litchi	0.5	8100
Grapes	0.50	8700

Agartala - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR lakh)</i>

Export of agricultural commodities from different Land Customs Stations (LCS) - NER (2013-14)

Moreh – Manipur		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR Lacs)</i>
Wheat Flour	4283.85	930.4
Peas	620	223.15
Other vegetables	81.4	56.33
Lentils	18	10.6

Dawki – Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Tomatoes	13.17	0.05

Mahendraganj – Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Arecanuts	9.25	1.71
Betel Nuts	10	1.03

Ghasuapara - Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Mankachar - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Hatisar - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Rice Parboiled	8881.18	1544.64
Rice Semi Milled	2657.9	454.69

Old Ragnabazar - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Citrus Fruit	0	0.62
Bananas	4.00	0.24

Sutarkandi - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Onions	540	151.86
Dried Onions	21.00	14.72
Other Citrus	66	10.05
Lemon	62	9.16
Oranges	55	6.68
Tomatoes	12	1.98

Karimganj - Steamerghat - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Oranges	1175.7	156.39
Other Citrus	691	122.34
Onions	72	20.66
Mangoes	110	15.48
Grapes	4.25	1.12
Lemons	21.35	2.69
Tomatoes	13.9	1.24

Manu - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Agartala - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Export of agricultural commodities from different Land Customs Stations (LCS) - NER (2012-13)

Moreh – Manipur		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR Lacs)</i>
Betel Nut	48	1728000
Cumin Seeds	2110.3	249716500
Wheat Flour	826.95	26986050

Dawki – Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Mahendraganj – Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Ginger	852	11458575
Betel Nut	337	2304937

Ghasuapara - Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Mankachar - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Ginger	297	3913426

Hatisar - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Orange	255967	75632800

Old Ragnabazar - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Citrus Fruits	0.148933	2013949

Sutarkandi - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Orange	1141	12683250
Ginger	12756	168616703
Tomato	6.596	98986
Betel Leaves	60	2905320

Karimganj - Steamerghat - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Orange	78	860520
Citrus Fruits	157.863	2132166
Ginger	3602	48265951
Betel Leaves	0.481	21926

Manu - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Ginger	7.781	34364
Banana	6	30229

Agartala - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Citrus Fruits	44	443075

Export of agricultural commodities from different Land Customs Stations (LCS) - NER (2011-12)

Moreh – Manipur		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR Lacs)</i>
Cumin Seeds	124.5	12400000

Dawki – Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Mahendraganj – Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Betel Nut	144	973742

Ghasuapara - Meghalaya		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Mankachar - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Hatisar - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Orange	3208.144	101678297

Old Ragnabazar - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Orange	0.011048	132577
Citrus	0.04651	533584
Banana	5.54	24459

Sutarkandi - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Orange	1141	12683250
Citrus	16.47	201106
Ginger	1479.15	26861573
Tomatoes	2.99	35976
Betel Leaves	63.33	1585637

Karimganj - Steamerghat - Assam		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Orange	1948	24862503
Citrus	101.49	1106523
Ginger	3561.14	56893005
Betel Leaves	25.05	1524288

Manu - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>
Banana	5.5	25079
Ginger	5.54	201821

Agartala - Tripura		
<i>Commodity</i>	<i>Qty (MT)</i>	<i>Value (INR)</i>

Annexure F: Approximate costs considered to calculate ROI for various products

S. NO	Product	Machinery	Ideal Capacity for NE (MT)	Cost (lacs)	Final Product Cost/ kg	Life of Plant	Revenue (in mn)	ROI	Ease of manufacturing
		GINGER							
1	Packed Ginger	Pack house	4000	600	100	15	6000	99	3
2	Ginger powder	Drying and milling plant	3000	320	180	10	5400	168	4
3	Dried ginger flakes	Drying plant	1000	150	130	10	1300	86	3
4	Dry Ginger	Drying plant	1000	120	120	10	1200	99	2
5	Ginger pickles	Processing plant	50	30	300	7	105	34	2
6	Ginger oil	Distillation plant	500	200	2000	10	10000	499	2
7	Ginger Oleoresin	-	NA	NA	NA	NA	NA	NA	NA
8	Crystallized ginger	Processing plant	50	30	300	5	75	24	3
9	Sushi ginger	-	NA	NA	NA	NA	NA	NA	NA
10	Fresh ginger	-	NA	NA	NA	NA	NA	NA	NA
		LEMON							
11	Pickles	Processing plant	50	30	300	7	105	34	2
12	RTS Beverages/ Squashes	Processing plant	200	48	150	10	300	62	3
13	Fresh Lemon	Pack house	4000	600	65	15	3900	64	4
14	Dried Lemon Peel	Drying and milling plant	100	90	90	10	90	9	2
15	Candied Lemon Peel	Processing plant	50	30	200	5	50	16	2
16	Lemon Juice concentrate	Juice and aseptic line	2000	400	200	15	6000	149	4
17	Pectin	-	NA	NA	NA	NA	NA	NA	NA
		PINEAPPLES							
18	Fresh pineapples	Pack house	5000	720	35	15	2625	35	4
19	RTS Beverages/ Squashes	Processing plant	100	50	200	10	200	39	3
20	Canned Pineapple/tidbits	Canning line	3000	650	300	8	7200	110	4
21	Candied Pineapple pieces	Processing plant	200	150	350	5	350	22	2

22	Pineapple juice concentrate	Juice and aseptic line	5000	650	250	15	18750	287	4
23	Freeze dried snacks	-	NA	NA	NA	NA	NA	NA	NA
		CHILLIES							
24	Pickles	Processing plant	50	30	200	7	70	22	2
25	Fresh chillies	Pack house	3000	440	40	15	1800	40	3
26	Dried chillies	Drying plant	1000	100	100	7	700	69	2
27	Dry chilli powder/ flakes	Drying and milling plant	1000	100	120	7	840	83	3
28	Pickled/ brined chillies	Processing plant	300	70	200	10	600	85	3
29	Sauces and spreads	Processing plant	300	65	300	10	900	137	3
30	seasonings	Processing plant	500	120	250	8	1000	82	2
31	Pigments	-	NA	NA	NA	NA	NA	NA	NA
32	Chilli oleoresins	-	NA	NA	NA	NA	NA	NA	NA
		KIWI							
33	Fresh kiwis	Pack house	2000	350	200	15	6000	170	4
34	Dried/ Candied kiwi	Processing plant	100	70	400	8	320	45	3
35	IQF Kiwi slices	Frozen food unit	500	1200	300	10	1500	12	2
36	RTS Beverages/ Squashes	Processing plant	100	30	250	10	250	82	3
37	Kiwi pulp	Juice and aseptic line	1000	220	300	15	4500	204	3
38	Kiwi juice concentrate	Juice and aseptic line	1000	220	400	15	6000	272	3
39	Kiwi wine	Winery	500	800	700	15	5250	65	2
		BANANA							
40	Fresh banana	Pack house	5000	600	40	15	3000	49	3
41	Dried banana slices	Processing plant	100	70	150	10	150	20	2
42	RTS Beverages/ Squashes	Processing plant	200	50	200	7	280	55	3
43	Banana Pulp/puree	Juice and aseptic line	2000	600	250	15	7500	124	3
44	Banana powder	Processing plant	2000	350	250	10	5000	142	3
45	Freeze dried snacks	-	NA	NA	NA	NA	NA	NA	NA
46	Snacks others	Processing plant	200	90	300	7	420	46	3
		ORANGES							
47	Fresh oranges	Pack house	4000	650	60	15	3600	54	4

48	RTS Beverages/ Squashes	Processing plant	250	65	200	7	350	53	3
49	Candied orange peel	Processing plant	50	30	150	7	52.5	17	2
50	Dried orange peel	Processing plant	50	45	150	7	52.5	11	2
51	Jams and marmalades	Processing plant	200	90	300	10	600	66	3
52	Orange juice concentrate	Juice and aseptic line	4000	670	300	15	18000	268	4
53	IQF Orange pieces	Frozen food unit	1000	1200	400	15	6000	49	3
54	Frozen pulp	Frozen food unit	500	1200	400	15	3000	24	2
55	Pectin	-	NA	NA	NA	NA	NA	NA	NA
56	Orange oil	-	NA	NA	NA	NA	NA	NA	NA
		JACKFRUIT							
57	Fresh jackfruits	-	NA	NA	NA	NA	NA	NA	NA
58	Canned Jackfruits bulbs	Canning line	1000	320	250	10	2500	77	3
59	Dried jackfruits slices	Processing plant	300	200	200	7	420	20	3
60	Preserves/jams	Processing plant	100	65	200	7	140	21	2
61	Fruit snacks	Processing plant	100	65	300	7	210	31	2
		RICE							
62	Bao Rice	Rice Mill	NA	NA	NA	NA	NA	NA	NA
63	Joha rice	Rice Mill	NA	NA	NA	NA	NA	NA	NA
64	Processed Rice flakes	Processing plant	100	60	200	10	200	32	2
65	RTE snacks	Processing plant	80	55	250	7	140	24	2
66	Breakfast cereals	Processing plant	100	90	220	10	220	23	3

Annexure G: List of Stakeholders contacted

#	State	City	Organization	Contact Person	Designation	Landline	Cell	Fax	Email	Address (Full)
1	Arunachal Pradesh	Itanagar	Horticulture Processing & Marketing Board	Mr. Rudham Sindhu	Director	NA	+91-8258905649	NA	NA	NA
2	Arunachal Pradesh	(Itanagar) Pune	Rhythm Winery	Mr. Akalpiti	MD & CEO	NA	+91-9881735946	NA	NA	NA
3	Arunachal Pradesh	Aalo	Horticulture Department	Mr. H Dirchi	Dist. Horticulture Officer	NA	+91- 8119025995	NA	NA	NA
4	Arunachal Pradesh	Ziro	Horticulture Department	Mr. Klomri Mortem	Dist. Horticulture Officer	NA	+91- 9436634842	NA	NA	NA
5	Arunachal Pradesh	Itanagar	Horticulture Processing & Marketing Board	Mr. Taw Papu	Horticulture Marketing Officer	NA	+91- 9402275051	NA	NA	NA
6	Arunachal Pradesh	Itanagar	Horticulture Processing & Marketing Board	Mr. Dego Ronya	Horticulture Marketing Officer	NA	+91-9436255885	NA	NA	NA
7	Arunachal Pradesh	Itanagar	Department of Industries & Commerce	Mr. Tokong Pertin		NA	+91- 9436229778	NA	NA	NA
8	Arunachal Pradesh	Itanagar	Horticulture Department	Mr. Kamo Ado	Mission Director HMNEH	NA	+91- 9863585131	NA	NA	NA
9	Arunachal Pradesh	Itanagar	Secretariat	Mr. Gamli Padu	Secretary - Horticulture	NA	+91-9402275042	NA	NA	NA
10	Assam	Guwahati	NABARD - Assam Regional Office	Dr. K. U. Viswanathan	General Manager	0361-2232227	+91-9422362684	0361-2235657	ku.viswanathan@nabard.org/vi swaku@hotmail.com	NABARD - Assam Regional Office, Opposite Assam Secretariat, GS Road, Dispur, Guwahati - 781 006
11	Assam	Guwahati	Assam Industrial Infrastructure Dev. Corporation (AIIDC)	P.K. Saikia	Managing Director	0361-2556834	+91-9435015207	NA	pksaikia@hotmail.com	A-4, RG Baruah Road, Ambikagirinagar, Guwahati, Assam 781024
12	Assam	Guwahati	National Horticulture Board	Sh. Prem Narayan	Dy. Director	0361-2343719,	+91-9415801944	0361-2340695	nrbghy@gmail.com	National Horticulture Board Chhibber House, 4th Floor, Dispur P.O., Guwahati-781 005
13	Assam	Guwahati	SFAC- Small Farmers agribusiness consortium	Santosh Kr. Das	Regional Incharge	0361-2340337	+91-9436132237	0361-2340337	sfacght@gmail.com/dassantos hkr@gmail.com	Jain Complex, 3rd Floor, G.S. Road, Near Dispur, Old Post Office, Guwahati-781005
14	Assam	Guwahati	ECGC- Export Credit Guarantee Corporation of India	Ramreisem R. Shimray	Branch manager	0361-2635983	+91-9706031940	0361-2635983	ramreisem.shimray@ecgc.in	H.P. Brahmchari Road, Near Nepali Mandir, Sharma Building, 3rd Floor, P.O. Guwahati-781008

15	Assam	Jorhat	Department of Horticulture, AAU	Dr. Utpal Kotoky	Professor	0376-2340098	+91-9435052660	0376-2340101	ukotoky@gmail.com	Department of Horticulture, Assam Agricultural University, Jorhat-785013, Assam
16	Assam	Jorhat	Department of Agricultural Economics, AAU	Prof. Nilotpal Borthakur	Professor	0376-2340101	+91-9435352463	0376-2340001	nilotpal.b@rediffmail.com	Department of Agricultural Economics, Assam Agricultural University, Jorhat-785013, Assam
17	Assam	Jorhat	Meghalee Food Products	Meghalee Bora	Proprietor	NA	+91-9954183527	NA	meghafoods@yahoo.com	Meghalee Food Product, Borbheta, Jorhat-5
18	Assam	Guwahati	Export-Import Bank of India	Anirudha Barooah	Regional Head	0361-2237902	+91-9830705819	0361-2237701	anirudha.barooah@eximbankindia.in	NEDFI House, 4th Floor, Dispur, G.S.Road, Guwahati 781 006
19	Assam	Guwahati	Inland Container Depot (ICD) – Amingaon	Adhir Ch. Das	Terminal Manager	0361-2680461/2680511	+91-9678044300	0361-2680461/2680511	amj.tm@concorindia.com	Amingaon, Guwahati
20	Assam	Guwahati	Assam Agriculture Marketing Board	Bulbul Hussain	Executive Engineer	0361 213 0187	+91-9435016456	NA	NA	RK Mission Rd, Ulubari, Guwahati, Assam 781007
21	Assam	Guwahati	APEDA - Guwahati Regional Office	Sunita Rai	Assistant General Manager	0361 248 0890	+91-9707315705	NA	NA	3rd Floor, Jain Complex, Guwahati - Shillong Rd, Near Post Office, Christian Basti, Guwahati, Assam 781005
22	Assam	Guwahati	Department of Agriculture - Assam	Taufiq Chisti	Joint Director - Statistics	NA	+91-9435102698	NA	NA	Department of Agriculture, Khanapara, Guwahati, Assam
23	Assam	Guwahati	Export Credit Guarantee Corporation of India Limited - Assam	R. Shinray	Branch manager	0361 2635 983	NA	0361 2635 983	guwahati@ecgc.in	H P Bramachari Road, Near Nepali Mandir, P O Rehabari, Guwahati - 781 008.
24	Assam	Dibrugarh	District Regulated Marketing Committee - DMRC Dhemaji	Rakhmail Hussain	Manager	NA	+91-7086082491	NA	NA	Silapathar, Dhemaji, Assam
25	Assam	Guwahati	Seven Foods Processing	N P Yadav	Chairman	0361 246 6019	+91-9864264165	NA	NA	3rd floor, Seven Square, Opp. Pizza Palace, Dr. B. Baruah Road, Ullubari, Guwahati, Assam 781007
26	Assam	Karimganj	Karimganj Fresh Foods & Spices Exporters & Importers Association	Abdul Hamid	President	NA	+91-9435503894	NA	NA	Karimganj, Assam, 788710

27	Assam	Sutharkandi	Land Custom Station – Sutharkandi	N Ravikumar Singh/Sudit Bhattacharjee	Inspector/Superintendent	NA	NA	NA	NA	Sutarkhandi, Karimganj District, Assam, 788710
28	Assam	Karimganj	Land Custom Station - Karimganj Steamer Ghat	S. Chakraborty	Superintendent	03843-262531	NA	NA	NA	Steamer Ghat, Karimganj, Assam 788710
29	Assam	Guwahati	NABARD - Assam Regional Office	Swati Karki	Manager	0361-2238115	+91-8811078913	0361-2235657	swati.karki@nabard.org	NABARD - Assam Regional Office, Opposite Assam Secretariat, GS Road, Dispur, Guwahati - 781 006
30	Assam	Guwahati	NABARD - Assam Regional Office	Dr. P.S. Harikrishnaraj	Asst. GM	0361-2238010	+91-8811094702	0361-2235657	ps.harikrishnaraj@nabard.org/psharikrishnaraj@gmail.com	NABARD - Assam Regional Office, Opposite Assam Secretariat, GS Road, Dispur, Guwahati - 781 006
31	Assam	Guwahati	Federation of Indian Export Organisations (FIEO)	Kaushik Dutta	Chapter Incharge	0361-2739888	+91-9954370400	NA	fieonortheast@fio.org/kaushikdutta@fio.org	1st Floor, N.N. Tower, H. No. 23, Dr. S.K. Bhuyan Road, Dighali Pukhuri (East), Guwahati - 781001
32	Assam	Guwahati	North East Mega Food Park	Rajib Biswas	Chief Financial Officer	0361-2736293	+91-9435111675	0361-2736294	northeastmfp@gmail.com/rajob@nefoodpark.com	Hotel Brahmaputra Ashok, MG Road, Guwahati - 781 001
33	Manipur	Imphal	Manipur Small Farmers Agribusiness Consortium (SFAC)	M.S. Khaidem	Project Coordinator	0385-2450515	+91-9612692315/9436026172	0385-2450515	ms_khaidem05@yahoo.com	Near Directorate of Agriculture, Sanjenthong, Imphal - 795001
34	Manipur	Imphal	Manipur Organic Mission Agency (MOMA)	K. Debadutta Sharma	Chief Executive Officer	0385-2441588	+91-9436201922/8014843226	0385-2441588	devduttas@rediffmail.com/manipurorganic@gmail.com	Near Directorate of Agriculture, Sanjenthong, Imphal - 795001
35	Manipur	Imphal	Exotic Juices Limited	Losi Dikho	Proprietor	NA	+91-8414099654	NA	NA	Punanamei, Mao Village, LS/PUB, Senapati Dist, Manipur. Pin code – 795 150
36	Manipur	Imphal	Thangjam Agro Industries Limited	Joykumar Thangjam	Managing Director	0385-2421350	+91-8974009452	NA	thangjamagro@gmail.com/joythangjam60@gmail.com	Chingmeirong East, Imphal - 795001
37	Manipur	Imphal	Department of Industries & Commerce, Imphal, Manipur	Elangbam Jeeten Singh	Deputy Director of Industries	NA	+91-9436030270/8257838209	NA	ejeetensingh@gmail.com	DIC Building, Lamphelpat, Imphal - 795001

38	Manipur	Imphal	Directorate of Horticulture	T. Pamei (IAS)	Commissioner	0385-2449076	+91-8794762298	NA	athuidaniel2015@gmail.com	201-Western Block, Manipur Secretariat, Imphal - 795001
39	Manipur	Imphal	Regional Center for Organic Farming	Mr. Pandey	Director	NA	+91-9402651462	NA	NA	Shija Road, Imphal - 795001
40	Meghalaya	Shillong	Meghalaya Marketing Board	Dr. PG. Lynrah	Secretary	0364-2227247	+91-9436100280	NA	NA	Shillong, Meghalaya
41	Meghalaya	Shillong	Department of Horticulture - Meghalaya	Pranjal Dutta	Horticulture Marketing Development Officer	NA	NA	NA	NA	Dhankheti, Malki, Shillong, Meghalaya 793001
42	Meghalaya	Shillong	Department of Horticulture - Meghalaya	WH Pakyntien	Agriculture Information Officer	NA	NA	NA	NA	Dhankheti, Malki, Shillong, Meghalaya 793001
43	Meghalaya	Shillong	Department of Horticulture - Meghalaya	Hannah Lyngdoh	Horticulture Development Officer - Fruit Preservation Centre	NA	NA	NA	hannahlyngdoh@gmail.com	Dhankheti, Malki, Shillong, Meghalaya 793001
44	Meghalaya	Shillong	NER Customs Office	MP Joshi	Superintendent - Preventive	NA	+91-9863113018	NA	NA	Office of the Commissioner of Customs (Preventive), 110, Mahatma Gandhi Road, Shillong-793001, Meghalaya
45	Meghalaya	Shillong	NER Customs Office	Subdeep Choudhary	Superintendent - Technical	NA	+91-9402132555	NA	NA	Office of the Commissioner of Customs (Preventive), 110, Mahatma Gandhi Road, Shillong-793001, Meghalaya
46	Meghalaya	Shillong	NER Customs Office	Mr. Wajir	Inspector - Technical	NA	NA	NA	NA	Office of the Commissioner of Customs (Preventive), 110, Mahatma Gandhi Road, Shillong-793001, Meghalaya
47	Meghalaya	Shillong	NER Customs Office	Mr. Baidya	Superintendent - Statistics	NA	+91-9863249412	NA	NA	Office of the Commissioner of Customs (Preventive), 110, Mahatma Gandhi Road, Shillong-793001, Meghalaya
48	Mizoram	Aizawl	Department of Horticulture	Mr. R Zotawna	Director	0389-2314370	+91- 9436151320			
49	Mizoram	Aizawl	Department of Industries	Mr. Hmingthanmawia	Director	0389-2322450	+91-			
50	Mizoram	Aizawl	Entrepreneur	Ms. P.C Lalawmpuii	-		+91-8974564513			

51	Mizoram	Aizawl	New Land Use Policy Implementation Board	Mr. P L Thanga	Secretary		+91-9436354415			
52	Assam	Guwahati	Entrepreneur - Arohan Foods	Mr. Anabil Goswami	MD & CEO		+91-8011050520			
53	Mizoram	Aizawl	Department of Customs	Mr. Haulkim	Assistant Commissioner	3692346515	+91-			
54	Nagaland	Dimapur	Exodelicia Food Product & Kuda Cold Storage	L. Doulo	Proprietor & MD	03862-243375	+91-9436008303/9612836651	NA	link4efp@gmail.com	NH 29, 5th Mile Model Village, Dimapur - 797112, Nagaland
55	Nagaland	Dimapur	Nagaland Industrial Development Corporation Limited	Temjen Y Jamir	Deputy Manager	03862-244117	+91-9436266379	03862-228209	tyjamir@yahoo.com	IDC House, Dimapur - 797112, Nagaland
56	Nagaland	Dimapur	Nagaland Industrial Development Corporation Limited	Taku Jamir	Managing Director	03862-230571-73	+91-9436002652	03862-228209	nidc@nagaind.com	IDC House, Dimapur - 797112, Nagaland
57	Nagaland	Kohima	Directorate of Horticulture, Government of Nagaland	Watienla Jamir	Director (Hort.)/Mission Director (HMNEH)	0370-2221311	+91-9436607747	0370-2221311	hortidte09@gmail.com	Directorate of Horticulture Government of Nagaland, Kohima-797001.
58	Nagaland	Dimapur	Central Institute of Horticulture	Dr. Lallan Ram	Director	03862-247088	+91-9423404432/94362276767	03862-247088	cihnerdir@gmail.com/lrjaiswar@rediffmail.com/allanram09@gmail.com	Dept. of Agriculture & Cooperation, Medziphema, Dimapur, Nagaland - 797106
59	Nagaland	Kohima	Directorate of Industries & Commerce	Khrielie Peseyie	Deputy Director (Food Processing)	NA	+91-9436009838	NA	directorsmfp@gmail.com/khrpsy@gmail.com	Directorate of Industries & Commerce, Near Hotel Vivor, Wokha Road, Kohima, Nagaland
60	Nagaland	Dimapur	Medicinal & Aromatic Farming, Nursery & Oil Production Limited	K. Nihokhu Chopi	Managing Director	NA	+91-9436060701	NA	kn.chopi@yahoo.co.in	PO 350, Unity Village Block II, 5th Mile, Opposite Green Park, Dimapur - 797112, Nagaland
61	Nagaland	Dimapur	Naga Spices Limited	Abeu Mero	Proprietor	NA	+91-9856125529	NA	NA	Near Holy School Plaza Point, Dimapur, Nagaland
62	Sikkim	Gangtok	Mevedi	Mr. Lepcha	Owner	NA	+91-9733180740	NA	NA	NA
63	Sikkim	Gangtok	Greengrocers	Mahesh Dawari	Managing Director	NA	+91-8972859436	NA	sikkim.greengrocers@gmail.com	Greengrocer, Near Govt. College, Tadong - 737101, Sikkim
64	Sikkim	Gangtok	FPO, East Sikkim	B.Chen Bhutia	NA	NA	+91-9635746139	NA	NA	NA
65	Sikkim	Gangtok	Sam Route Logistics	NA	NA	NA	+91-9832005914	NA	NA	NA
66	Sikkim	Gangtok	Nature Gift	Vivek Centuri	Owner	NA	+91-8967560714	NA	NA	NA
67	Sikkim	Gangtok	NA	Nation Chamling	Owner	NA	+91-8906458798	NA	NA	NA

68	Sikkim	Gangtok	Service provider Organic certification	Mr. Hoshiyar	Incharge	NA	+91-9434448275	NA	NA	NA
69	Sikkim	Namchi	Maivnam Gardens	Nirmala Rai	Manager	NA	+91-943448804	NA	NA	Namchi, East Sikkim
70	Sikkim	Gangtok	Bee Keeping Trainer	C. K. Rai	NA	NA	+91-9749854771	NA	NA	NA
71	Sikkim	Gangtok	SIMFED	Mr. Roger R. Rai	Managing Director	NA	NA	NA	md@simfed.in	Sikkim State Cooperative Supply & Marketing Federation Ltd., Sonam Gyasto Marg, Gangtok, East Sikkim-737101 INDIA
72	Sikkim	Gangtok	SIMFED	Kailash Rai	GM-IV (Floriculture & Agriculture Inputs)	NA	+91-9832014342	NA	gmiv.fai@simfed.in	Sikkim State Cooperative Supply & Marketing Federation Ltd., Sonam Gyasto Marg, Gangtok, East Sikkim-737101 INDIA
73	Sikkim	Gangtok	SIMFED	Jiwan Sharma	GM-V (Marketing)	NA	+91-9475013947	NA	gmv.marketing@simfed.in	Sikkim State Cooperative Supply & Marketing Federation Ltd., Sonam Gyasto Marg, Gangtok, East Sikkim-737101 INDIA
74	Sikkim	Gangtok	Progressive Farmer	Karma Bhutia	NA	NA	+91-9635746139	NA	NA	NA
75	Sikkim	Gangtok	College of Agriculture, Gangtok	Srivastava	NA	NA	+91-9434711030	NA	NA	NA
76	Sikkim	Gangtok	Organic Sikkim	Binita Chamling	Managing Director	NA	+91-9971391975	NA	NA	NA
77	Sikkim	Gangtok	Echostream	Sonam Tashi Gyaltzen	Product Designer	NA	+91-9474522599	NA	NA	NA
78	Sikkim	Gangtok	Orchid grower	Kumar Yonjan	Owner	NA	+91-9832032996		NA	NA
79	Sikkim	Gangtok	Horticulture Department, Govt. of Sikkim	Padam Subba	Joint Director - Model Floriculture Centre, HCCDD	NA	+91-9434110106	NA	padamsubbacool@gmail.com	NA

80	Sikkim	Rumtek-Gangtok	Cymbidium Development Centre	Pama Bhutia	Project Head	NA	+91-7699227601	NA	NA	Cymbidium Development Centre(Under Dept. of Horticulture-Sikkim), Roomtek, Gangtok
81	Sikkim	Gangtok	Dept. of Horticulture	Anita Thapa	Joint Director-Horticulture (East)	NA	+91-9593444413	NA	NA	Krishi Bhawan, Upper Tadong, Tadong, Gangtok, Sikkim 737102
82	Sikkim	Gangtok	Himalayan Orchids Pvt. Ltd.	Dilkhush	Incharge	NA	+91-8906000999	NA	NA	NA
83	Sikkim	Gangtok	Dept. of Horticulture	Kesan Lachungpa	Information-Orchid clusters				NA	NA
84	Sikkim	Siliguri	Marketing Yard - Siliguri (SIMFED)	Ganga Sharma	Dep. Manager	NA	+91-9733866416	NA	NA	Siliguri Regulated Market Committee, Siliguri
85	Sikkim	Gangtok	Mainam Gardens - Namchi. S. Sikkim	Satyam	General Manager	NA	+91-9733007799	NA	NA	NA
86	Sikkim	Gangtok	Dept. of Horticulture - Fruits, Nurseries, Farms, Bee keeping	Shri H.C. Pradhan	Addl. Director	NA	NA	NA	NA	Krishi Bhawan, Upper Tadong, Tadong, Gangtok, Sikkim 737102
87	Sikkim	Gangtok	Sikkim Organic Mission	Shri Mani Kr. Pradhan	Additional Executive Director (ICS & Cert.)	NA	+91-9002728602	NA	NA	Krishi Bhawan, Upper Tadong, Tadong, Gangtok, Sikkim 737102
88	Sikkim	Gangtok	Dept. of Horticulture (Extension)	Mrinalini Srivastav - IPS	Capacity Building officer	NA	+91-9932378632	NA	NA	Krishi Bhawan, Upper Tadong, Tadong, Gangtok, Sikkim 737102
89	Sikkim	Gangtok	Shoten Group	Abhimanyu Dhakal	NA	NA	+91-9641793246	NA	NA	NA
90	Tripura	Agartala	Department of Commerce & Industries	Swapan Mitra	Manager (M&E)	0381-2415586	+91-9436454387	NA	swapan.mitra23@gmail.com	Department of Industries & Commerce, Khejurbagan, Near Hotel Ginger, Agartala, Tripura

91	Tripura	Agartala	Department of Commerce & Industries	Sapna Debnath	Addn. Director (Food Processing)	0381-2415586	NA	NA	NA	Department of Industries & Commerce, Khajurbehan, Near Hotel Ginger, Agartala, Tripura
92	Tripura	Agartala	Land Ports Authority of India	D. Nandi	Manager	0381-2328842	+91-9436582693	0381-2328842	agt.icp@gmail.com/nandidebasis@rediffmail.com	Ministry of Home Affairs, Government of India, Integrated Check post, Agartala - 799001, Tripura
93	Tripura	Agartala	Department of Horticulture & Soil Conservation. Tripura	M. Sukaladas	Additional Director	0381-2324739	+91-9436456116	0381-2324739	dhctripura@yahoo.co.in/tmcelltripura@gmail.com	Department of Horticulture & Soil Conservation. Government of Tripura, Paradise Chowmahani, Agartala-799001, Tripura

Annexure H: Upcoming road and railway projects in NER

SR. NO.	NAME OF PROJECT	BENEFICIARY STATE	STATUS
1	Agartala Sabroom Line	Tripura	Targeted for completion by March 2018
2	Agartala Akhaura (Bangladesh)	Tripura	Land acquisition in progress.
3	Bhairabi Sairang Line	Mizoram	Land acquired. Earthwork and tunneling in progress.
4	New Moynaguri-Jogighopa NL with GC of New Mal Moynaguri Road & New Changrabandha- Changrabandha	Assam	Bridgework under progress.
5	Bogibeel Bridge with linking lines between Dibrugarh and North Bank Line	Assam	Foundations and girders installed. Railway links also completed at both ends. A new bridge over Brahmaputra for access into Arunachal Pradesh through Upper Assam relieving load on the Tezpur bridge which is the only current option.
6	Byrnihat-Shillong	Meghalaya	Location survey completed. Work on hold due to local agitations.
7	Tetiliya- Byrnihat	Meghalaya	Earthwork and bridge work taken up. Delays due to land procurement in some areas.
8	Jiribam-Imphal	Manipur	Earth work, bridges work and tunnel work in progress. Targeting completion by 2019 covering 2 more sections.
9	Sivok – Rangpo	Sikkim	Forestry and wild life clearance awaited.
10	Murkongselek – Pasighat	Arunachal Pradesh	Land acquisition in process.
11	Dimapur-Kohima	Nagaland	Contract awarded. Marking of alignment done. Delays due to disagreement with state government.
12	Dimapur – Tizit Line	Nagaland	Clearance from Cabinet Committee awaited.

Annexure I: State Profiles

Arunachal Pradesh

Arunachal Pradesh is characterized by rough and undulating topography and is categorized by numerous rivers and streams which originate in higher Himalayas. Owing to swift changes in topography and altitude, the climatic conditions changes within short distances. The state has three distinct agro-climatic zones i.e. subtropical, sub temperate and temperate. According to the 2011 census, the state population is 1, 382,611 out of which 77% is rural population and remaining 3% is urban population.

The total area of Arunachal Pradesh is 83.74 lakh hectares of which 4.24 lakh hectares is cultivable area whereas net sown area of the state is 2.13 lakh hectares. The major agricultural and horticultural crops of the state are citrus (mandarin orange), pineapple, banana, kiwi, apple, ginger and potatoes. The state of Arunachal Pradesh has tremendous potential for horticultural crops. In 2015-16, the state has produced 3.06 lakh MT of fruits, 0.33 lakh MT of vegetables, and 0.36 lakh MT of spices.

The following table shows the area, production and regions in which they are grown for major crops of Arunachal Pradesh.

S No.	Crop	Area (in ha)	Production (in MT)
1	Banana	5,421	31,644
2	Pineapple	6,964	37,332
3	Orange	42,640	2,17,044
4	Ginger	4,081	20,996
5	Apple	4,682	7,281
6	Kiwi	3,379	6,047
7	Large cardamom	8,300	1,757

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Due to lack of infrastructure in terms of marketing, processing and storage huge quantity of produce is lost. Reducing the wastage of these crops by building proper infrastructure, the surplus quantities can be utilized for export purpose.

Though Arunachal Pradesh has a huge potential for horticultural crops, still there are various challenges that need to be addressed. The major challenges which are there in the state are less area under cultivation, low productivity, subsistence cultivation practices, poor interstate and intrastate connectivity, absence of supportive infrastructure and many more. Various measures have to be taken to address these challenges like building of infrastructure in terms of market linkages, processing and storage facilities.

Case Study: Kiwi Wine – Arunachal Pradesh

Compared to others, Kiwi has been a new prospect comparatively when it comes to the fruit produce in the NER. Arunachal Pradesh is the primary producer of Kiwi in the NER (4720 MT in 2015)*. Other regions include mid hills of Himachal Pradesh, Uttar Pradesh, J & K, Sikkim, Meghalaya and Kerala. The fruit has high nutritive and medicinal value. It is a rich source of vitamin B & C and minerals like phosphorus, potassium & calcium. Fruits are consumed fresh or combined with other fruits in salads and desserts. Few small scale cottage industries are involved in production of kiwi jam and squashes, but in limited quantity and geographical spread. Ripening period ranges from October to December, which is the lean period for other fruits in the NER. Hence price of Kiwi is always comparatively high. Monty, Harvard, Bruno and Allison. The fruit is mostly grown in the state's West Kameng and Lower Subansiri districts.

However, Arunachal Pradesh has faced a hindrance in terms of making use of the quantity it is producing. Most products don't have a substantial local demand. Hence, the authorities were faced with a dilemma of how to make use of the quantum of kiwi available locally. Also, marketing of the raw or processed product has been a lacunae due to unavailability of infrastructure and market linkages in the region. Post-harvest losses are to the tune of 12-15%. In most of the cases, the farmers sell the whole orchard to the contractor before harvesting at a pre-fixed price. However, some farmers do sell the produce to the middlemen/aggregators/ traders from outside places such as Guwahati, Silchar, Kolkata and Delhi. #

As a result of this, the Arunachal Pradesh Horticultural Produce Marketing & Processing Board (APHPMPB) took up an initiative and engaged with a Pune based company Hill Crest Foods and Beverages Private Limited for exploring prospects for making wine from kiwi. Kiwi fruits cultivated in Arunachal Pradesh are of high aroma and flavour, thus producing a very crisp and fresh kiwi wine (*Arun Kiwi*). It is highly acidic and has sugar levels similar to grapes. An MOU has been signed between the two parties. The Pune based company intends to source the Kiwi to Pune and process it there further for wine making. A major factor contributing to this cause is that the quality of wine can be adjusted even if fruit quality is poor or has suffered deterioration due to unpredictable weather of the NER (hail/rains) or issues faced during transit.

At a broader level, looking at the future, it makes sense to set up a wine processing unit in the state itself. This would reduce transit cost, thereby the landed cost of the fruit, generate employment and promote entrepreneurship in the state of Arunachal Pradesh. The authorities in the state are also proactive in this regard and has proposed a single window clearance for issuing licenses and providing electricity and water supply for setting up wineries and also granting tax exemption for 10 years.

* http://www.business-standard.com/article/current-affairs/kiwi-success-may-push-arunachal-for-more-fruit-wine-production-115051000750_1.html

Value Chain Analysis of select crops in North Eastern States, SFAC

Assam

The state of Assam is rich in culture, ethnic groups, languages and literature. It is known for Assam tea, petroleum resources, silk and rich biodiversity. According to the 2011 census, the state population was

recorded at 31,169,272 out of which 85.92% inhabited the rural area while the remaining 14.08% constituted the urban population. Majority of the rural population of Assam has agriculture as the sole bread winner.

The total area of Assam is 78.44 lakh hectares of which 30.16 lakh hectares is the cultivable area while the net sown area in the state is around 28.11 lakh hectares. The major agricultural commodities of the state include Rice, Wheat, Jowar, Bajra, Maize and Pulses like Arhar, Gram etc. The major horticultural produce includes Citrus fruits, Mango, Ginger, Turmeric, Banana, Grapes, Pineapple, Onion, Potato etc.

The following table shows different crops that are grown in Assam, production statistics and the regions in which they are grown.

S No.	Crop	Area (in ha)	Production (in MT)
1	Banana	51,279	8,65,669
2	Potato	1,04,521	7,83,768
3	Pineapple	16,007	2,81,271
4	Jack Fruit	21,945	1,95,639
5	Orange	15,761	2,02,378
6	Coconut	21,141	1,46,786
7	Papaya	7,418	1,48,857
8	Ginger	16,525	1,42,093
9	Assam Lemon	13,073	1,04,533
10	Guava	4,227	84,518
11	Areca nut	68,038	56,994
12	Mango	4,587	45,689
13	Garlic	10,177	50,070
14	Litchi	5,435	48,725
17	Tapioca	3,301	30,090
18	Sweet Potato	6,213	32,858
19	Onion	8,283	32,421
20	Turmeric	16,244	15,906
21	Chilies	19,605	17,287
22	Black Pepper	3,528	5,898

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Due to lack of adequate marketing & processing facility huge quantity of the produce is lost. A large share of these surplus quantities can be easily explored for exports in fresh and processed forms. The two major trade routes in Assam are Steamerghat and Sutarkandi. The major commodities exported from these areas include Fresh Ginger, Orange, Betel Leaves, Tomato and Fresh Fruits (citrus).

Although the state of Assam possesses huge amount of fertile lands which is highly advantageous for agriculture, there exist some challenges that hamper the growth of the sector. Agriculture in the state is characterized by low level of productivity due to recurring natural calamities, low level of mechanization, inadequate availability of quality inputs, low level of assured irrigation and inadequate marketing infrastructure. To overcome these challenges more reform needs to be initiated in a range of areas, such

as investment in agriculture and support infrastructure as well as in creating new avenues of growth through the development of vertically integrated food processing chains, market linked skill development and cross-border trade.

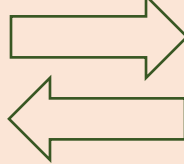
Case Study: Arohan Foods

Pig farming in North-East is a social obligation and is an integral part of the culture. It is mainly a backyard activity and almost every household rears 2-3 pigs in their backyard. There is a heavy demand for pork in the region and even though it contains around 50% of the total pig population in India, the demand levels are such that crores worth of pigs are being imported into the region from the nearby states of Bihar and Jharkhand. But most of the demand is for fresh pork which is available from road side meat shops in unhygienic conditions. But with the increase in the awareness levels among the people of NER about the advantages of packaged meat, the demand for such pork products started increasing in the region.

Sensing the opportunity, team from Arohan Foods decided to take advantage of the market dynamics. Though the founders decided to enter into the segment, except for the idea about business and market, none of them had hands on experience on product development. At this point of time, their association with National Research Center on Pig (NRC) in Guwahati helped them a lot. The research team at NRC helped team Arohan converting their idea into market oriented products and using the small manufacturing plant in the NRC campus, team started manufacturing small quantities of products and started marketing them locally. This way they could improve their market linkages and stabilized their operations.



Choice pork products at retail outlet



Pork sausages



Later in 2013, the company was funded by a venture capital fund named Omnivore Partners, which made it the first venture capital funding in the region. The funds from the investment helped Arohan in establishing its own plant in Sonapur near Guwahati and the experience and market linkage that were brought by Godrej backed Omnivore helped Arohan in reaching new heights. Today Choice pork, the brand of Arohan is a well-known brand in the region and the products travel all the way to all major metros in the country. This shows that there is no dearth of talent in the region and all one needs is a right guidance in right direction.

Manipur

Manipur is one of the Border States in the northeastern part of the country having an international boundary of about 352 km long stretch of land with Myanmar in the southeast. According to 2011 census, total population of the state is 2,721,756, rural population is around 70% and remaining 30% is urban population. The total area of the state is 22.32 lakh ha of which 3.16 lakh hectares is cultivable land and 2.33 lakh hectares is net sown area.

Agriculture being the main occupation of Manipur state, it contributes significantly to economy of the state. Agriculture sector provides employment to 62.25% of total working population of the state. The major agricultural crops grown in the state are paddy, maize, sugarcane and pulses and horticultural crops are citrus (Khasi Mandarin, Assam Lemon, Pomelon), Pineapple, Banana, Papaya, passion fruit, ginger, turmeric, cabbage, brinjal, peas, cauliflower, tomato and potato. The state production during 2012-13 is 2.44 lakh MT of fruits, 4.36 lakh MT of vegetables, 0.75 lakh MT of spices and 0.45 lakh MT of plantation crops (Tea, Arecanut, and Cashewnut).

The following table shows the area, production and regions in which they are grown for major crops of Manipur.

S No.	Crop	Area (in ha)	Production (in MT)
1	Khasi Mandarin	8,422	39,624
2	Assam Lemon	1,069	3,724
3	Pineapple	10,816	1,09,393
4	Banana	6,959	83,988
5	Papaya	708	5,500
6	Cabbage	7,100	84,538
7	Brinjal	-	63,870
8	Peas	-	59,426
9	Cauliflower	2,800	30,250
10	Tomato	-	28,725
11	Potato	-	15,200
12	Ginger	9,587	60,149
13	Turmeric	2,208	12,831
14	Chillies	2,033	1,659
15	Areca nut	1,474	23,328
16	Cashew nut	9,047	16,764
17	Tea	2,040	5,107

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics.

Case Study: Thangjam Agro Industries Private Limited (TAIPL), Imphal, Manipur

Thangjam Agro Industries is one of the oldest and most well-known food processing industries operating in Manipur operating under the flagship brand 'Likla'. Set up in 1991, it started with fruit squashes and has diversified over the years into other similar products like jam, tomato sauce, fruit cubes and slices, pickles and packaged water.. It operates two plants in Manipur, one in Chingmeirong East and the other in the Food Park, Nilakuthi. Employing over 200 personnel, the facilities are ISO certified.

Mr. Joykumar, the man with the vision behind Thangjam Agro's growth firmly believes in engaging farmers at the grass root level for procurement of raw material thereby providing adequate returns on their produce and contributing to the farming community. The facility sources pineapple from Thayong and Moirang via contract farming. Oranges are sourced from Tamenglong and lemons come from Ukhrul district. The company also assists farmers by supplying seeds and effective farming techniques and methods by linking them to experts. Thangjam's employee base consists of 80% women and it helps to form women SHGs as well to empower them further.

Thangjam Agro is one of the few successful entrepreneurial ventures which has sustained itself over the years successfully in an area where such a trend is minimally seen. To grow further and diversify, TAIPL is looking forward to venture into a tetra pack, fruit based ready to drink beverages (Passion fruit and Pineapple based) operating out of its existing facilities. It has an estimated scope of consuming 900 MT of pineapple and 3500 MT of passion fruit which will be sourced from regions across Manipur thereby providing further boost to local farmers and value chain actors. The primary market identified for this venture is Myanmar. The Land Custom Station (LCS) at Moreh will act as a transit node to send the products across. The market in Myanmar has demand for these products as per a preliminary in-house study done by TAIPL.

It is encouraging to see an entrepreneur pushing the boundaries in an area where trained workforce, skill development and employability has not evolved the way it has in other parts of the country. However, with a very positive outlook and persistence, Mr. Joykumar intends to grow his venture as well as contribute to the economy and social welfare of the Manipuri community.



(Source: Thangjam Agro Industries Private Limited)

Meghalaya

The State has major portion of land shielded by hills scattered with gorges and small valleys. Bestowed with dense forests and rivers flowing down undulating terrain, this region is one of the most scenic of the North Eastern States. The population of Meghalaya is predominantly tribal, the main tribes are the Khasis, the Jaintias and the Garos besides other plain tribes such as Koch, Rabhas and Bodos etc.

According to 2011 census, population of Meghalaya is 2,964,007, of which 80% is rural population whereas only 20% is urban population. The economy of Meghalaya is chiefly agrarian as it is rural based with Agriculture laying a major role in the state's economy. As, 81% of the state's population depends on Agriculture, employment and income generation also depends on Agricultural developmental activities to a great extent. The total area of Meghalaya is 22.42 lakh hectares out of which 10.56 lakh hectares is cultivable land and net sown area is 2.84 lakh hectares.

The major agricultural crops grown in the state are paddy, maize, sugarcane and pulses and horticultural crops are citrus (Khasi Mandarin, Assam Lemon, Pomelon), Pineapple, Banana, Papaya, passion fruit, ginger, turmeric, cabbage, brinjal, peas, cauliflower, tomato and potato. The state production during 2012-13 is 2.44 lakh MT of fruits, 4.36 lakh MT of vegetables, 0.75 lakh MT of spices and 0.45 lakh MT of plantation crops (Tea, Areca nut, and Cashew nut).

S No.	Crop	Area (in ha)	Production (in MT)
1	Khasi Mandarin	8,422	39,624
2	Assam Lemon	1,069	3,724
3	Pineapple	10,816	1,09,393
4	Banana	6,959	83,988
5	Papaya	708	5,500
5	Cabbage	1,800	38,130
8	Cauliflower	2,000	40,350
9	Tomato	2,200	30,230
10	Potato	18,139	1,72,955
11	Ginger	9,587	60,149
12	Turmeric	2,208	12,831
13	Chillies	2,033	1,659
14	Areca nut	1,474	23,328
15	Cashew nut	9,047	16,764
16	Tea	2,040	5,107

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Some crops have productivity more than the national average. Over the period of time, Meghalaya has developed its image as major supplier of vegetables to North Eastern states and also off season vegetable supplier.

The state has huge marketable surplus which has the export potential but it is currently not being explored due to various factors like lack of marketing infrastructure, lack of transport facilities, weak cooperative

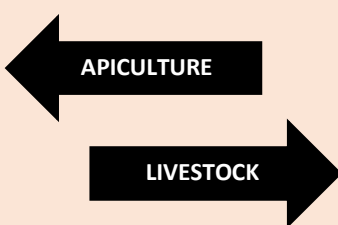
organizations. With the development of proper infrastructure, this export potential can be exploited and can be a great opportunity to export fresh and processed horticultural produce.

Case Study: Meghalaya Basin Development Authority (Integrated Basin Development and Livelihood Promotion Programme)

The Government of Meghalaya has launched a State flagship programme titled IBDLP in order to achieve 12th Five Year Plan and Millennium Development Goals. It keeps in mind four major pillars namely Knowledge Management, Natural Resource Management, Entrepreneurship Development and Good Governance and will be implemented in a mission mode through nine missions- Aquaculture Mission, Horticulture Mission, Livestock Mission, Sericulture Mission, Tourism Mission, Forestry & Plantation Crops Mission, Apiculture Mission, Energy Mission and Water Mission. Each mission is designed to leverage the natural advantages that the state has in the sector and to generate livelihood opportunities for every household and to accelerate growth.

The IBDLP programme is implemented through institutional frameworks across the state in 11 districts to achieve the targeted goals. IBDLP has entered into partnerships with Infrastructure Development Finance Company (IDFC), International Financial Corporation (IFC), Kreditanstalt für Wiederaufbau (KfW), Small Farmers Agribusiness Consortium (SFAC) amongst many others. The programme is people-centric and brings about a complete paradigm shift in the development strategy as it veers away from the traditional 'Beneficiary' approach and promotes alliances with 'Entrepreneurs' and 'Development Partners' in taking the State to the higher trajectory of growth, prosperity and wellbeing. It endeavors to focus more on the less developed areas, under privileged sections of society, women and youth.

The IBDLP focuses on complete value chain management of different production sectors coupled with a thrust on thematic and institutional convergence of developmental initiatives to reduce the business risks and also enhance comparative advantage of the state in gaining greater market access. It aims to boost employment and social welfare by means of these activities. The DBDU headed by the Deputy Commissioner of the district is the grassroots level implementing body for IBDLP. They ensure convergent action and integration of efforts of all the departments/ agencies in tune with the philosophy of the programme.



The success of the missions and the IBDP itself depends on the existence of critical infrastructure in sectors like transport, power, telecom, cold storage, marketing facilities thus making infrastructure in all the sectors a key focus. The current state of infrastructure in the state in most sectors is poorer than the national average and there is negligible private investment in infrastructure development. In order to give a significant push, traditional models of infrastructure development exclusively by the public sector need to be revisited and successful models of Public Private Partnership (PPP) and community participation examined.

Source: MBDA Official Website

Mizoram

Mizoram is sharing its boundary with Myanmar in the east and south and Bangladesh in the west, Mizoram occupies an area of great strategic importance in the north-eastern corner of India. It has a total of 722 Km. boundary with Myanmar and Bangladesh. Mizoram has the most variegated hilly terrain in the eastern part of India. The hills are steep and are separated by rivers which flow whether to the north or south forming deep valleys between the hill ranges.

The state has three different agro climatic zones i.e. temperate zone, subtropical zone and tropical zone. The mild climate of the state has an advantage to grow various type of flowers throughout the year. It grows flowers like Anthurium, roses, bird of paradise and gladiolus etc. which has great potential to export. The main pattern of agriculture followed is Jhum or Shifting cultivation.

According to 2011 census, Mizoram has a population of 1,091,014, out of which 48.5% are rural people and remaining 51.5% are urban population. The state has an area of 21.08 lakh hectares, of which 4.08 lakh hectares is cultivable land and 1.30 lakh hectares is net sown area.

The main horticulture crops are fruits including mandarin, orange, banana, passion fruit, grapes, pineapple papaya, cabbage, okra, chayote, bitter gourd, tomato and potato. Spices such as ginger, turmeric and pepper are gaining popularity. Rice, maize, pulses and oil seeds are major field crops. The state production during 2013-14 is 3.44 lakh MT of fruits, 2.60 lakh MT of vegetables, 0.64 lakh MT of spices and 0.1 lakh MT of plantation crops (Areca nut, Tung)

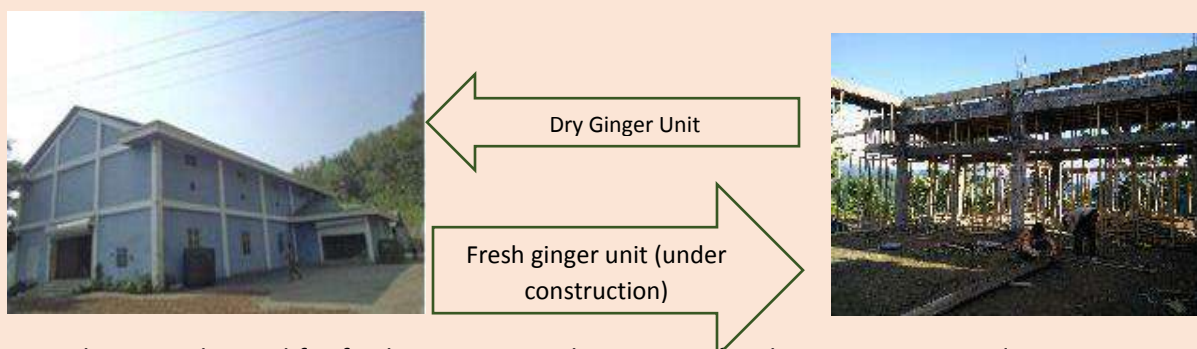
S No.	Crop	Area (in ha)	Production (in MT)
1	Khasi Mandarin	13,508	40,430
2	Lemon	8,000	25,600
3	Pineapple	4,091	30,140
4	Banana	10,840	1,40,920
5	Papaya	1,050	24,600
6	Grapes	2,450	23,870
7	Cabbage	3,230	43,280
8	Okra	3,250	22,430
9	Chayote	4,660	80,020
10	Bitter gourd	4,050	21,840
11	Tomato	880	8,270
12	Ginger	7,480	29,920
13	Turmeric	6,250	24,700
14	Chillies	9,040	9,100
15	Areca nut	10,138	6,050
16	Tung	500	3,083

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Case Study: Community Development Action and Reflection

Community Development Action and Reflection (CDAR) is an active Non-Governmental Organization (NGO) at Mizoram working in the field of capacity building of the farmers. With a vision to make farmers of the region capable of getting maximum benefit from their land and remunerative prices for their produce, CDAR came into existence in 2004. It serves a number of small and marginal farmers and works across the entire value chain of different agricultural commodities like ginger, turmeric, bird's eye chilli etc. CDAR helps farmers in self-help group formation, establishing market linkages for their produce, organic farming and certification and thereby act as a bridge for the governmental policies to reach to the farmers. It is also actively involved in different activities like conducting base line surveys, promoting awareness about organic farming, registration of farmers for organic certification, imparting training to farmers on several aspects of farming etc.

Since 2007, with the cooperation of Central Mechanical Engineering Research Institute (CMERI), CSIR, CDAR is running the Post-Harvest Agricultural Processing Unit at Aizawl, Mizoram. This unit is one of the first of its kind that is established in the state and is established for processing of ginger, turmeric and bird's eye chilli. The unit has facilities for sieving, washing, weighing, rinsing, slicing and drying. Ginger is cut into slices, dried, packed and is exported mainly to European nations.



Over the time, demand for fresh ginger started pouring in for the organization and so as to cater to the demand CDAR along with New Land Use Policy Implementation Board (NIB) is in the process of establishing a pack house along with cold store for exporting fresh ginger and oranges from the region. The project is currently under construction and is expected to start its operations from March 2017.

Currently CDAR is one of the largest NGOs working in the region and is associated with more than 5400 farmers and has converted more than 15,000 acres of land into certified organic farms. This shows that there is significant export potential for the NE products and all that is needed is establishment of proper market linkages.

Nagaland

Nagaland is a hill state located in the extreme northeastern region of India with Kohima as its capital. The state shares common boundaries with Myanmar in the East, state of Assam in the West; Arunachal Pradesh and a part of Assam in the North with Manipur in the south. Nagaland has an agrarian economy. The main crops grown in the state include rice, millet, maize and pulses. Cash crops like sugarcane and potato are also grown in some parts. Coffee, cardamom and tea come under plantation crops which are grown in hilly areas. Majority of the population is involved in the cultivation of rice as it is the staple diet

of the people. More than 80% of the gross cropped area is under rice cultivation. A sizeable population of the state grows oil seeds which includes Rapeseed, mustard etc.

There are two methods of cultivation which exist in Nagaland. The Naga tribes practice both Jhum and terrace cultivation. The area under Jhum cultivation is about 87,339 hectares and under terraced cultivation is about 62,091 hectares. Although majority of population is engaged in cultivation, still Nagaland depends on the import of food supplies from other states. This is due to less availability of food grains in the state as the area under cultivation is less.

The population of Nagaland is 1,980,602 (2011 census), the rural population forms 71% of total population and remaining 29% is urban population. The total area of the state is 16.58 lakh hectares, out of which 6.94 is cultivable land and 3.6 lakh hectares is net sown area.

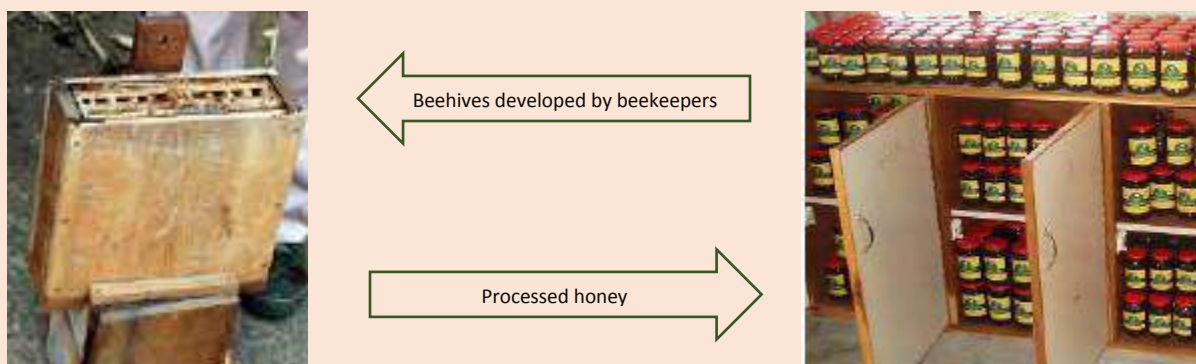
S No.	Crop	Area (in ha)	Production (in MT)
1	Banana	7,320	1,09,800
2	Pineapple	9,500	1,42,500
3	Orange	6,100	54,800
4	Passion fruit	8,500	21,250
5	Papaya	1,360	16,320
6	Chilli	5,820	41,904
7	Cabbage	8,100	1,62,000
8	Peas	1,560	9,560
9	Ginger	3,520	52,800

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

Case Study: Nagaland Beekeeping and Honey Mission (NBHM)

The state of Nagaland, owing to its thick forests and climate, provides ideal conditions for honey cultivation and offers immense potential for apiculture and related activities. However, beekeeping in Nagaland is marred by low level technology, limited investment and low productivity, lack of extension, unhygienic handling of honey, unorganized marketing, low quality and lack of market initiatives.

To counter these challenges and to promote beekeeping as an economic activity in the state, Government of Nagaland has launched Nagaland Beekeeping and Honey Mission (NBHM) as a mission mode way back in 2007 and became the first state in the country to launch a mission on beekeeping and honey enterprise.



(Source: National Beekeeping & Honey Mission)

The mission had an overarching goal of increasing the honey production in the state from 110 MT in 2007 to 5,000 MT by year 2020 and supplying organic honey and pollen to the world market. Building capacity among beekeepers about scientific beekeeping methods, creating extensive awareness, supporting the beekeepers through extension services, creation of processing infrastructure and creating market linkages for the processed product are identified as the key activities to be carried out. Multiple bodies like North Eastern Council (NEC), Tribal Cooperative Marketing Federation of India (TRIFED), Sir Ratan Tata Trust, NABARD and National Bee Board (NBB) are roped in for providing support to the program at various levels in the value chain.

These interventions has shown promising results for the mission and till now (2014) around 14,000 farmers from more than 400 villages were trained. 30 common facility centers and 2 honey processing units were established. The production of honey in the state increased to 400 MT. This proves that an integrated approach with emphasis on capacity building and market linkages helps in establishing beekeeping as an economic activity. Further treading the path will help NER to establish itself as a hub for honey exports.

Sikkim

The mountainous state of Sikkim is one of the land locked states in the North East Region of the country. The state occupies a strategic position sharing its boundaries with 3 neighboring countries, with Nepal in the west, China (Tibet Autonomous Region) in the North and East, Bhutan in the east and the state of West Bengal in the south. It is the second smallest as well as the least populous state in the country.

The state covers a total geographical area of 729,900 ha out of which around 47% is under forest cover. The net sown area is estimated to be around 65,043 ha. The land being blessed by nature with perennial water sources, diverse soil profile, extremely varied climate and wide ranging topographical and agro-ecological conditions provides an immense scope for agricultural diversification. The main crops grown in the region include rice, maize and buckwheat in cereals, oranges and pears among fruits, ginger, cardamom and turmeric in spices and peas, beans and tomatoes in vegetables. Of late, there is a significant increase in the area under cultivation of flowers like roses, gerbera, orchids and Anthurium etc. as they are generating better incomes to the farmers.

The following table shows different crops that are grown in Sikkim, production statistics and the regions in which they are grown.

S No.	Crop	Area (in ha)	Production (in MT)
1	Banana	1,615	3,890
2	Potato	9,457	16,850
3	Pineapple	305	27
4	Jack Fruit	10,055	49,000
5	Orange	16,010	3,842
6	Papaya	525	150
7	Ginger	9,250	51,568
8	Assam Lemon	995	8,955
9	Guava	1,300	4,680
10	Areca nut	222	2,40,600

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

The state treaded a path of rapid economic development. The state assembly passed a resolution in 2003 for transforming the state into a “Total Organic State” and adopted several measures to achieve the same. In 2015, Sikkim became the country’s first “Organic State”.

The state is also one of the most advanced states in the region with respect to the market linkages for the agricultural products grown in the country and is a role model to the other states in the NER. Though partly, this can be attributed to the proximity of the state to Kolkata, the rapid strides the state has made in infrastructure development, implementation of the adopted policies, training and capacity building of the actors in the value chain cannot be undermined.

Case Study: Sikkim Organic Mission

Sikkim is an exemplar for organic farming. Government of Sikkim started organic farming mission as a flagship program in 2003 with an objective of making farming sustainable, remunerative and respectable. The first step in the process of making the shift towards organic was to get rid of the use of chemical fertilizers and pesticides and to create awareness among farmers for the benefits of organic food. In order to achieve this the subsidy for inorganic fertilizers and pesticides was curtailed and the Departments of Food Security and Agriculture Development and Horticulture and Cash Crop Development worked towards the capacity building of the farmers.

Another major step taken in this regard to bear the cost of certification and renewal of certification. International as well as National standards are followed for certification. This has encouraged the farmers in the state to go for certification. In order to facilitate the process the government has also appointed service providers who educate the farmers about certification registration procedures and help them implement the protocols. The service providers are also managing the TraceNet in the area. TraceNet collects, stores and reports - forward and backward traces and quality assurance data entered by the operators and certification bodies within the organic supply chain. Government has also taken the responsibility of supplying inputs to the farmers. This has ensured that the entire production in Sikkim is completely organic.

As a result of the Sikkim government's continuous efforts till date a total area of 74,190 Ha has been organic certified. The organic mission is further extending its support in processing and branding of the produce. Since value addition and organic brand will fetch a better price in the market the government is planning to market the commodities under the brand of "Sikkim Organic". The organic product branded as "Sikkim Organic" is synonymous to the highest quality standard. Also Sikkim government has set a target that by 2018 all the products moving out of Sikkim would be in processed form. The Sikkim organic will be marketed at the local outlets as well as through SIMFED. They also plan to export these products to premium markets once they establish the infrastructure and create the quantum. This is expected to further enhance the profit margins for all the stakeholders.

Tripura

Tripura is a state in North-East India. It shares borders with Bangladesh, Mizoram and Assam. Tripura is surrounded by Bangladesh on its north, south and west. The length of its international border is 856 km (84 per cent of its total border).

The state has a population of 3,671,032 (2011 Census), major population being in rural areas i.e. 74%. Also, the total land for the state is 10.48 lakh hectares, of which cultivable land is 2.77 lakh hectares. Major horticultural crops grown in Tripura are Pineapple, Jackfruit, Litchi, Orange, Banana, Potato, Tomato, Cauliflower, Cabbage, Ginger and turmeric. State produces 8.08 lakh MT of vegetables, 8.19 lakh MT of fruits, 0.48 lakh MT of spices and 0.44 lakh MT of nuts.

S No.	Crop	Area (in ha)	Production (in MT)
1	Pineapple	11,948	170890
2	Jackfruit	10,410	3,00,000
3	Litchi	3,921	20,578
4	Orange	6,704	36,521
5	Banana	13,990	1,41,313
6	Potato	9,040	1,59,466
7	Tomato	1,750	43,050
8	Cauliflower	2,793	57,720
9	Cabbage	3,276	86,189
10	Ginger	1,893	15,636
11	Turmeric	1,959	15,636

Source: Sathguru Analysis, State departments of horticulture and directorates of economics and statistics

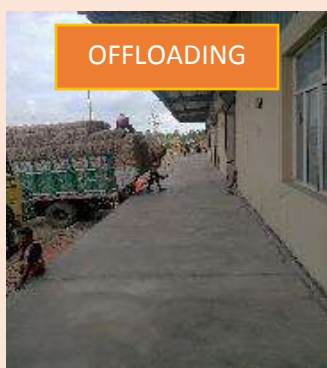
There is a competitive advantage for crops like Pineapple, cabbage, cauliflower and tomato. The productivity for these crops are higher than national average.

Case Study: Land Ports Authority of India – Land Custom Station, Agartala, Tripura

Tripura shares 856 km long border with the neighboring country of Bangladesh. This gives the state immense potential for cross border trade as a result of which several Land Custom stations (LCS) have been established to facilitate convenient import and export of goods and commodities between the two countries. Major products making their way from Tripura to Bangladesh include Electronic items, Food items, Citrus fruits and stone chips. Vice versa, Hilsa fish, Cement, Crushed stones, Food items and plastic goods make their way from Bangladesh to India.

Recently, Agartala LCS has been converted to an Integrated Check Post (ICP) with greater autonomy and the prospects of transit facilities for Indian and Bangladeshi citizens as well. These may include: Customs and immigration facilities, weigh-bridges, security and scanning equipment, currency exchange booths, internet facility, cargo process building, cargo inspection sheds, warehouse and cold storage, health and quarantine facilities, clearing agents, banks, scanners, closed circuit televisions, public address systems, isolation bay, parking, cafeteria, hotels and other public utilities

A trend of meagre exports to Bangladesh when compared to the imports coming in is clearly visible. As of 2015-16, the total imports from Bangladesh amounted to INR 381.76 crore while the exports were a paltry INR 1.96 crore (Source: TIDC). A major reason cited by stakeholders is the excessive duty charged on landed cost at the Bangladesh side which is to the tune of approximately 40%. This has been revealed to be a discerning factor for the Bangladeshi parties from forging trade ties or procure material coming in from India.



The trucks enter the cargo complex via the inspection bay where preliminary checking is done. Then, the goods are offloaded through contracted labourers and stored till its collection is done by the recipient party. A cold storage facility is also present, however it is not utilized due to lack of import-export of perishable products. Processed food samples are lab tested before clearance of entire consignment.

The future potential for the ICP looks bright with a proposed railway line connecting it to Akhaura in Bangladesh, 14 km from the ICP. The ICP and other LCSs have been implemented well with adequate infrastructure in place. Currently, a total of 38 ICP/LCSs across the NER are underutilized. Policy and trade level interventions need to be made after mutual negotiations so as to utilize the available services and resources to the maximum, thereby giving a huge boost to bilateral trade through these LCSs.

Annexure J: State wise Status of Organic Farming

Arunachal Pradesh: Arunachal one of the largest states in the region with a cultivable area of 4.24 lakh ha most of which is organic by default, hasn't made significant steps towards promotion of organic farming. According to 2013-14 statistics, only 71.49 ha (0.01% of total cultivable area) of land is certified which is very insignificant compared to the potential. Way back in 2007, the state with a vision to turn into organic, constituted a task force to frame a state organic farming policy and nothing happened later. Recently in 2016, the state launched a "State soil health mission" which intends proper documentation of soil health and distribution of soil health cards and also check overuse of fertilizers. The state offers huge potential for organic spices like large cardamom, ginger and turmeric.

Assam: The steps towards promotion of organic farming in Assam started way back in 2004-05 where the government of Assam has implemented a pilot project on organic cultivation of Joha rice in the districts of Udalguri and Lakhimpur. The project was a small success and the organic rice produced was exported to Switzerland. Later production of mustard in Golaghat region was converted into organic. In this way several baby steps were taken towards the promotion of organic farming in the region. Recently under Phase I of RKVY scheme, 30 legislative assembly constituencies were targeted for conversion into organic of which 8 constituencies covering 425 ha were completely converted as well as certified. With this success, under Phase II of RKVY scheme, the state now targeted 60 legislative assembly constituencies covering 3000 ha mostly covering paddy. The state marketing board also established first organic market in the region in Guwahati as a hub to the farmers, traders and consumers of organic produce, which is currently operating in Public Private Partnership mode. According to 2013-14 statistics, only 2828.26 ha (0.09% of total cultivable area) of land is certified. The state offers huge potential for organic Joha rice, ginger and oranges.

Manipur: Inspired by the journey of Sikkim towards a complete organic state, Manipur started taking steps towards promotion of organic farming in the state. Though small initiatives like promotion of cultivation of organic ginger with the help of Spices Board happened way back in 2004, no significant steps were taken later. Last year, under the aegis of Horticulture and Soil Conservation department of Manipur, a new organization, Manipur Organic Mission Agency was created as a nodal agency for central scheme Mission Organic Value Chain Development. The agency has set itself a target promoting organic farming in 5,000 ha and has achieved 500 ha till now. Ginger, turmeric, king chilli, pineapple, orange and Kachai lemon were identified as the target crops. According to 2013-14 statistics, no farm land in Manipur is certified.

Meghalaya: The Meghalaya government's plan to convert vast agricultural lands in the state from inorganic to organic farming is still in the nascent stages. Recently in 2015, under Integrated Basin Development and Livelihoods Programme (IBDLP), the flagship program of Government of Meghalaya, Mission Organic in Meghalaya was launched. The mission emphasizes on dual goal, to spread awareness about organic production and products and to develop capacity among farmers to switch from traditional farming to organic. The mission has set itself a colossal target of converting 100,000 ha in 5 years i.e. by 2020. According to 2013-14 statistics, only 373.13 ha is certified as organic in the state of Meghalaya.

Mizoram: Next to Sikkim, Mizoram was the second state to pass a resolution in state assembly to move towards becoming a complete organic state. An organic farming act was introduced way back in 2004 and small steps towards adopting organic farming were taken. The state agricultural department started encouraging usage of organic inputs in place of chemical ones and imparting training on organic farming. Apart from these, no other significant steps were taken by the governments. According to 2013-14 statistics, no farm land in Mizoram is certified.

Nagaland: Nagaland adopted its state organic policy in 2007 which laid emphasis on limiting the use of synthetic inputs in specified regions and promoting production of organic manures and bio-fertilizers. The traditional agricultural practices of Nagas does not involve use of external inputs. Hence the state can be quickly brought under organic cultivation. However no solid steps were taken towards achieving the target of converting the state into a 100% organic state. As on 2013-14, the certified area under organic farming is 5168.6 ha.

Sikkim: Sikkim assumes leadership role in organic farming. It is the first state in the country to be declared as completely organic and thus is a role model to rest of the states in NER. Sikkim voluntarily adopted to go organic way back in 2003. Twelve years later, by the end of 2015 all the farms (75,000 ha) in the state are certified as organic. Right emphasis was kept on educating the farming community about the benefits of organic farming and involving them all through the process. Organic farming was introduced as a subject in the schools and technical training was imparted to the farmers. On the other hand government also helped farmers by providing organic inputs and in the development of their production internally. Simultaneously efforts were also kept on creating value for the products by branding them and placing them in premium markets. Together these steps helped in the success of the initiative of which the people of Sikkim are reaping the benefits.

Tripura: Though many farmers in the region adopt organic farming practices in the region, there is no specific policy in the state for the promotion of organic farming. The state offers huge potential for organic oranges, pineapple and spices like ginger, turmeric and chilli. As on 2013-14, the certified area under organic farming in the state is 203.6 ha.

