



GOVERNMENT OF MEGHALAYA
DIRECTORATE OF FOOD PROCESSING



**DRAFT MISSION JACKFRUIT
DOCUMENT**

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CHAPTER ONE

MISSION JACKFRUIT

Executive summary

Jackfruit is one of the most abundant tree crops in the state but yet one of the most neglected. The crop is available in abundance in almost the entire state & almost all districts, yet every year tons of jackfruit falls to the ground and rots. A conservative estimate from the Garo Hills alone pegs the wastage of ripe jackfruit at around 10.87 lakh metric tonnes valued at a staggering Rs. 434 crores per season.

Yet jackfruit is one of the most versatile fruit tree crops which has been hailed as a miracle food crop for its nutritional and health properties with every part of the tree having some utility or the other right from the fruits and seeds for value addition, food security and medicinal purposes, the leaves for animal fodder, the timber for furniture and construction and the roots for water conservation. In addition the tree is also an excellent candidate for incorporation into a climate change adaptation program due to its versatility and hardiness.

In mainland markets tender or raw jackfruit is in high demand as a vegetarian meat substitute while the ripe fruit and seeds can be turned into a variety of value added by-products like squash, sweets, flour, cakes, chips, papad, noodles etc. Recent advances in processing technology combined with the increasing awareness of consumers about the health and nutritional benefits of jackfruit has sparked off demand and development of new products like Ready to Cook tender jackfruit, dehydrated / freeze dried unripe jackfruit chips and jackfruit seed flour. In fact a conservative estimate by the Jackfruit Consortium of Kerala puts the number of products that can be made from jackfruit at more than one hundred.

With a view to leverage and make use of this tremendous and abundant natural resource, which is currently being wasted, a five year **MISSION JACKFRUIT** is proposed to be launched with the following objectives.

- To catalyze and promote sustainable rural and urban livelihoods through the processing and value addition of jackfruit by small scale and nano enterprises.
- Creation of a value chain for jackfruit products and generating employment opportunities along the value chain for unemployed youth.
- Addressing food security and nutritional issues of the state in the long run.
- Protection and preservation of catchment areas through promotion of the widespread cultivation of jackfruit for its food, timber, health and soil amelioration benefits.
- Providing an additional source of income for rural and urban families through the commercialization of its processing and value addition.
- Developing the markets for jackfruit and its value added products through a focused and professional go to market and field to fork strategy.

The Mission aims to achieve the above through adoption of the following implementation strategy.

- Action Research programme for Local Varietal identification, germplasm survey, technology sourcing & transfer.
- Varietal improvement through the introduction and propagation of improved varieties / grafts via nurseries in both public and private sectors
- Demand driven R&D for product and process development, design and development of equipment, improved storage, shelf-life, packaging etc
- Establishment of a Food Testing Laboratory with NABL / FSSAI certification
- Promotion of jackfruit cultivation in 2000 hectares of catchment areas and promoting the formation of jackfruit collection, aggregation, agro processing clusters & FPOs
- Establishment of 3 Techno-Incubation Centres (TICs) one each in the Garo, Khasi and Jaintia Hills for providing hands on training, technical assistance and incubation to entrepreneurs and to also to act as a common processing facility for jackfruit.
- Promoting the establishment of 50 SMEs in jackfruit processing through a credit linked start-up fund
- Promoting the establishment of 200 Nano jackfruit processing / brining enterprises at village level through a credit linked Nano start-up fund
- Conduct of Hands on Training for 10,800 entrepreneurs / master trainers in the incubation centres over the next 5 years.
- Conduct of Village level Go Mobile trainings on plant management and minimal processing for 69,300 partners over the next 5 years.
- Development and creation of IEC materials, training manuals, publications, Z-cards etc
- Organization of Jackfruit Melas / awareness camps in all 11 (*eleven*) districts every year for the next five years.
- Organization of a State Jackfruit Festival to celebrate the fruit every year for the next five years.
- Training cum Exposure visits on Value Addition of Jackfruit for around 2100 partners over the next five years.
- Creation of a Jackfruit brand, hygienic and modern packaging, brand building, Advertising, trade promotion, Marketing and export promotion / facilitation.

COMPONENT WISE SUMMARY COST OF THE MISSION:

SUMMARY OF COSTS FOR MISSION JACKFRUIT					
Sl no	ITEM	PARTICULARS	QUANTITY	UNIT COST	Total cost (₹)
1	Action research	State wide action research on Local Varietal identification / selection, germplasm survey, technology sourcing & transfer.	1	10000000	100,00,000
2		Propagation nurseries for improved varieties in the public sector @ 100% for 4 ha	10	2500000	250,00,000
3	Varietal improvement	Propagation nurseries for improved varieties in the private sector @ 50% for 1 ha	10	750000	75,00,000
4	R&D	Demand driven R&D for product and process development, design and development of equipment, improved storage, shelf-life, packaging etc		20000000	200,00,000
5	Food testing laboratory	Food Testing Laboratories with NABL / FSSAI certification	1	25000000	250,00,000
6	Jackfruit cluster formation	Formation of jackfruit collection, aggregation, processing clusters & FPOs	8	1000000	80,00,000
		Promotion of jackfruit cultivation in the catchment areas (Ha)	2000	60000	1200,00,000
7	Establishment of Techno Incubation Centres (TICs) in Garo and Khasi Hills	Machinery, equipment etc	3	18730290	561,90,869
8	Startup funds for jackfruit SMEs	Machinery, equipment etc	20	800000	400,00,000
9	Startup funding for nano brining / processing units	Equipment	200	200000	400,00,000
10	Training	Hands on Training in the incubation centres for entrepreneurs & Master trainers	360	230900	831,24,000
11	Village level training	Go Mobile village level training on plant management & minimal processing	1980	50000	1089,00,000
12	Training materials	Z-Cards, Manuals, Brochures, leaflets etc	200000	12.5	25,00,000
13	Awareness / Melas	Organizing awareness camps / jackfruit melas / mobilization camps in all 11 districts for 5 years	55	439000	241,45,000
14	Festivals	State jackfruit festivals for 5 years	5	2386000	119,30,000

15	Exposure	Training cum Exposure visits on Value Addition of Jackfruit outside the state for 105 batches of 20 partners	105	616000	646,80,000
16	Marketing	Packaging & Branding, advertising, marketing / trade promotion / buyer seller meets, vending kiosks, retail outlets, export facilitation etc			1140,00,000
				SUB TOTAL	76,09,69,869
17	Mission management	Mission management & operational expenses @ 5%			228,29,096
18	M & E	Monitoring & Evaluation	LS		80,00,000
				GRAND TOTAL	79,17,98,965
				SAY	79,17,98,000

(Rupees seventy nine crores seventeen lakhs, ninety eight thousand) only

CHAPTER TWO

BACKGROUND

Jackfruit is a tropical fruit tree species found in tropical, high rainfall, coastal and humid areas of the world. It belongs to family *Moraceae*. Scientifically *Artocarpus heterophyllus*, it is the favorite fruit of many, owing to its sweetness. The jackfruit tree is widely cultivated in tropical regions of India, Bangladesh, Nepal, Sri Lanka, Vietnam, Thailand, Malaysia, Indonesia and the Philippines. Jackfruit is also found across Africa, e.g., in Cameroon, Uganda, Tanzania, and Mauritius, as well as throughout Brazil and Caribbean nations such as Jamaica. However, India is considered to be the native place of Jack fruit.

The jackfruit has played a significant role in Indian agriculture for centuries. Archaeological findings in India have revealed that jackfruit was cultivated in India 3,000 to 6,000 years ago. Findings also indicate that the Indian Emperor Ashoka the Great (274–237 BC) encouraged arboriculture of various fruits including jackfruit. Varahamihira, the Indian astronomer, mathematician, and astrologer, wrote a chapter on the treatment of trees in his Brihat Samhita. His treatise includes a specific reference on grafting to be performed on trees such as jackfruit.

Botanical Description:

Botanically, this popular Asian tropical fruit belongs to the family of *Moraceae*, genus: *Artocarpus* and is closely related to figs, mulberry, and breadfruit. Jackfruit (*Artocarpus heterophyllus* Lam.) is the largest tree borne fruit in the world, reaching up to 50 kg in weight and 60-90 cm in length (recently an 81 kg fruit was also reported from Panrutti, India). A mature tree produces up to 700 fruits per year, each weighing 0.5 to 50 kg. On an average, 50-80 tons of fruits can be harvested from a hectare of land. The tree is monoecious, producing male and female flowers. The stem of this plant is straight and rough whereas bark is green or black, 1.25 cm thick and exudes milky latex; leaves broad obovate, elliptic, decurrent, glabrous, entire; inflorescence solitary axillary, cauliferous and ramiflours on short leafy shoots. It has also been reported that the evergreen leaves are oblong, oval or elliptic in shape, 10-15 cm in length, alternate, glossy and dark green in colour. The juvenile leaves are lobed.

Propagation:

Propagation is usually by seeds, which can be kept no longer than a month before planting. Germination requires 3 to 8 weeks. The seedlings should be moved when no more than 4 leaves have appeared. A more advanced seedling, with its long and delicate tap root is very difficult to transplant successfully. Cutting-grown plants and grafted seedlings are possible. Jackfruits mature 3 to 8 months from flowering. When mature, there is usually a change of fruit colour from light green to yellow-brown. After ripening, they turn brown and deteriorate rather quickly. Cold storage trials indicate that ripe fruits can be kept for 3 to 6 weeks at 52° to 55° F and relative humidity of 85% to 95%. Immature fruit is boiled, fried, or roasted. Chunks are cooked in lightly salted water until tender and then served. The only handicap is copious gummy latex which accumulates on utensils and hands unless they are first rubbed with cooking oil. The seeds can also be boiled or roasted and eaten similar to chestnuts. In Southeast Asia dried slices of unripe

jackfruit are sold in the markets. The ripe bulbs, fermented and then distilled, produce potent liquor.

Origin and Distribution:

The jackfruit is native to parts of South and Southeast Asia and is believed to have originated in the rainforests of Western Ghats of India and is cultivated throughout the low lands in South and Southeast Asia. Major jackfruit producing countries are Bangladesh, India, Myanmar, Nepal, Thailand, Vietnam, China, the Philippines, Indonesia, Malaysia and Sri Lanka. Jackfruit is also found in East Africa e.g. Uganda, Tanzania and Mauritius as well as throughout Brazil and Caribbean nations such as Jamaica. Jackfruit is the national fruit of Bangladesh and is one of the three auspicious fruits of Tamil Nadu in India along with mango and banana.

Uses:

Jack fruit has many uses. Mature jack fruit can be prepared as a vegetable by boiling or cooking. Ripe jack fruit is a very popular fruit. Both young jack fruit, as well as jack fruit seeds are prepared as a vegetable, while jack fruit seeds are also cooked to produce a delicious traditional dish. Its many uses have been summarized below.

1. As a nutritious food – Mature jack fruit, young jack fruit and the jack fruit seeds provide high nutrition value food sources
2. Fruit – ripe jack fruit is a popular fruit
3. Value added processed food – dehydrated jack fruit, canned/bottled jack fruit, chips and other snacks based on jack fruit.
4. Timber – Jack fruit tree provides an excellent medium hardwood timber that shows termite resistance. This timber is widely used for making furniture, doors, boats, windows & musical instruments.
5. Firewood – branches are used as firewood
6. Ecological and environmental use – Provides perennial cover, reducing the impact of rain drops and provides shade and serves as a wind break.
7. Medicinal value - various parts of the tree and the fruit are used in traditional medicine in many south east Asian countries.
8. Cultural value - Chips of heartwood when boiled yield yellow dye, used to colour the robes of Buddhist monks. People of Hindu communities use leaves to decorate temples and other places of worship.

The primary economic product of jackfruit is the fruit which is used both when mature and immature. When unripe (green), it is remarkably similar in texture to pulled pork / chicken, making jackfruit an excellent vegetarian substitute for meat. In fact, canned jackfruit (in brine) is sometimes referred to as “vegetable meat”. Jackfruit seeds (nuts) can be roasted like chestnuts, boiled or ground into flour for making noodles, papad and pastries. The fruit pulp is sweet and tasty and used as dessert or preserved in syrup. The fruits and seeds are also processed in a variety of ways for food and other products. Jackfruit value added products include chips, papads, pickles, ice cream, jelly, sweets, beverages like squash, nectar, wine and preserved flakes, etc. It can be simply eaten as dessert, a snack or fruit. Additionally, jackfruit leaves, bark, inflorescence,

seeds and latex are used in traditional medicines. Dairy farmers have also reported that there is an increase in milk yield when cows are fed jackfruit leaves.

The wood of the tree is also used for various purposes. Everything from its wood, which is purported to be better than teak, is used to make boats, musical instruments, doors and furniture, to its sweet edible bulb and seeds, can be used for a variety of products, either wholesomely or as additives. Furthermore there is growing evidence that the tree is highly suitable for incorporation into a climate change adaptation and food security program due to its natural pest resistance, soil moisture retention property, resilience, widespread availability and nutritional content while being virtually maintenance and input free.

Nutritional Composition:

Jackfruit is a nutritious fruit rich in carbohydrates, proteins, potassium, calcium, iron, and vitamin A, B, and C. Due to high levels of carbohydrates; jackfruit supplements other staple foods in times of scarcity in some regions. The flesh of the jackfruit is starchy and fibrous, and is a source of dietary fibre. The presence of isoflavones, antioxidants, and phytonutrients in the fruits indicate that jackfruit has cancer-fighting properties. It is also known to help cure ulcers and indigestion. In common with other tropical fruits such as durian, banana, etc., it is also rich in energy, dietary fibre, minerals, and vitamins and free from saturated fats or cholesterol. Only a cup of the fruit contains 155 calories and only 4 grams of fat. The fruit is also low on saturated fats, cholesterol and sodium. Jackfruit is rich in vitamin A and, as well as niacin, riboflavin, thiamine and folate. Aside from the vitamin content, the fruit is also rich in essential minerals. The simple sugars present in jackfruit can improve your overall health. A cup of jackfruit contains 11% of the daily recommended allowance of fibre which will improve your digestive system.

Medicinal properties:

Jackfruit can successfully treat colorectal cancer which is a difficult disease and which affects more than 1.17 million people in the USA annually according to the National Cancer Institute. Jackfruit is rich in phytonutrients, isoflavones, lignans and saponins which have powerful anti-cancer properties. These nutrients will fight free radicals in the body and have the ability to prevent cancer and other diseases.

Phytonutrients prevent the developmental stage of cancer cells and they can only be found in plant-based foods. Jackfruit contains enough of them to help your body fight conditions such as stomach ulcers. At the moment, research is underway to see what makes these compounds so powerful against cancer.

Saponins are powerful anti-cancer agents which are especially useful in fighting colon cancer. According to a study, saponins induce mycotic arrest in leukaemia cells, which lead to remission in some cases. These phytonutrients bind to the outer layer of cancer cells and prevent their growth.

Lignans and isoflavones bind to receptors in the same way estrogens do, and according to studies, they significantly reduce the risk of endometrial cancer. A study from 2006 which

included 500 women showed that jackfruit can considerably reduce the risk of several types of cancer due to the presence of these phytonutrients.

The antioxidants in the fruit will prevent the action of free radicals and protect your body from oxidative damage. Jackfruit is also rich in fibre which cleans the colon, removes toxins from the digestive tract and reduces the risk of colon cancer. Strengthens the immune system - Jackfruit is rich in vitamin C and simple sugars that will reinforce your immune system. According to an animal study, the polysaccharides in jackfruit can improve phagocytic cell function and the function of the immune system.

With many crops showing a decreased level of production, due to erratic weather, triggered by climate change, scientists, globally, have found jackfruit, a good prospect in their quest for alternatives. The Janambhumi group organised a festival of silk and dye whereby Assam's marigold, betel leaves, jackfruit, hibiscus, black berry, turmeric, tea leaves are some of the plant species from which natural dye can be extracted and applied on clothes and other purposes. Recently Jackfruit is gaining popularity in Goa due to its nutritional benefits.

The greatest advantage of this wonderful tree is that once it is planted, it can take care of generations due to its hardy nature, wider adaptability, no pest and disease problem and it is the only fruit which requires minimum care and considered to be truly organic fruit which can be grown as an economically viable fruit crop compared to other fruit crops. Jackfruit is grown mainly on homestead farms and produces multiple products for food, feed and industry as well as contributing towards soil management for sustainable environments. Although the importance of jackfruit for these purposes has been recognised, little research has been done. There is a lack of understanding of the taxonomy and origins of jackfruit, of the needs for quality planting materials and in particular, the availability of appropriate technologies for propagation, production, post harvest handling, processing of products and their marketing. In spite of such a vast potential and usefulness, jackfruit remains an underutilized fruit species and deserves to be given the needed thrust for research and development.

GLOBAL SCENARIO

Till recently, jackfruit was an insignificant, scattered or boundary crop the world over. However once some countries realised its importance, their governments started giving support to its farming and value addition. Vietnam, with 15 years history of jackfruit plantations already has a whopping 50,000 hectares under jackfruit cultivation now. Malaysia, Philippines, Cambodia and even Sri Lanka are making aggressive efforts to promote jackfruit. Initiatives to promote manufacture of value-added products are taking place especially in Sri Lanka, where agencies under the ministry of agriculture have been giving training to homemakers, street vendors and entrepreneurs in minimal processing of the fruit to arrest its wastage and create livelihoods in rural areas. Tender jackfruit in brine and canned tender jackfruit curries are popular in the country. More than a dozen companies produce a few jackfruit products for export. Scientists and activists in Sri Lanka have gone on record saying that because of jackfruit, their country would never starve if ever food becomes scarce.

Vietnam is the number one in the world in making value-added jackfruit products. Sixty per cent of their production goes to industries—for mainly making vacuum-fried chips. Malaysia has also included jackfruit in its national policy.

China started jackfruit cultivation only in 1992 but the production has gone up. It encourages jackfruit plantations and planting of jackfruit trees by the roadside.

Philippines is offering e-learning courses on cultivation of jackfruit. They are investing on research and development of technologies that would be helpful for processing jackfruit. Realising the potentialities of jackfruit as a viable livelihood and business opportunity especially for rural families, these countries are today actively encouraging the commercial cultivation of jackfruit. - *(Excerpt from an interview with Shree Padre in Down to Earth Magazine—8th July 2015)*

JACKFRUIT IN INDIA

India is the second biggest producer of the fruit in the world and is considered as the motherland of jackfruit. Chakka, its Malayalam name, according to some, has given birth to the English name jackfruit. In our country, the trees are found distributed in southern states like Kerala, Tamil Nadu, Karnataka, Goa, coastal Maharashtra and other states like, Assam, Bihar, Tripura, Uttar Pradesh and foothills of Himalayas.

Commercial cultivation of jackfruit is still at a primitive stage in India, primarily because of the difficulty in procuring elite planting materials. Jack is easily propagated through seeds. The seedlings take 8-10 years to bear fruits. Due to the highly cross pollinated nature of the crop, vegetative propagation is essential in order to get true to type plants. In India, the total area under jackfruit cultivation is approximately 1,02,552 hectares, of which, an estimated 1,00,000 trees are grown in back yards and as intercrop in other commercial crops (betel nut, coffee, pepper and cardamom plantations) in south India. In India, the major area under jackfruit is in Kerala state and it was regarded as heavenly fruit in the ancient periods. Recently Kerala declared jackfruit as the State fruit. It is grown in an area of 97,536 ha with annual production of 348 million fruits and productivity of 3,568 fruits per ha. In Assam, though the area and production has not shown any change, but the productivity has been improving. The value of jackfruit in Karnataka has been calculated to Rs. 12,718 lakhs (Anonymous, 2011).

In Meghalaya, Tripura, Assam and Arunachal Pradesh, Jackfruit is the most popular fruit among the local fruits. The states offer a huge potential and scope for jackfruit resource exploitation, production and value addition owing to the availability of diverse local genotypes since several years and favourable climatic condition. Rich jackfruit resources have been found both in the hilly slopes and plains. In the peak season there is huge market glut. Fruits are marketed to neighbouring states and also exported to Bangladesh. Apart from being used as a table fruit, raw jackfruit is very popular as vegetable throughout the year. Cut pieces of vegetable type of jackfruit costs about Rs. 40.00 in peak production season and in the off/ lean season (September to January) per kg of cut pieces of vegetable types cost about Rs. 80.00-100.00. There is a tremendous potential for identification of superior genotypes and systematic cultivation with increasing area, production, productivity and preparation of different value added products in these states.

Jackfruit mostly grows as a scattered tree in India. Large-scale commercial cultivation takes place only in Panruti in Tamil Nadu where many people grow jackfruit as a monocrop. Middlemen buy the fruit and take it to big cities such as Mumbai, Bengaluru and Hyderabad. But growers get at least Rs 70-100 per fruit.

Jackfruit is available round the year in Panruti. In a few areas—for instance in Idukki district of Kerala and Tumkur in Karnataka—it is available for 10 months. The jack husk industry in Hyderabad and Diva Foods, a chips unit in Thiruvananthapuram, run their production unit for 10 months a year. A Karnataka farmer, Channegowda of Hassan district, is developing a 30-acre jackfruit orchard in which he has planted carefully selected cultivars that will yield at different times of the year.

Though jackfruit is a neglected crop and generally looked down upon as a poor man's fruit, success stories around the fruit are slowly coming to light. Vinutha P. Hegde of Sirsi, a housewife, has produced three tonnes of jackfruit bar in the past five years. Shridhar Ogale, a Devgad-based farmer, is producing preserved tender jackfruit (phanas bhaji) for making vegetables. He is the first farmer to export jackfruit pulp to the UK for making ice-creams. He has recently also started marketing jack seed. Radhika, who used to be a daily wage earner, is running a very successful jackfruit papad industry in Moodabidri, Karnataka. Jackfruit pulp making, preserved tender jackfruit—two technologies that are practiced in Maharashtra—also have good scope for use in rural Meghalaya.

With these successes the countdown for jackfruit development has begun in the country. Kerala has adopted jackfruit as its State fruit. Many civil society groups have started organising jackfruit festivals. In the past decade, about 75 jackfruit festivals have been conducted in Kerala and Karnataka, two in Tamil Nadu, one in Maharashtra and two in Meghalaya. With growing awareness of the health and nutritional properties of the fruit and sustained efforts of jackfruit farmers and entrepreneurs across the country, it is anticipated that the jackfruit will definitely become the most sought after fruit in the coming years. Meghalaya, through this Mission, would be well placed to take full advantage of this emerging market for the benefit of its people.

JACKFRUIT IN MEGHALAYA:

Jackfruit is one of the most neglected tree crops grown in the state of Meghalaya and reliable data on its area, yield, productivity is not available nor has its genetic diversity been studied. Though the fruit is available from end January to July / August the crop does not figure in the list of fruit crops interventions of the line departments. The tree is found in abundance especially in the Garo Hills region, southern slopes of East Khasi Hills, parts of West and South West Khasi Hills, Jaintia hills and Ri Bhoi district. The Garo Hills region of the State has tremendous potential to produce huge number of jackfruits but due to lack of intervention, suitable infrastructure, processing, packaging and market access, enormous quantities of Jackfruit is wasted every year. Rough estimates put the number of trees in Meghalaya at between 4 to 5 lakh trees. An assessment done by the Basin Development Unit, East Garo Hills estimated a loss of Rs. 434.00 crore each season as villagers leave the fruit rotting in the open. In East Garo Hills alone, it is estimated that the villagers lose more than Rs.118.00 crore every year by under-utilizing the fruit due to the lack of awareness among the rural communities.

Value addition of jackfruit is still a new concept in the state and market penetration of the value added end products is still not there in the North Eastern Region due to lack of awareness and the fact that the ripe fruit in its original form is difficult and bulky to handle. However this is a golden opportunity to tap into the latent market for jackfruit value added products like canned bulbs, chips, papad, juices, flour etc and would give the state a first mover advantage. An assessment of the current Market scenario of Jackfruit in India shows that the demand is more in the Northern, Western and Southern parts of the country in comparison to the Eastern part while there is substantial demand in the export market especially to the UK, Middle East and USA.

Seeing the potential of the fruit and more importantly, it's by products, as an extremely viable opportunity for the sustainable promotion of livelihoods and both rural and urban enterprises, the Meghalaya Basin Development Authority (MBDA) in collaboration with the East Garo Hills District Basin Development Unit (BDU) had conducted a two-day "Jackfruit Festival" on July 11, 2014 at Williamnagar. The festival included cooking of jackfruit products, jackfruit eating and biggest jackfruit competitions. During the event the College of Home Science, Tura, Bethany Society from Tura, Mendipathar Mutli purpose Cooperative Society from Mendipathar, Sangma Bakery from Willimanagar, Marak Bakery from Williamanagar, Romgpi Food Paradise from Williamnagar, DCIC, East Garo Hills, MRDS, East Garo Hills and 12 Self Help Groups displayed various value added Jackfruit based products in 20 stalls. The products included Jackfruit Cakes, Jackfruit Muffins, Jackfruit Chips, Jackfruit Biscuits, Jackfruit Bread, Jackfruit Chocolates, Jackfruit Pickles, Jackfruit wine, Jackfruit Juice and Jackfruit Jam. The BDU, West Garo Hills in collaboration with the Meghalaya Institute of Entrepreneurship (MIE) had also organized a jackfruit festival on the 3rd of July 2015 (*The Telegraph July 4th 2015 edition*) to spread awareness about the fruit. As a follow up to the event the Meghalaya Institute of Entrepreneurship (MIE) under the IBDLP had also conducted three workshops in Shillong, Tura and Guwahati to create awareness and to sensitize policy makers, implementers, entrepreneurs and farmers on the potential of Jackfruit for Livelihood and Enterprise promotion. The workshops threw up a lot of ideas including the formulation of a specific **Mission Jackfruit** to leverage this abundant natural resource for livelihood, enterprise and food security of the people.

MARKET POTENTIAL:

Weight, spoilage and high transportation costs are the major constraints related to marketing of jackfruit coupled with a lack of reliable price information at the farm gate level. The price per fruit varies from market to market. The fruits are bought from the farm gate at very low prices as compared to when sold in the main markets. Therefore, initiatives on helping farmers and farmer-entrepreneurs to take shorter routes to final consumers while keeping consumer prices reasonable is the prerequisite action which needs to be explored in the state. This can be done through processing of jackfruit at the small scale / village level, for example, preparation of products such as jackfruit chips, jackfruit mixture, squash, jam and sip ups, jackfruit seed flour and selling into the market directly or exploring tie ups with higher end aggregators and wider markets.

Possibilities and opportunities exist for small / nano food producers to process jackfruit for local income generation and employment and the popularisation of the crop and its value addition fits

in very well into the objectives and goals of the NEC 2020 vision and the SDG Goals. In rural areas of jackfruit producing countries, food processing is a major source of employment. It is not only important to the national micro economy but is also one of the fastest growing sectors particularly relevant to marginalised and vulnerable women.

Small but significant instances of the market potential of jackfruit and how it has turned around the lives of farming families can be found in Kerala where there is a growing movement around the processing and value addition of jackfruit led by the Jackfruit Consortium spearheaded by noted farm journalist Shree Padre. The Jackfruit Company formed by Annie Ryu in 2011 and sourcing from 350+ farming families of Kerala today has a turnover of \$ 24 million dollars and more than 70 retail outlets across the United States. The Artocarpus Food Pvt Ltd Company formed by entrepreneur Subhash Kurodh from Kerala is one of India's first full-fledged jackfruit processing company sourcing from local farmers and exporting processed jackfruit products to the USA and the Middle East.

Growers can make good income from jackfruit if they are organised and have good market connectivity but there are some issues related to harvesting. Each fruit matures at different times and it is not feasible for a farmer to take it to the market, particularly because it is also huge. However if they are organised and have direct market linkage, they can make a good earning. There are farmers even in the perennially-drought-affected Vidarbha in Maharashtra who earn Rs. 5,000-10,000 by selling jackfruit locally as a vegetable to Nagpur which consumes around one (1) metric tonne of the fruit per day as a meat substitute. In Toobugere village in Karnataka, farmers started earning Rs. 100–200 per fruit after they formed a jackfruit growers' association, the first and only such association in the country, and built direct connectivity to the market. This was facilitated by Bengaluru's University of Agricultural Sciences.

Similarly Odisha's Indian Institute of Horticulture Research has trained tribal women in minimal processing procedures of the fruit and given them small, handy machines to peel the outer rind which has helped them increase their income. From Kerala, about 50,000 tonnes of raw jackfruits are sent to cities like New Delhi as a vegetable. Middlemen buy it for Rs 5-10/- per fruit and sell it to retailers in markets of faraway cities for over Rs. 25/- per kg where it is a rich man's vegetable – this despite the fact that Kerala suffers from a huge shortage of vegetable and fruits.

In the North East it is believed that a market for both the ripe fruit and for value added products can emerge and be sustainable provided jackfruit be made more accessible by giving consumers a convenient packaging, as opposed to having to buy a 7-10-kilogram fruit and through a well thought out and properly executed supply chain and go to market strategy.

RESOURCE AVAILABILITY

Jackfruit (*Artocarpus heterophyllus* Lam) is grown at low to mid altitude areas in Meghalaya such as in the Garo Hills region, southern slopes of East Khasi Hills, parts of West and South West Khasi Hills, parts of Jaintia hills and Ri Bhoi district with substantial quantities of the fruit being produced from the five (5) districts of the Garo Hills where almost each and every household has an average of 5 trees per household. Though no accurate records exist as to its area, yield, variety and population, an estimate of the quantum of production of the fruit was made by the then

Deputy Commissioner of East Garo Hills district, Shri. Vijay Mantri, in 2012, under the aegis of the Integrated Basin Development and Livelihoods Promotion Programme (IBDLP). The estimate assumed an average population of 5 trees per household for 2,71,804 households (2011 census), with each tree yielding an average of 50 fruits per season and an average weight of 20 kgs per fruit which resulted in an estimated population of 13,59,020 trees and a production of 13.59 lakh metric tonnes. Assuming that 20% of the fruits were consumed locally, the marketable surplus of jackfruits still threw up a staggering figure of 10.87 lakh metric tonnes.

People of the producing areas normally consume the ripe fruits and seeds locally with some quantity of fruits finding their way to the markets of Assam. However due to the bulk and weight of the fruit and its perishability, long distance markets are unreachable and most of the fruit is left to rot in the orchards. In the Garo Hills, jackfruit is a source of pig feed whereby pigs are tied to the jackfruit tree and feed on the fruits that fall down. In some other parts of the state the jackfruit leaves are also used as goat and cattle fodder.

To say that jackfruit is an underutilized fruit crop across the state would be an understatement. Aside from scattered home scale pickle and chips making there is no significant value addition activity happening anywhere in the state with most of the consumption happening at the household level. Despite the fact that there is a demand for jackfruit value added products in the mainland, fruits are rotting under the tree due to transportation hurdles, negligence and non availability of value addition opportunities including awareness about its potential for income generation amongst both the rural and urban communities. It is estimated that the country as a whole could be wasting jackfruit worth Rs 2,000 crore. The actual loss could be much higher. In the Garo Hills region of Meghalaya alone, jackfruit worth Rs. 434.00 crore was wasted in 2012. Even in progressive states such as Kerala too, the fruit is still considered a poor man's crop though the situation is slowly changing due to the efforts of the Kerala based Jackfruit Consortium.

Across the country only two agriculture universities (UAS, Bengaluru and IIHR, Odisha) and the CARD-KVK ((Krishi Vigyan Kendra), Thiruvalla, have done pioneering work on jackfruit despite jackfruit being classified as a "minor fruit" and doesn't have a mandate for research. In Meghalaya, the College of Home Sciences, Tura, under the Central Agriculture University, has been conducting training of farmers and some basic research on identification of processing cultivars under a Mission sponsored by the Ministry of Science & Technology. Though there is need for lot of R&D on jackfruit and on the potential of jackfruit as a food security and climate change adaptation crop, nothing concrete has been happening as compared to other producing countries.

The Meghalaya Institute of Entrepreneurship (MIE) had conducted 3 (three) workshops on Jackfruit in Shillong and Tura including an Interactive Workshop on Jackfruit in the Indian Institute of Entrepreneurship (IIE) Guwahati, in collaboration with the University of Agriculture Sciences, Bangalore and the CARD-KVK, Kerala, to create awareness on the livelihood and enterprise potential of Jackfruit. 100 (one hundred) farmer entrepreneurs have been sent for training on "Value Addition of Jackfruit" to ICAR- CARD KVK, Kerala and University of Agricultural Sciences (UAS), Bangalore. Three batches of 20 farmer entrepreneurs of the Garo Hills have also been sent for training on "Value addition of Jackfruit" in the College of Home Sciences, Tura, West Garo Hills district and an Awareness programme on the Potential of Jackfruit was held in Sohla

Thymmai village, Ri Bhoi district on the 2nd April, 2015. Post the trainings, some of the farmer entrepreneurs especially the cooperative societies, have started the collection and small scale production of jackfruit products like squash, chips, and mixture. Seeing the keen interest that the trainees have expressed in jackfruit the MIE is assisting them in the development of packaging and branding of their products.

While the efforts of the MIE has been focused on skilling and capacity building of such farmer entrepreneurs to value add jackfruit, its capacity to scale up the value chains is limited due to the unavailability of required facilities for training and skilling within the state. To this end and to address this perceived need, the Mission proposes to set up three Techno Incubation centres in Shillong, Tura and Jowai, to cater to a wider audience of farmer entrepreneurs who may not be able to travel to either Bengaluru or Kerala for training. Keeping in view the size of the market there is enough potential for large numbers of small enterprises to be incubated and to link them to a centralized marketing channel through the incubation centres.

MISSION IMPLEMENTING AGENCY

The Mission will be implemented by the newly created Directorate of Food Processing in coordination with the Meghalaya Institute of Entrepreneurship (MIE) as the PMU for the Directorate.

CHAPTER THREE

MISSION COMPONENTS

a) Mission Focus

The Mission will mainly focus on the development, promotion and up scaling of value addition of jackfruit and creation of holistic value chains for movement of the finished products to consuming markets of the country through a process of incubating private enterprises (both small and medium) so as to take full advantage of an existing readily available natural resource for engendering sustainable livelihoods opportunities for farmers and farming families across the state.

b) Operational Area

The Mission will cover all jackfruit growing districts of the state and be targeted at entrepreneurs, SHGs, well functioning cooperative societies, farmer interest groups (FIGs) etc keeping in view the peculiarities of the fruit and of the need for aggregation and bulking up of the produce. Three Techno Incubation Centres (TIC) are proposed to be established in Jowai, Shillong and Tura at locations with well developed infrastructure like hostels, water, electricity, buildings etc. 6 (six) days hands on trainings in the incubation centres will be imparted to batches of 30 (thirty) partners from all districts and Jackfruit Melas / awareness camps in all 11 (eleven) districts over the next five years will be organized. Small rural and medium urban processing enterprises are proposed to be promoted amongst the entrepreneurs, SHGs, cooperative societies and FIG to be trained and already trained who have existing minimum infrastructure facilities like work sheds, large jackfruit plantations and working capital. Aggregation and exit facilities are also proposed to be established in the Garo Hills and Ri Bhoi, in locations with existing required infrastructure of work sheds and space, for aggregation.

c) Action Research

As stated earlier jackfruit has been a neglected crop in the state with immense potential for generating sustainable livelihoods and enterprises both in the rural and urban areas. As there has been virtually no R&D work done on the subject within the state, it is imperative that the Mission be grounded on sound scientific and technical foundations for its success. To this end the Mission would take up action research on the following areas.

- i) Local varietal survey with the objective of germplasm preservation and improvement, identification of elite jackfruit genotypes for various purposes viz., table, squash, tender fruit as vegetable, chips, papad, seed and bulb flour preparation to be used in industry.
- ii) Identification and sourcing of appropriate technologies for the value addition of jackfruit in consultation with the Universities and technical partners.

- iii) Block and village level surveys with the objective of mapping, identifying, creating and organizing production and aggregation clusters for the supply chain.

This component will be implemented during the first two years of implementation upon Mission launch through the Directorate of Food Processing, Directorate of Horticulture and the MIE to be able to zero in on the areas with maximum production for the purpose of cluster mobilization, formation and formulation of the supply chains. The action research would also help in zeroing in on the most suitable local varieties for processing into various types of by products so that they can be further multiplied and improved upon. This component would also look at the various processing technologies and equipment available both within and outside of the country and at their suitability to the local conditions in collaboration with the technical institutions.

d) Varietal improvement

Preliminary work done by the MIE in collaboration with the UAS, Bengaluru and CARD-KVK, Kerala has indicated that the JF varieties of Meghalaya may not be suitable for all forms of processing and value addition. Meghalaya especially lacks early fruiting varieties that can fruit throughout the year which are suitable for use and processing as a vegetable. However such grafted varieties have been developed by both UAS and Kerala and are available for multiplication subject to their suitability to our agronomic conditions. Through action research and if found suitable, such varieties could be introduced into the state and multiplied by nurseries to be set up under the mission both in the public and private sector for large scale vegetative propagation of plants. In the case of private sector such interventions would be credit linked.

e) Research & Development

The arena of JF processing and value addition is just beginning to catch the attention of the scientific and industrial community across the country beginning with Kerala, Tamil Nadu and Maharashtra. Protocols, standards and equipment for processing and value addition are still being fine tuned by institutions and industry. A lot of the equipment in use in these states has either been adapted from conventional fruit processing equipment or imported from countries like Vietnam, Malaysia, Sri Lanka or China. As Meghalaya conditions differ from these states there is a need for demand driven R&D for product and process development, design and development of equipment, improved storage, shelf-life, packaging etc, suited to the unique conditions of the state, which could be conducted in collaboration with or outsourced to institutions like Agri Universities, NEHU, IITs, Indian Institute of Packaging, CFTRI, DRDO, IIFPT, NIFTEM etc.

f) Quality Control / Analysis laboratory

As food products, jackfruit and its by products are subject to stringent food safety and quality standards mandated by the Government under the Food Safety and Standards Act, 2006. To be able to penetrate and gain widespread acceptance in the markets it is essential that processed and value added products meet the standards as defined by the FSSAI. Meghalaya

has the Combined Food and Drugs Laboratory located in the Pasteur Institute, Shillong, which was set up 20 years ago and which conducts microbial and chemical analysis of food and water samples. However more sophisticated quality control analysis and tests like nutritional content, active ingredient, antibiotic residues, heavy metals etc, required under the export regime and higher end retail markets still needs to be done outside the state which are expensive for small scale enterprises. As the Directorate of Food Processing will be taking up other products besides Jackfruit for processing, it is perhaps a necessary requirement for the state to consider setting up of a dedicated quality control / analysis lab accredited to the National Accreditation Board for Testing and Calibration Laboratories (NABL) and FSSAI with assistance from the MoFPI under the Pradhan Mantri Kisan SAMPADA Yojana.

g) Jackfruit cluster formation

Jackfruit is a heavy fruit which presents unique supply chain challenges in the movement of the fruit from the producing farms to markets. As things stand today the fruit is sold in its raw form in local and roadside markets sometimes at throwaway prices. Many farmers do not even harvest the fruit and allow it to rot on the ground due to the difficulties of transporting it and the very low prices that they get. For the processing and value addition of the fruit to take off on a commercially viable scale there is a need to create agro processing clusters that can function as collection / aggregation centres located within the producing areas and to encourage entrepreneurs and the formation of FPOs / FIGs or cluster groups that can take on the responsibility of aggregation and perhaps to a certain extent carry out primary or minimal processing of the fruit before shipping it to a larger facility. Such cluster can be linked to markets / processing / aggregation centres through the 1917iTEAMS platform of the Department. Furthermore in view of the well known property of Jackfruit to ameliorate soil moisture regimes, clusters can be encouraged to take up systemic area expansion of the tree for catchment areas and springsheds protection in collaboration the Community Led Landscape Management Project (CLLMP) with which will not only ensure the continued existence of the catchment and springs but will also provide livelihood and enterprise opportunities to the cluster through aggregation and value addition.

h) Techno Incubation Centres

The Mission will establish three (3) Techno Incubation Centres (TICs) in Shillong, Tura and Jowai at the start of the Mission, at locations with well developed infrastructure like hostels, water, electricity, buildings, work space, classrooms, laboratories etc like the College of Home Science (COHS), Tura, NEHU or IIHM. The COHS, Tura under the Central Agriculture University (CAU), Imphal, is already a nodal agency for jackfruit in Meghalaya and had been implementing a jackfruit germplasm Mission of the Department of Biotechnology, Ministry of Science & Technology, Govt. of India which is now over. The MIE has partnered with the College in training some of the Garo farmer entrepreneurs in small scale processing of jackfruit.

The Techno Incubation Centres have been conceived of as Centres for Training and Technology Support for local entrepreneurs and groups interested in the business of promoting jackfruit. The Centres will be equipped with the necessary essential equipment /

facilities and training by the partner Universities under this Mission and will be a place where prospective entrepreneurs can get an idea of and be trained on the essential infrastructural requirement for setting up a processing unit for jackfruit based value added products. Training will be a major activity under the Techno-Incubation Centre, so that a large number of people could derive benefit from it. This benefit could be translated into an income generating activity not only for the entrepreneurs, but also for the jackfruit farmers through backward integration. The TICs will also function as Common Facility Centres (CFCs) for entrepreneurs, Self Help Groups and Cooperative society members who can utilize the facility to process their produce by paying a nominal user fee and earn profits from sale of the produce, without investing too much in the establishment of machinery and equipment. The objectives of the TICs would be:

- To organise awareness, training programmes on value addition of jackfruit to stake holders viz., farmers, entrepreneurs, officers of agri / horti Departments.
- To provide hands-on training on preparation of value added products from jackfruit.
- To provide incubation facilitation to prospective entrepreneurs for the production of value added products from jackfruit.
- To provide technical assistance to innovative entrepreneurs for product development in jackfruit.
- To act as a production / processing unit of jackfruit based products for its widespread popularisation.
- To effectively disseminate the value addition technologies, as more and more people would become convinced about the benefits of the technology by producing the various products by themselves.

The TICs would be equipped with the following units and equipment (Details in Annexure – II)

Processing Units:

- Fried chips manufacturing unit (FCMU)
- Squash making unit
- Pickle making unit
- Powdering / Dehydrated products making unit
- Jackfruit Preserve, bites, jam and jelly making unit
- Quality control lab

Products of the TICs

The TICs will provide training and incubation on the following value added products of Jackfruit:

- Ripe jackfruit Preserve
- Jackfruit Chips

- Jackfruit pulp
- Jackfruit Mixture
- Dehydrated Ripe jackfruit: Bites
- Dehydrated Ripe jackfruit pulp: Chew
- Ripe Jackfruit Squash
- Jackfruit Pickle
- Dehydrated Tender Jack fruit
- Dehydrated raw Jack fruit
- Ripe Jackfruit frozen RTS juice
- Ripe Jackfruit Jam
- Ready to cook tender jackfruit
- Jackfruit seed flour
- Raw jackfruit flour
- Jackfruit leathers

The establishment of the TICs will be done with the active collaboration and support of institutions of higher and technical learning like the University of Agricultural Sciences, Bangalore, the ICAR-CARD KVK, Kerala and the College of Home Sciences, Tura. Personnel of the TICs will be trained at the three institutions so that a cadre of Master Trainers can be incubated to further propagate the knowledge and technologies to the larger audience. The Directorate of Food Processing and MIE will work together to bring all the various stakeholders, mobilize resources, identify entrepreneurs, incubate and handhold them after their trainings. Since the facilities of the TICs are also common and applicable to the processing of other fruits and vegetables, the TICs would also train entrepreneurs in their processing during the jackfruit off season so that the facilities are not idle and are able to deliver maximum benefit to the people of the state. To ensure immediate takeoff, the TICs would initially focus on incubating the 300 odd entrepreneurs and society members already identified and capacitated by the MIE. During the trainings the trainees will be simultaneously screened and evaluated through socio economic and psychometric analysis tools to assess their potential as prospective entrepreneurs for further incubation.

The techno incubation centres will operate on a service driven revenue generating model through the incubation of entrepreneurs and enterprises, provision of processing, packaging, common facilities, training and capacity building services. Assets generated by the Mission will be operated and maintained by the respective TIC hosting institutions.

i) Start-up funding for jackfruit SMEs

Post the training the Mission will facilitate the establishment and incubation of 50 small scale value addition / processing enterprises over a five year period and handhold them till marketing of their products. The units will be selected from amongst the best performing society / groups / entrepreneurs based on the socio economic / psychometric evaluation conducted during the training and based on their having in their possession existing minimum infrastructure facilities like worksheds, sufficiently large jackfruit plantations and working capital. The enterprises incubated through this Mission will be linked to buyers and markets

nationwide by the Mission which will provide credit linked start-up fund support of Rs. 8.00 lakhs each for minimum processing equipment, while working capital, human resources and raw material will have to be met by the enterprises through their own investments or through bank linkages which will ensure greater stakeholder participation, ownership, continuity and sustainability of the enterprise. The Directorate of Food Processing and MIE will facilitate the establishment of the enterprises in coordination with the Departments of Commerce & Industries, Cooperation, Labour, Legal Metrology, the FSSAI, financial institutions, insurance brokers, market strategists and brand designers to ensure a smooth take off. Assets created through this Mission will be operated and maintained by the respective enterprises. The indicative list of equipment for each enterprise is indicated at Annexure – II.

j) Start-up funding for Nano processing / brining units

Jackfruit also lends itself admirably to home scale or Nano processing either as chips, pickles, kurkure, sweets, jams, papad etc which is yet another avenue for additional livelihood and income support especially for housewives, marginalized and vulnerable women. The processes are simple and with very little training and using commonly available household utensils, women can easily make such products at home which can then be sold in the local shops and markets. There is great potential under this component to target large numbers of households that can benefit from the jackfruit trees that grow in their own backyards. An example is that of Shri. K. Narashimaiah, a farmer cum teacher in Kachahalli village of Karnataka who earns around one lakh rupees per annum from only 6 trees in his backyard. In order to trigger off such nano enterprises a start-up fund of Rs. 2.00 lakhs per enterprise for purchase of basic equipment is proposed under the mission either as a form of patient capital or linked to credit under MUDRA, WEEFI, RMK, STEP, Mahila E-Haat or similar schemes.

k) TIC Trainings / incubation

The TICs will take up the training, skilling and incubation of 360 batches of trainees covering 10,800 partners / entrepreneurs with 30 trainees per batch spread over 5 years. The trainings will be residential with each training spread over 6 days in the TIC campuses. Modules for the trainings will be developed by the Directorate of Food Processing and MIE in consultation with the UAS, Bengaluru, CARD-KVK, Kerala, IIHM, Shillong and COHS, Tura. Master trainers of the TICs will be trained by the COHS, Tura, the UAS, Bengaluru and the CARD-KVK, Kerala which already has a functioning TIC. Necessary manuals of operation and processing will be developed by the Directorate of Food Processing and MIE with inputs from all the concerned institutions.

The trainings will be structured to emphasise more on the practical aspects of processing, packaging, handling of machinery and equipment, food safety and hygiene. To this end the module is being tentatively structured to impart 2 days of theory cum practical and 4 full days of hands on processing practice. During the trainings an evaluation of the entrepreneurial competencies of the partners will be conducted by the MIE using socio economic and psychometric tools like the Focused Behavioural Event Interview (FBEI) to shortlist potential entrepreneurs for further facilitation in setting up their enterprises. Post training the TICs will follow up on potential entrepreneurs for incubation and handholding in coordination with the

Directorate of Food Processing and MIE to assist the entrepreneurs in establishing their enterprises.

l) Go Mobile Village level Trainings

In order to take the concept and awareness about jackfruit value addition to the masses a concept of village level Go Mobile trainings is being proposed under the Mission wherein Master Trainers will move to the village clusters and stay there for 3 to 4 days to train farmers in the basics of plant management and minimal processing at the Nano enterprise / household level. The trainings will be conducted for 6 hours daily (3 hours morning and 3 hours evening) so that farmers can go about their daily work with minimal disruption while availing training at their doorstep. Under this approach the Mission would be able to reach out and train twice the number of farmers in half the time and cost. A total of 1980 batches of 35 farmers / batch are targeted for 5 years which would enable the Mission to reach out to about 69,300 farmers across the state. Training materials, manuals, Z-Cards etc would be developed by the Mission.

m) Awareness campaigns / Melas

To further add a fillip to the awareness and trainings and sensitize people and society at large about jackfruit, melas / campaigns to spread awareness about the fruit and its potentialities, will be organized in all 11 district headquarters of the state to sensitize and draw the attention of policy makers and practitioners, Govt. Officials, farmers, civil society, citizens and entrepreneurs to the potential of jackfruit and encourage them to take up the jackfruit cause. These melas could be organised by the Directorate of Food Processing through the respective DHOs wherein potential / prospective entrepreneurs / groups / societies could be identified through these melas for linking them to the TICs.

The melas would be a platform in which entrepreneurs and processors can not only showcase and sell their products but they would also be an opportunity for them to interact with buyers, from within and outside of the district. The melas would feature jackfruit shows, jackfruit exhibitions and jackfruit competitions and would be the ideal opportunity to carry out the process of varietal identification and classification of the jackfruits on display by a team of experts to be drawn from the Universities and research institutions.

n) State Jackfruit Festivals

Awareness about jackfruit, its many benefits and opportunities amongst buyers, consumers, higher end entrepreneurs, makers and practitioners of policy, civil society, thought leaders etc is also an important aspect of the Mission in order to mobilize and shape public perception of the fruit and ensure their buy-in into the jackfruit cause for the benefit of farmers across the state. To this end State Level jackfruit festivals are important showcases and opportunities for entrepreneurs incubated under the Mission to showcase and market their products to a wider audience and interact with buyers, experts, scientists, source leads, negotiate deals, explore markets, technology options and gain knowledge from fellow entrepreneurs and processors etc. Such festivals constitute an integral part of the Mission

and will be held for two days every year over the next five years of the mission lifecycle to showcase the farmers, the entrepreneurs, the products, the technology and the Mission.

o) Exposure visits

Exposure visits are an essential part of any training and incubation programme in order to open the minds and eyes of our entrepreneurs to the growth and business opportunities available outside of their village, block, district or state and to afford them an opportunity to interact and see how people of other states or even districts go about their livelihoods. An exposure visit is an inspirational experience and offers partners a chance to experience another culture, see different places, meet different people, see new and different technologies, eat different kinds of food, all of which opens up their minds to new ideas and increases the adoption rate of improved technologies and teachings. Over the Mission lifespan 2100 entrepreneurs in 105 batches of 20 partners each will be sent for exposure and training to places where jackfruit cultivation and value addition is being done on a commercial scale. The exposure visits would be organized by the Directorate of Food Processing and anchored by the partner Universities and organizations.

p) Packaging, branding and marketing

The most critical component of any enterprise, packaging, branding and marketing is the culmination of an entrepreneur's hard work, time, patience and sacrifice and deserves perhaps the maximum attention. As discussed earlier, in mainland markets, tender or raw jackfruit is in high demand as a vegetarian meat substitute while the ripe fruit and seeds can be turned into a variety of value added by products like squash, sweets, flour, cakes, chips, papad etc. A recent emerging demand is for RTC (Ready to Cook) tender jackfruit, dehydrated / freeze dried unripe jackfruit chips, Vacuum fried chips and jackfruit seed flour which are being increasingly seen on mid to high end market shelves, retail malls and speciality stores. This demand is being fuelled and driven by the growing awareness of jackfruit's health, nutritional properties and organic nature amongst a growing number of the health conscious middle and upper class population which is looking for healthier alternatives to highly processed and chemically laden packaged food. The growing number of nutritional research being done by researchers both in India and abroad and the never ending quest of the food industry for new products and cuisines is also driving this demand upwards especially amongst the diabetic and hypertension afflicted population while the wellness and health food industry is also on the lookout for natural and minimally processed organic produce. All these channels require the product to be certified, tested, packed hygienically and be well branded which makes this component so critical for the success of the mission and the enterprises incubated. A conservative estimate by the Jackfruit Consortium of Kerala puts the number of products that can be made from jackfruit at more than one hundred.

Advocates of climate change mitigation, food security and the organic lobby are also to a certain extent responsible for the increasing demand for jackfruit products as the tree is an excellent candidate for incorporation into a climate change adaptation program due to its versatility and hardiness requiring perhaps the lowest input of any tree crop while at the

same time is an abundant source of easily accessible, cheap, nutritious food for marginal areas.

This demand is reflected in the number of start-ups that are emerging and taking up the processing of jackfruit both for the Indian and export markets. Companies like the Jackfruit Company, Artocarpus Foods Pvt Ltd, Jackfruit 365 etc have been making waves in the food industry and are quickly moving into a commanding position in the market. Like them there are numerous smaller full fledged companies especially in Kerala and in Maharashtra which are today shifting focus to the processing of jackfruit especially for exports. Export houses are also increasingly incorporating jackfruit as one of the desired products in their portfolio and the MIE has been receiving enquiries from such export houses.

However while jackfruit items like squash, chips, papad, jack flour etc can be made in the home or in cottage scale units, the newer products like RTCs, dehydrated jack, freeze dried jack, and pulp can only be made using high end equipment with strict quality control processes especially for the high end market and exports. Packaging and branding of jackfruit products is taking centre stage and is critical for effective market penetration, eyeballs, brand recollection and shelf space. Countries like Thailand, Sri Lanka, Philippines, Vietnam are investing heavily in the jackfruit industry with most of the leading equipment manufacturers located in these countries. Sensing the demand, the Indian equipment manufacturing industry is also gearing up to start the manufacturing of jackfruit processing equipment like vacuum fryers, jackfruit peelers etc within the country.

In view of the market potential for both low and higher end jackfruit products, the Mission will be making substantial investments in packaging, creation of a jackfruit brand and promotion of trade for jack products of the enterprises incubated and set up under this Mission. In order to achieve this, the Mission will work with the TICs to hand hold the enterprises in ensuring that quality, testing and certification norms are met and to develop a common brand for jackfruit products both for the low and high end market segments including exports. Road shows, advertising campaigns, buyer seller meets, vending kiosks, online presence, trade fairs, B2B meetings, electronic and social media will all be leveraged to reach out to consumers and markets. The Mission will be engaging the services of reputed design houses, national institutions like the Indian Institute of Packaging (IIP), National Institute of Design (NID) and experts for shelf life certifications, packaging design and brand building as well as the extensive competencies / resources of the PMU to achieve this. The Business Facilitation Centres (BFCs) proposed to be set up in the metros of Delhi, Kolkata and Mumbai will be intensively used to solicit buyers and facilitate the entry of our entrepreneurs into these markets and facilitate the participation of our entrepreneurs in national and international level trade events.

Tie ups with other jackfruit processors and buyers across the country and abroad are already being explored along with logistics, warehousing, distribution and cold storage operators like Global Entrade. The Mission will also leverage upon the extensive enterprise facilitation network across the state to mobilize higher end entrepreneurs who could be players in the higher end value chain.

In order to achieve all this and build up cost efficient and sustainable value chains, the Mission will be adopting a strategy of domain specialization and de skilling whereby trained processors linked to the production clusters concentrate only on ensuring the production and packaging of quality jackfruit products. Transportation, warehousing, storage, branding, distribution, supply chains, promotion, advertising, will be taken up by either higher end local entrepreneurs and / corporate entities linked to the processors. This way it ensures that private sector domain expertise is brought into the Mission and that sufficient employment opportunities are generated across the value chain by the Mission. The ecosystem of the 1917iTEAMS is going to be extensively used to coordinate and bring together all these facets into an integrated chain that stretches from the farming clusters to the final consumer. In every step of the chain opportunities will be created for smart educated young people to involve themselves and also create employment and income generation opportunities for many others.

MISSION ROAD MAP

INTERVENTIONS	Year 1	Year 2	Year 3	Year 4	Year 5
Action Research					
Varietal improvement					
R&D					
Food testing Lab					
Cluster formation					
Establishment of 3 Techno Incubation Centres					
Establishment of SMEs					
Establishment of Nano enterprises					
Training & incubation					
Go Mobile training					
Jackfruit Melas					
State festivals					
Exposure cum training					
Packaging, Branding, Marketing					

MONITORING AND EVALUATION

The Mission will put in place an M&E system that would detail the monitoring procedures at various levels as well as guidelines for submission of various reports. Roles and responsibilities of various technical as well as project implementing staff with respect to MIS and monitoring & evaluation will be defined. Specific requirement with respect to training needs will be clearly indicated along with identified source for training arrangements. Key performance indicators for various activities under the Mission will be specified in order to ensure success of the Mission. The key highlights of the M&E function are as follows.

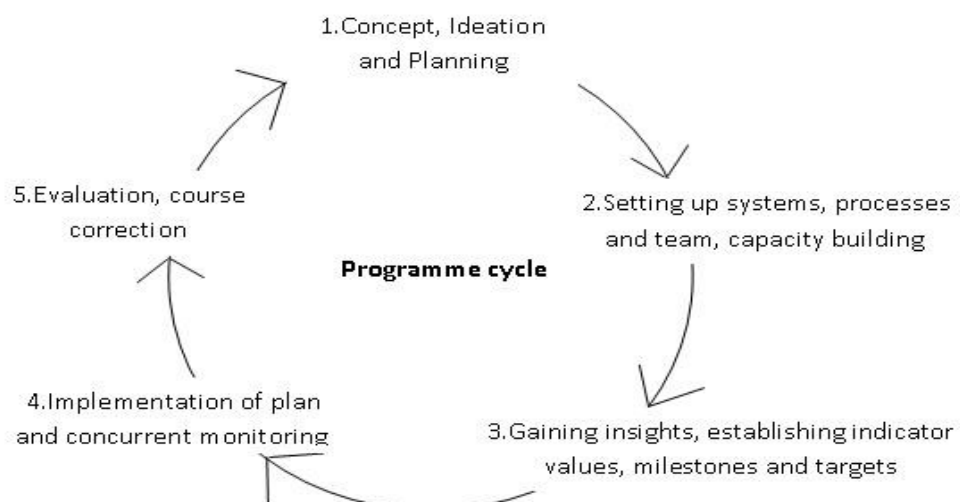
The goal of M&E is to outline a strategy for the Mission which will help monitor the progress of the implementation and aid in informed decision making.

This section also aims to lay the foundation of setting up Monitoring and Evaluation systems to help achieve the programmatic goals.

This section aims to provide a structure of the activities to be undertaken under Monitoring and Evaluation, how progress will be monitored, periodic evaluations be undertaken by the M&E team, and how the team will interpret and add value all the information for effective decision making by the Mission Administration.

The proposed Strategy for Monitoring and Evaluation is based on three fundamental stages in a Programme /Project Life Cycle – Planning, Implementation, and Evaluation. These stages have been explained as under.

Figure: Programme / Project Life Cycle stages



Planning

The Planning stage would comprise concept planning, ideation, systems setup namely MIS and monitoring, processes and timelines for monitoring, setting up the team, appointment of professionals and their capacity building, gaining insights through research and studies, establishing indicator values, fixing milestones and targets for achievement. The proposed

activities and their status is explained in the following sections.

1) Concept, Ideation and Planning

This would be the start off stage in the entire process of Monitoring and Evaluation and would involve concept development through prima-facie knowledge and reports available, planning activities, setting timelines against these activities, etc. Preparation of this Strategy paper is part of this stage.

Setting up systems, processes, M&E team and their capacity building

Based on the Strategy document and activities conceptualised and planned, the following activities will be undertaken.

1) *Setting up the M&E team*

A dedicated core team would be set up at the Mission HQ to monitor and report the progress of the project. This would include notification of personnel, their capacity building, establishing flow of information and value-add expected from each team member. This team may be supported by other team members based in districts for collection of information and its digitisation.

In addition to this core unit at Mission HQ, based in Shillong, staff in districts will also be nominated. A plan for capacity development of team members would also be formulated and operationalised.

The two primary functions of the team have been proposed as separate sub-units. Though majority of the tasks for these sub-units will be specific to their functions, they will not be limited to these specified tasks.

The **Monitoring** sub-unit would undertake tasks which would entail regular tracking of physical and financial progress of the programme, primarily through MIS.

The **Evaluation** sub-unit would be undertaking tracking progress of the Mission at regular time intervals and also as per the compliances of funding agencies. Their tasks would comprise surveys, impact studies, case studies / success stories, etc.

The team may undertake FGDs (Focused Group Discussions), case studies, qualitative and in-depth studies involving limited sample size (less than 30), in consultation with the reporting authority. In case of concurrent monitoring also, external agencies may be contracted to collect and synthesise data under the supervision of the M&E team. This will allow the team to focus on higher value add like analysis and interpretation for better decision making.

It is proposed that data collection and entry in computers be made mandatory under the supervision of the M&E team. However use of tablet computers or mobile phones for field data collection could eliminate the need to data entry, as data will be entered directly into tablets/phones rather than using a paper questionnaire and uploaded directly into a survey database.

2) *Establishing reporting formats, requirements and calendar*

This will be undertaken for the Mission and other projects under its ambit. Under this, outlines may be defined for undertaking Annual Outcome Studies, Thematic Outcome studies, KAP studies, Qualitative and case studies.

The reporting requirements for M&E will be established and the other outlines will be defined.

3) Designing MIS

This stage would include designing the MIS structure, indicators and flow along with defining the information requirement from institutions/stakeholders. It is suggested that trained personnel of DRDA may be engaged to design the MIS structure.

Gaining insights, Establishing indicator values, milestones and targets

1) Baseline Study

The Baseline Study would be undertaken before commencement of any project. Based on the values of indicators generated in the Baseline Study, mid-term and end-term assessments would indicate progress of the project.

2) Setting Milestones, timelines, targets

Based on the Baseline study and reporting requirements established, milestones, timelines and targets will be fixed annually. Along with, the periodicity of measurement would also be established.

Implementation of Plan and Concurrent Monitoring

In this stage, plans will be implemented, concurrent and regular monitoring mechanisms will be established. The M&E team, with assistance from district teams will periodically collect information and undertake its digitisation to monitor progress of programme and projects.

1) Launch of MIS

Concurrent monitoring will be undertaken with the help of quantitative information derived from MIS. It may be designed, developed, operationalised and maintained as a web enabled system which will provide continuous progress of the programme and projects on various indicators including project administration indicators like staff recruitment, sanction and release of financial tranches, receipt and expenditure, etc.

2) Output and outcome monitoring

This will ensure that the targets and milestones set are achieved in the stipulated timeline. This would be a regular exercise and agencies of the department may be utilised for undertaking these studies.

Annual outcome surveys

These will be undertaken to measure the outcomes of outputs that have been delivered in the last year or so. This would include indicators that will measure progress towards goals and objectives.

Thematic outcome surveys

These more focused surveys will be undertaken to provide information on the outcomes of

specific interventions - particularly those which only affect a specific group of participants (like Lakadong farmers).

Progress monitoring

This will be undertaken on a regular basis to ascertain achievement of physical targets for project activities and outputs as set out in Annual Work Plans and Budgets and provide course corrections. This activity will be undertaken by the SMMU and will be based on reports generated and MIS.

3) Process monitoring

This will ensure that the process planned to achieve the targets and milestones are being followed and will also help in course correction.

KAP studies

KAP (Knowledge, Attitude and Practice) studies are widely-used for assessing uptake and acceptability of newly introduced technologies or income-generating activities (IGA). It comprises three components as explained below

1. Knowledge: does the trainee KNOW what to do (i.e. has she/he remembered the key points of the training?)
2. Attitude: based on her/his knowledge of the technical approach for the IGA, and knowledge of her/his own circumstances, does the trainee think the IGA is suitable for her/him (and if not, why not)?
3. Practice: She / he actually going to implement the new technology or IGA?

Case studies and success stories

These would be collected during the course of the project and would provide insights into the successes and aspirations of the target respondents, which will help in better design and delivery systems. These would be undertaken along with studies like Rapid Assessment, Baseline, Annual Outcome and Thematic Outcome. The M&E team can also, during their field visit, collect case studies and success stories.

Evaluation and Course Correction

In this stage, a periodic evaluation (half yearly and annual) would be undertaken and corrective measures suggested. All these would be compiled and prepared by the M&E team.

1) Evaluation

Based on reports from various studies, monitoring mechanisms and MIS, half yearly and annual progress reports will be compiled and submitted for review. Any issues of concern/red flags and suggestions for course correction will be included in these reports.

2) Planning for following year

At the end of the year, a planning exercise for M&E activities in the following year would also be undertaken and proposed.

In addition to the above the following evaluation studies will also be undertaken.

- **Mid-term Assessment Study** – this would be undertaken mid way through the project to ascertain the progress achieved and any mid-course corrections which need to be introduced.

It would include indicators to measure progress towards goals and objectives.

- **End-Term Assessment Study** – this will be undertaken at the end of the project period (around the time of project completion) and will assess the achievement of the project during the tenure.

Social Cost Benefit Analysis:

The social cost benefit analysis of the various mission components will be worked out to understand the income gains to farmers, employment gains and other gains to the society. Various measures of project performance will be employed to study the direct and indirect benefits of the Mission. The impact of the Mission on the State Domestic Product (SDP) will be studied based on the data generated from MIS and monitoring reports.

Social Audit and Direct Benefit Transfer (DBT)

The Mission will be making substantial investments in area expansion, training and infrastructure like processing machinery and equipment. Funds under the Mission will be transferred to the enterprises / partners by Direct Benefit Transfer (DBT) to ensure transparency and speedy implementation in the field and the DBT will be linked with the Social Audit which will be deployed to monitor the progress of the Mission in the field. Social audit is a process in which the details of the resources, both physical and financial, used by the public agencies for the development initiatives are shared with the people, often through a public platform. It allows people to enforce transparency and accountability, thereby providing the ultimate users an opportunity to scrutinize the development initiatives. It is proposed under the Mission to create a social audit team involving beneficiaries of the Mission, civil society members, media personnel and reputed persons in the society to ensure transparency and accountability of the programme.

CHAPTER FIVE

SYNERGIES & CONVERGENCE

A Mission of this magnitude cannot be successful without the active collaboration and convergence of related agencies, departments and institutions. The Directorate of Food Processing will be the focal point of convergence and coordination with the following.

- With the Cooperation Department in establishing aggregation and processing enterprises in the cooperative sphere.
- With the Department of Commerce & Industries in the establishment and registration of small scale processing units.
- With the Horticulture Directorate in terms of technical and professional support by horticulturists and field personnel.
- With the TICs as their technical and capacity building programs are linked with the ICAR CARD-KVK, Kerala, the University of Agricultural Sciences, Bengaluru and the College of Home Sciences, Tura which are the national and state pioneers in jackfruit promotion. The Directorate of Food Processing through the MIE will explore and institutionalize technical collaborations with these institutions as over 100+ jackfruit partners have been facilitated by the MIE for training in these institutions over the last couple of years.
- The Mission will ensure close coordination and relationships with banks and financial institutions for leveraging financial assistance and loans for the enterprises to be set up. Schemes like MUDRA and StandUp India will be actively pursued especially for women groups / entrepreneurs.
- The Mission would leverage the resources of the District Horticulture Offices for mobilizing entrepreneurs, establishment of the value & supply chains, organising of jackfruit Melas and awareness campaigns.
- The Mission would also draw upon the professional expertise and marketing resources of the Meghalaya Livelihoods Access to Markets (MeghaLAMP) Mission.
- The Mission would integrate with the Springsheds initiative of the MeghaLAMP and CLLMP by encouraging jackfruit plantations in and around the catchment areas of springs and water sources.
- The Mission would also encourage jackfruit plantations through the Community Nursery initiative of the CLLMP in convergence with the Forest Department.
- The Mission would closely work with and leverage upon the cloud based resources of the 1917iTEAMS platform for evacuation logistics and for reaching out to buyers and sellers of

jackfruit and its various by products whilst educating farmers through advisories of the platform.

- Other linkages built into the Mission are with the Food Safety and Standards Authority of India (FSSAI) and the Department of Legal Metrology.
- The Mission will also work closely with institutions like the Indian Institute of Entrepreneurship, Guwahati, the NIRD & PR – NERC, Guwahati, the Entrepreneurship Development Institute of India (EDI), Ahmedabad, Institute of Rural Management Anand (IRMA) to further capacitate our entrepreneurs and to take the message and market of jackfruit across the North East which potentially could become a hub for jackfruit given the naturally occurring abundance of the crop in the region.
- Most importantly the Mission will link with the Ministry of Food Processing Industries (MoFPI) and establish a close working relationship with the Ministry and its affiliated bodies such that the state is able to leverage the multitude of schemes available with the Ministry for the benefit of the farmers and entrepreneurs of the state.

CHAPTER SIX

FINANCIALS OF THE MISSION

The Mission has set a target of reaching out and impacting 82,200 farmers, 50 SMEs and 200 Nano enterprises over the next 5 years with a total outlay of Rs. **79.18** crores out of which it is proposed to leverage **Rs. 42.62** crores as convergence from MIDH, **Rs. 6.30** crores from MoFPI, and **Rs. 27.14** crores from the Mission. A total of Rs. **48.92** crores will be the investment from both the MIDH and MoFPI for the Mission. Administrative support for the Mission has been kept at 3% of outlay amounting to Rs. **2.29 crores over 5 years and M&E at Rs. 80.00 lakhs**. A total of Rs. **30.26** crores is therefore being sought from the Government of Meghalaya as support funds for the Mission over a period of 5 years.

CONCLUSION

Jackfruit and its value addition is a readymade golden opportunity for the state to improve livelihoods and generate employment opportunities in both the urban and rural areas through promotion of local enterprises and creation of its value chains while addressing issues of climate change, food and nutritional security. Judging from the experiences of entrepreneurs who have started venturing into this field, there is great scope for up-scaling value addition interventions for the crop as well as a ready market nationwide. More importantly the Mission will demonstrate the feasibility of turning a long ignored low input, low cost natural resource of the state into a high value product capable of sustaining and generating income for a long line of enterprises and entire communities. Our estimates are that even if only 10 % of the total production of jackfruit is tapped and channelized into the value chain, it would potentially generate livelihoods for around 20,000 households. Even more important is the demonstration impact that such a Mission can have on other states of the North East who also have extensive jackfruit plantations and who would be able to learn from the Meghalaya experience to also improve the livelihoods of their people - and that may be something worth investing in.

ANNEXURE - I

SUMMARY OF COSTS FOR MISSION JACKFRUIT					
Sl no	ITEM	PARTICULARS	QUANTITY	UNIT COST	Total cost (₹)
1	Action research	State wide action research on Local Varietal identification / selection, germplasm survey, technology sourcing & transfer.	1	10000000	100,00,000
2	Varietal improvement	Propagation nurseries for improved varieties in the public sector @ 100% for 4 ha	10	2500000	250,00,000
		Propagation nurseries for improved varieties in the private sector @ 50% for 1 ha	10	750000	75,00,000
3	R&D	Demand driven R&D for product and process development, design and development of equipment, improved storage, shelf-life, packaging etc		20000000	200,00,000
4	Food testing laboratory	Food Testing Laboratories with NABL / FSSAI certification	1	25000000	250,00,000
5	Jackfruit cluster formation	Formation of jackfruit collection, aggregation, agro processing clusters & FPOs	8	1000000	80,00,000
		Promotion of jackfruit cultivation in the catchment areas (Ha)	2000	60000	12,00,00,000
6	Establishment of Techno Incubation Centres (TICs) in Garo, Khasi and Jaintia Hills	Machinery, equipment etc	3	18730290	561,90,869
7	Start-up funding for jackfruit SMEs	Machinery, equipment etc	20	800000	400,00,000
8	Start-up funding for nano brining / processing units	Equipment	200	200000	400,00,000
9	Training	Hands on Training in the incubation centres for entrepreneurs & Master trainers	360	230900	831,24,000
10	Village level training	Village level mobile training on minimal processing	1980	50000	10,89,00,000
11	Training materials	Z-Cards, Manuals, Brochures, leaflets etc	200000	12.5	25,00,000
12	Awareness / Melas	Organizing awareness camps / jackfruit melas / mobilization camps in all 11 districts for 5 years	55	439000	241,45,000
13	Festivals	State jackfruit festivals for 5 years	5	2386000	119,30,000

14	Exposure	Training cum Exposure visits on Value Addition of Jackfruit outside the state for 12 batches of 20 partners	105	616000	646,80,000
15	Marketing	Packaging & Branding, advertising, marketing / trade promotion / buyer seller meets, vending kiosks, retail outlets, export facilitation etc			11,40,00,000
				SUB TOTAL	76,09,69,869
16	Mission management	Mission management & operational expenses @ 5%			228,29,096
	M & E	Monitoring & Evaluation	LS		80,00,000
				GRAND TOTAL	79,17,98,965
				SAY	79,17,98,000

(Rupees seventy nine crores seventeen lakhs, ninety eight thousand) only

ANNEXURE – II

DETAILED COST PROJECTIONS FOR MISSION JACKFRUIT						
SI no	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
1	Action Research	A. Action Research				
		State wide Local Varietal identification / selection, germplasm survey, technology sourcing & transfer.	1	10000000		10000000
		A. Total				10000000
SI no	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
2	Varietal improvement	B. Varietal improvement				
		Propagation nurseries for improved varieties in the public sector @ 100%	10	2500000		25000000
		Propagation nurseries for improved varieties in the community / private sector @ 50%	10	750000		7500000
		B. Total				32500000
SI no	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
3	R&D	C. Research & Development				
		Demand driven R&D for product and process development, design and development of equipment, improved storage, shelf-life, packaging etc		20000000		20000000
		C. Total				20000000
SI no	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
4	Food testing laboratory	D. Testing Laboratories				
		Food Testing Laboratories with NABL / FSSAI certification	1	25000000		25000000
		D. Total				25000000
SI no	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
5	Jackfruit cluster formation	E. Cluster formation & area expansion				
		Formation of jackfruit collection, aggregation, processing clusters & FPOs	8	1000000		8000000
		Promotion of jackfruit cultivation in the catchment areas (Ha)	2000	60000		120000000
		E. Total				128000000

SI no	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
6	Establishment of Techno Incubation Centres (TICs) in Garo, Khasi and Jaintia Hills	F. Machineries & equipment				
		Electric Dryer	1	700,244		700244
		Automatic form fill packing machine	1	540,000		540000
		Continuous band sealer	1	30,000		30000
		Double jacketed steam kettle (100 lts)	1	90,000		90000
		vegetable cutting machine	1	72,600		72600
		Jackfruit cutter	1	50,700		50700
		Cutting table 5’ X 2 ½’ X 30” HT + 6”	2	25,200		50400
		Jackfruit peeling machine	1	84,000		84000
		Vacuum Frying Machine	1	600,000		600000
		Electrical Deep Fryer- Big	1	78,000		78000
		Finger Chips cutter	2	1,800		3600
		Squash Unit	1	1,755,000		1755000
		Weighing balance (50 Kg)	1	9,600		9600
		Weighing balance (1 kg)	3	1,800		5400
		Packing machines	1	30,000		30000
		Foil Sealer	2	9,000		18000
		Powdering machine	1	378,000		378000
		Dough Mixer (5 litre)	1	60,000		60000
		Fruit mill	1	72,000		72000
		Pulper cum Finisher	1	120,000		120000
		Multipurpose VAT	1	204,000		204000
		Jackfruit chips cutting machine for tender jack	1	12,000		12000
		Nitrogen flushing & sealing machine	1	56,400		56400
		Vacuum packing machine	1	72,000		72000
		Cold Storage	2	2,400,000		4800000
		Dry ink coding machine	1	48,240		48240
		Quality control facilities / lab	1	3,600,000		3600000
		Import duty, Freight & transportation charges		1,200,000		1200000
		Installation costs, electrical, civil works etc		2,640,000		2640000
		GST @ 18%		1,350,105		1350105
Total for one centre						18730290
F. Total of 3 Techno Incubation centres one each in Garo, Khasi and Jaintia Hills						56190869
SI no	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
7	Start-up funding for jackfruit SMEs	G. Small & Medium Enterprises				
		Solar / electric dryer (small)	1	240000		240000
		Double jacketed steam kettle (50 lts)	1	48000		48000
		Jackfruit cutter	1	50700		50700
		Cutting table 5’ X 2 ½’ X 30” HT + 6”	1	25200		25200
		Electrical Deep Fryer- small	1	39000		39000
		Finger Chips cutter	1	1800		1800

		Weighing balance (50 Kg)	1	9600		9600
		Weighing balance (1 kg)	1	1800		1800
		Packing machines	1	30000		30000
		Foil Sealer	1	9000		9000
		Dough Mixer (5 litre)	1	60000		60000
		Fruit mill	1	72000		72000
		Nitrogen flushing & sealing machine	1	56400		56400
		Vacuum packing machine	1	72,000		72000
		Jackfruit chips cutting machine for tender jack	1	12000		12000
		Pre operating expenses				72500
Total						800000
G. Total of 50 units						40000000
SL No	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
8	Start-up funding for nano brining / processing units	H. Nano enterprises				
		HDPE containers 50 liters with lid	45	1200		54000
		Steel container SS 316 / 304 (100 liters)	4	30000		120000
		Cost of 1 kg plastic pouches (kg)	20	500		10000
		Labelling	2000	6		12000
		Sealing machine	2	2000		4000
						200000
H. Total of 200 units						40000000
SL No	ITEM	PARTICULARS	QUANTITY	UNIT COST	NO OF DAYS	Total cost (₹)
9	6 days Hands on Training in the incubation centres for entrepreneurs & Master trainers (30 trainees / batch=360batches = 10800 partners)	I. Training - I				
		Classroom charges with LCD	1	4550	2	9100
		Practical area charges	1	4550	6	27300
		Stationery	30	50		1500
		Fooding	30	400	6	72000
		Accommodation	30	300	5	45000
		Resource person fees	4	2000	6	48000
		Conveyance for resource persons	4	500	6	12000
		Transport (pick up and drop) including POL for 30 partners	1	5500	2	11000
	Documentation & reports	1	5000		5000	
		Total				230900
		I. Total of 360 batches in five years				83124000
SL No	ITEM	PARTICULARS	QUANTITY	UNIT COST	NO OF DAYS	Total cost (₹)
10	Village level training (35 trainees / batch = 1980 batches =	J. Training - II				
		Village level mobile training on minimal processing	1980	50000	3	99000000
		Documentation & reports	1980	5000		9900000

	69300 partners)					
		J. Total for 1980 batches in five years				108900000
SI No	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total Cost (₹)
		K. Training materials				
11	Training materials	Z-Cards, Manuals, Brochures, leaflets etc	200000	12.5		2500000
		K. Total of training materials				2500000
SI No	ITEM	PARTICULARS	QUANTITY	UNIT COST	NO OF DAYS	Total cost (₹)
		L. Awareness / Melas				
		Venue charges		LS	1	20000
		Construction of Exhibition Stall 10 nos. (100 sqft @ Rs.40 /sqft)	10	40	1	40000
		Construction of Food stalls (150 sq ft @ Rs.40 /sqft)	2	40	1	12000
		Hiring of chairs	500	50	1	25000
		Flex banner	3	1500		4500
		Printing of pamphlets, publicity, posters billboards		LS		20000
		Hiring of sound system with generator		LS	1	30000
		Resource person fees	3	1000	1	3000
		Conveyance for resource persons	3	500	1	1500
		Food, lodging and TA for 4 guests @ 4000/- each approx.	4	4000	1	16000
		Light Refreshment for approx. 600 participants @ ₹ 75/-	600	75	1	45000
		Transport expenses	500	150	1	75000
		Local artists	1	35000	1	35000
		Lunch for approx. 600 participants @ ₹ 145/- per head	600	145	1	87000
		Miscellaneous				25000
		Total				439000
		L. Total of 55 programs				24145000
SI No	ITEM	PARTICULARS	QUANTITY	UNIT COST	NO OF DAYS	Total cost (₹)
		M. Festivals				
		Venue charges		LS	2	40000
		Construction of Optanorm Exhibition Stall 10 nos. (100 sqft @ Rs.40 /sqft)	30	60	2	180000
		Construction of Food stalls (150 sq ft @ Rs.40 /sqft)	4	40	2	24000
		Construction of pandal & cover	1	600000		600000
		Hiring of chairs	1000	50	2	100000
		Flex banner	8	2500		20000

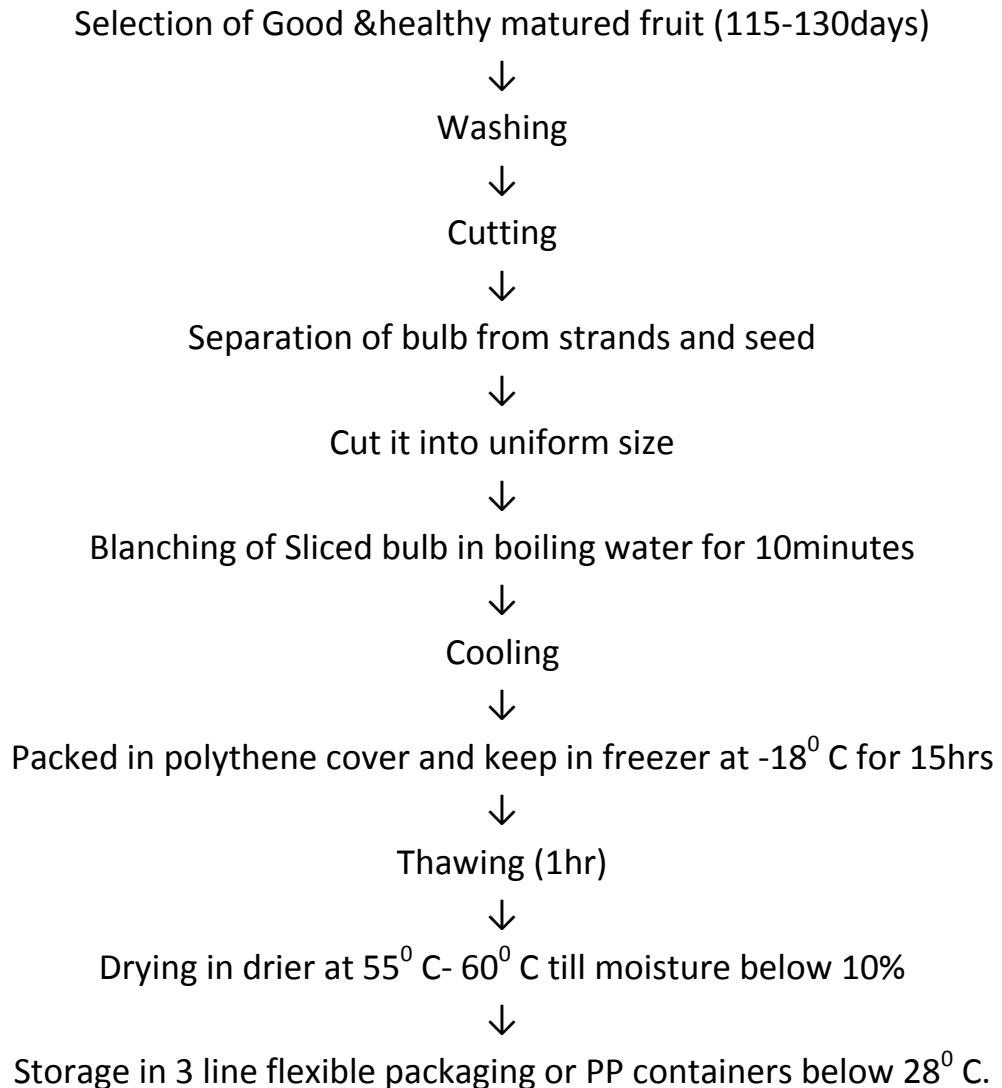
		Publicity through print, electronic & digital media		LS		100000
		Hiring of sound system with generator		LS	2	60000
		Resource person fees	8	1000		8000
		Conveyance for resource persons	8	500		4000
		Food, lodging and TA for 8 guests @ 15000/- each approx.	8	15000	2	240000
		Light Refreshment for approx. 1000 participants @ ₹ 60/-	1000	75	1	75000
		Transport expenses	1000	150		150000
		Local artists	2	45000		90000
		Lunch for approx. 1000 participants @ ₹ 145/- per head	1000	145		145000
		Prize money	10	50000		500000
		Miscellaneous				50000
Total						2386000
M. Total of State festivals for 5 years						11930000
SL No	ITEM	PARTICULARS	QUANTITY	UNIT COST	NO OF DAYS	Total cost (₹)
14	Training cum Exposure visits on Value Addition of Jackfruit outside the state	N. Exposure				
		Train / air tickets	20	4800		96000
		Training fees	20	12000		240000
		Accommodation, fooding and outstation logistics	20			200000
		Daily Allowance	20	280	10	56000
		Local Transport	20	LS	2	24000
Total						616000
N. Total for 105 batches over 5 years						64680000
SL No	ITEM	PARTICULARS	QUANTITY	UNIT COST		Total cost (₹)
15	Branding, advertising, marketing / trade promotion / buyer seller meets	O. Marketing				
		Packaging & Branding		LS		30000000
		Advertising, marketing & Trade Promotion including mobile vending kiosks		LS		50000000
		Vending / retail outlets	8	2000000		16000000
		Buyer seller meets @ 2 per year	10	800000		8000000
		Export facilitation		LS		10000000
	O. Total					114000000
		TOTAL (A+B+C+D+E+F+G+H+I+J+K+L+M+N+O)				760969869
SL	ITEM	PARTICULARS	QUANTITY	UNIT		Total cost

No		COST				(₹)
16	Mission management	P. Management & Administration				
		Mission management & operational expenses @ 3%				22829096
	M & E	Monitoring & Evaluation		LS		8000000
		P. Total				30829096
		GRAND TOTAL				791798965
					SAY	79,17,98,000
(Rupees seventy nine crores seventeen lakhs, ninety eight thousand) only						

ANNEXURE -III

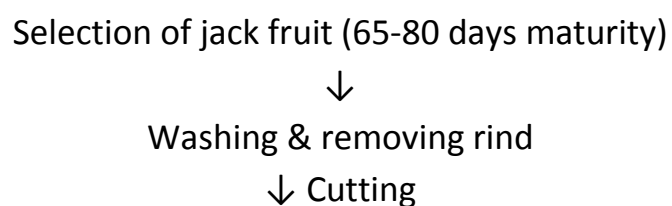
PROCESS FLOW FOR SOME JACKFRUIT VAUE ADDED PRODUCTS

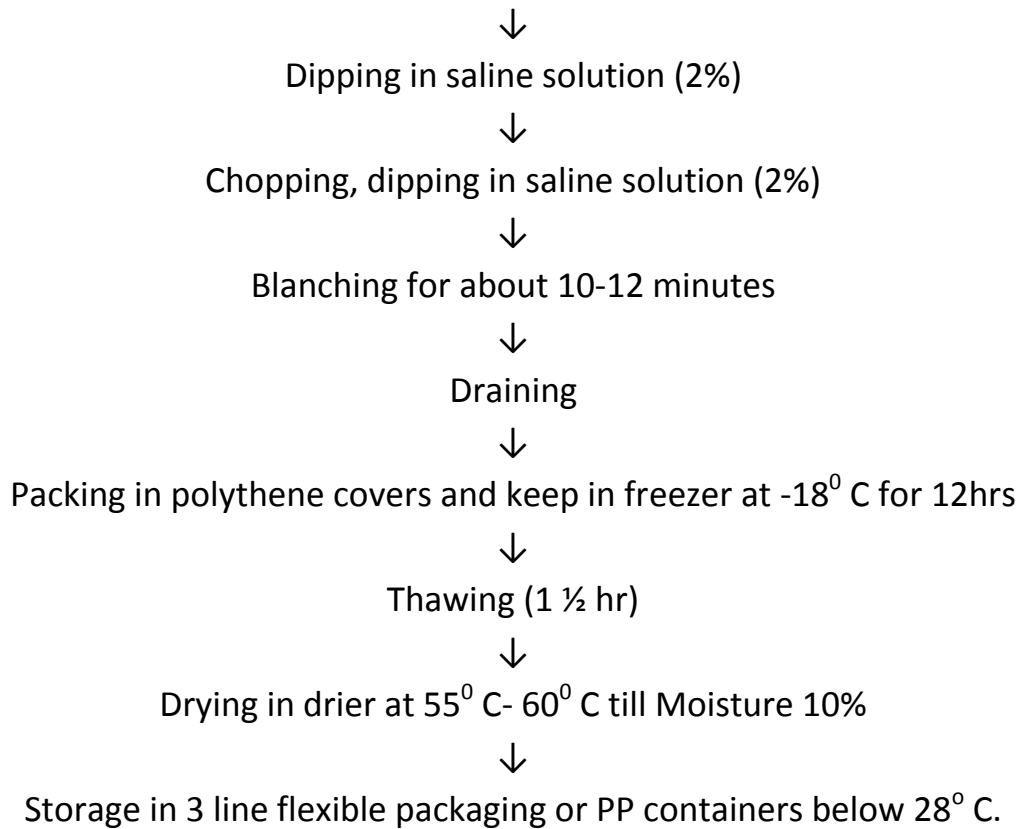
DEHYDRATED RAW JACK



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DEHYDRATED TENDER JACK

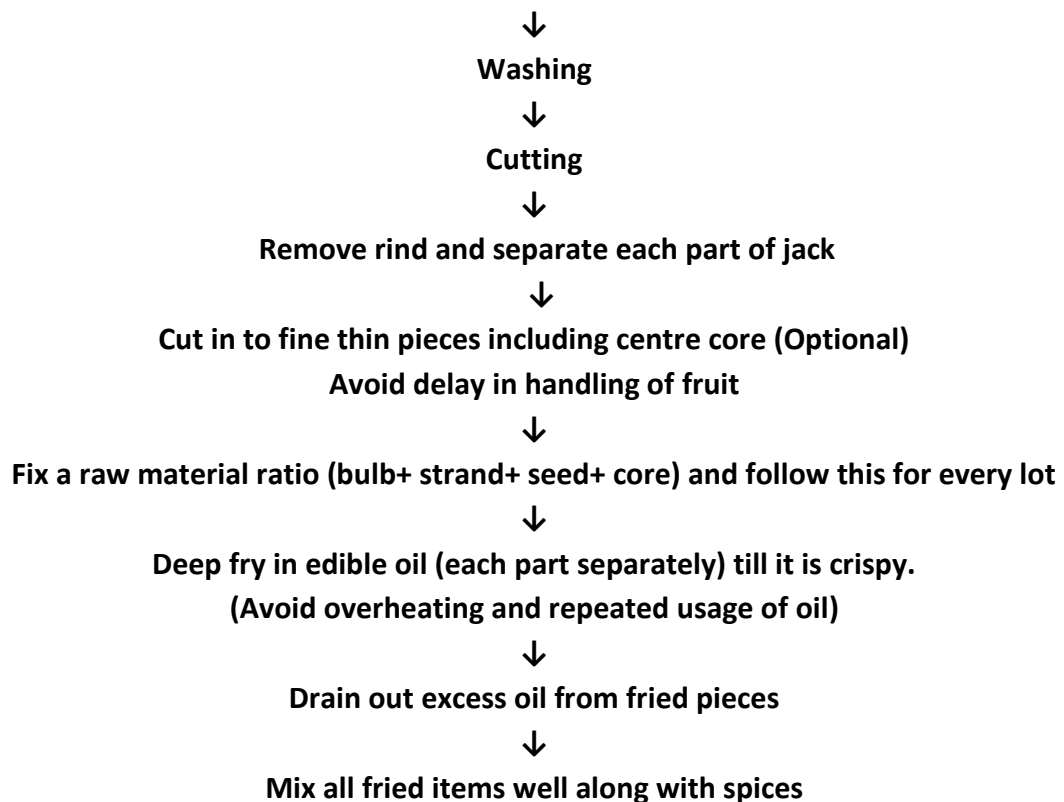




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JACKFRUIT MIXTURE

Select matured fruit either koozha or Varikka with optimum maturity (105- 125 days)



**Fix a composition/ratio for ingredients
(garlic ginger paste, asafoetida, Chilly and pepper powder and salt)**



**For better shelf life, pack in laminated polyester pouches with nitrogen flushing for
Increased shelf life or air tight containers. Keep the fried items separately and mix together,
along with spices during the time of marketing(Optional)**

-----XXXXXXXXXXXXX-----

DEHYDRATED JACK SEEDS

Selection of Good & healthy matured fruit (115-130days)



Washing, Cut into uniform size



Blanching of Sliced seed in boiling water for 15-18 minutes, Cooling



Packed in polythene cover and keep in freezer at -18⁰ C for 15hrs



Thawing (1hr)



Drying in drier at 55⁰ C- 60⁰ C till Moisture 10%



Storage in 3 line flexible packaging or PP containers below 28⁰ C

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JACKFRUIT PRESERVE

Minimum fruit: 55%

**Minimum Total Soluble Solids: 68% Substances allowed: Fruit Juice/Pulp, sugar, citric acid,
ascorbic acid, permitted colour, flavour and preservatives.**

Selection of good healthy fruits (Koozha) with optimum maturity (120- 150 days)



Washing



Cutting

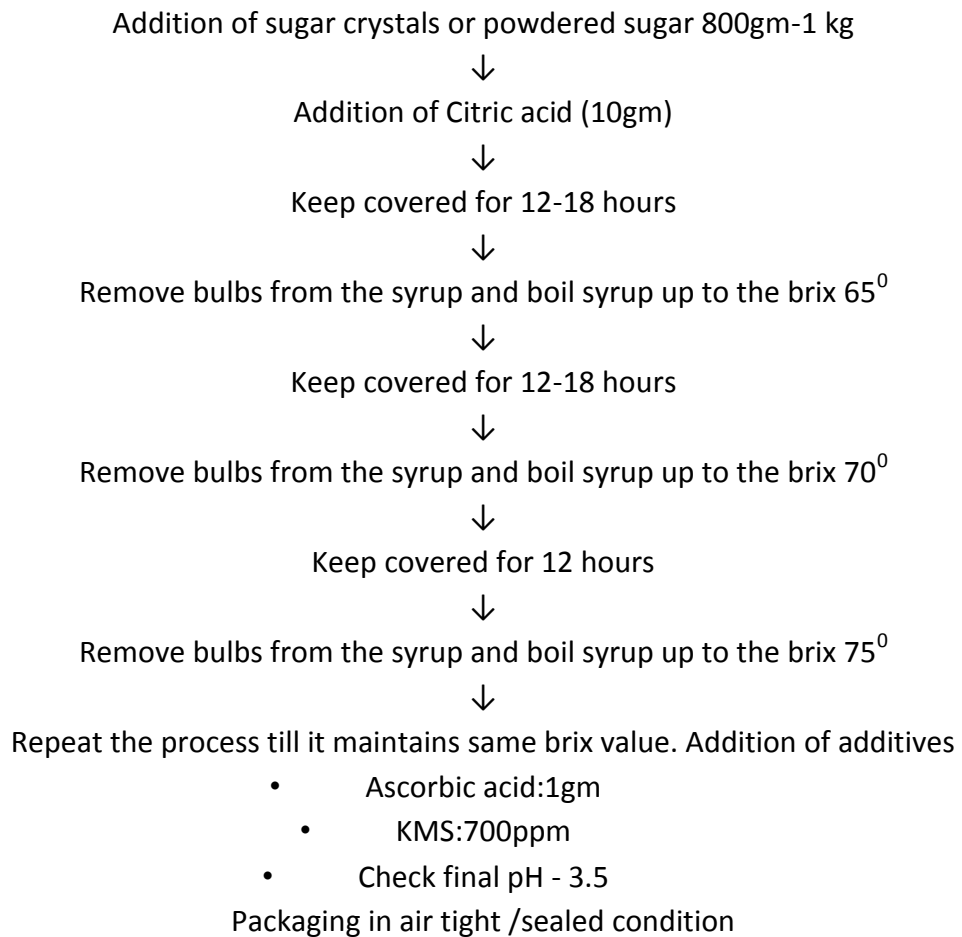


Take the bulb (Remove the seeds and strands) 1 kg



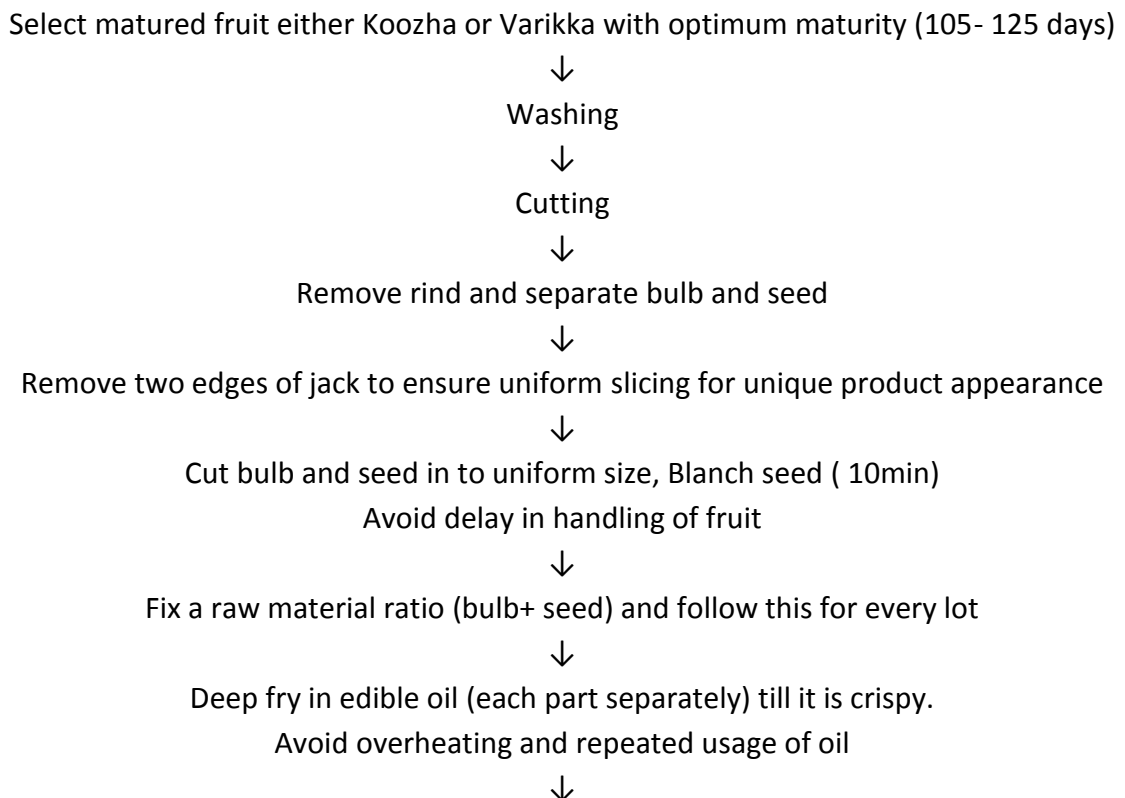
Blanching of bulb (1mts)





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JACKFRUIT CHIPS



Drain out excess oil from fried pieces
↓
Mix fried bulbs and seeds well along with spices
Fix a composition/ratio for ingredients
(Garlic ginger paste, asafoetida, Chilly and pepper powder and salt)
↓
For better shelf life, pack in laminated polyester pouches with nitrogen flushing for increased shelf life or air tight containers. Keep the fried items separately and mix together, along with spices during the time of marketing(Optional)

-----XXXXXXXXXXXXX-----

JACKFRUIT BAR/CHEW

Product specifications as per FSSAI:
Moisture- Not more than 15% Total Soluble solids- 75% Minimum Fruit Content- 25%
Selection of good healthy fruits (120-150 days) Both varieties
↓
Washing, Ripening (up to semi ripe), Cutting
↓
Take the bulb (Remove the seeds and strands)
↓
Blanching of bulb (20 - 30seconds)
↓
Extraction of pulp, Check TSS
↓
Addition of powdered sugar (175gm)
(May vary according to the variety)
↓
Addition of Citric acid (7gm)
(May vary according to the variety)
↓
Ascorbic acid (1gm)
Potassium Meta bi Sulphate (700ppm)
↓
Addition of additives
Colour – 1ml (solution 9:1), Essence- 1ml
↓
Filtering (1mm sieve), Balance pH 3.5 TSS to 25 o
↓
Evenly spread it in trays (1mm-2mm thickness)
↓
Drying in drier at 55⁰ C- 60⁰ C till it is dry (Moisture 12-15%)
Storage – 3 line polyester laminated pouches and keep below 30⁰ C