# CSIR Technologies for Rural Livelihood

## Building Atmanirbharta with Science and Technology

A Joint Initiative of CSIR, UBA and VIBHA


CSIR-National Institute of
Science Communication and Policy Research
(CSIR-NIScPR)
Vigyan Sanchar Bhawan, New Delhi

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# Introduction

As the country celebrates the 75th year of its independence, migration in search of employment still remains an important development challenge. The prominent face of migration became evident during the recent COVID-19 pandemic which triggered mass scale reverse migration reinforcing the loopholes in the unsustainable and non-resilient economic developmental model of the country. One of the most devastating impacts of COVID-19 crisis is the loss of livelihoods of the large population that lives at the bottom of country's socio-economic pyramid.

Taking cognizance of the problem, Council of Scientific and Industrial Research (CSIR), Unnat Bharat Abhiyan (UBA) coordinated by Indian Technology Delhi (IITD) and Vijnana Bharati (VIBHA) came together signing a tripartite Memorandum of Understanding (MoU) on July 28, 2020 with an objective to jointly work towards creation of livelihood opportunities in the rural areas of the country through CSIR Technologies. It is recognized that appropriate Science & Technology interventions can play a catalytic role in bringing equity and equality in the process of development. With this background the collaboration aims to focus on dissemination of CSIR Technologies for meeting the rural societal needs using the vast institutional network created under UBA and local chapters of VIBHA. CSIR having a vast countrywide network of 37 national laboratories, 39 outreach centres and 3 innovation complexes carries out research on hugely diverse spectrum of areas like oceanography, geophysics, chemicals, drugs, genomics, biotechnology, nanotechnology, mining, aeronautics, instrumentation, environmental engineering and information technology etc. It has over 3,000 active scientists engaged in research thereby developing a big pool of technologies. UBA has a network of about 3000 higher education institutes working closely with about 15000 villages across India. VIBHA is an organization with a national presence working through autonomous institutions and independent organizations. In line with the dream of Shri Narendra Modi, Hon'ble Prime Minister of India, the collaborative effort is to strive towards making India's villages Atmanirbhar through utilizing locally-available resources and empowering the weaker sections of the society. In this regard a launch ceremony to disseminate CSIR Technologies using higher education network of UBA and local chapters of VIBHA was inaugurated by Dr. Harsh Vardhan, the then Hon'ble Union Minister for Science & Technology, Earth Sciences, and Health & Family Welfare, on 30th September 2020. Since then multiple technology demonstration and showcasing events have been organized in which CSIR technologies were showcased to potential technology seekers and other stakeholders interested in technology diffusion through online and offline modes. These technology demonstrations and showcasing have been able to generate huge interest among potential technology seekers across the country and they have come forward to understand their scope of implementation in specific geographies.

One of the aims identified for sustained collaborative efforts for technology dissemination is the preparation of a repository of appropriate CSIR rural technologies. The repository would provide detailed information on CSIR rural technologies and feature their assessment on select parameters for enabling the identification of technologies based on the needs of a specific geographical area and sector. This document presents the first such repository of 82 CSIR rural technologies (Appendix 1). Information on various technologies was collected from CSIR laboratories based on a set of parameters which were framed through consultations with CSIR, UBA national coordinating institute IIT Delhi, and field visits by the UBA Regional coordinating and participating institutions and VIBHA.

This data was analyzed on parameters like gestation period, training days required to get familiar with the technology, investment required to put technology into production, whether technology can be a part of circular economy, status of technology commercialization, whether the resources required for production are made locally, region of the country where technology was developed and the state in which technology was developed. The trends emerging from the analysis are shown in the subsequent section.

**Summary of findings:** The trends emerging from the data collected about 82 CSIR Technologies shows many interesting trends summarized as below:

**Gestation period:** Gestation period refers to the period between the start of an investment in the technology and the time when production using it can start. The technologies were categorized as the following gestation periods:

1) Immediate
2) 1 week to 6 Months
3) 6 Months to 1 year
4) 1 year to 2 year
5) 2 year 3 year
6) 3 year to 5 year
7) More than 5 year

Technologies belonging to above categories were counted and following trend (Figure 1) was observed:

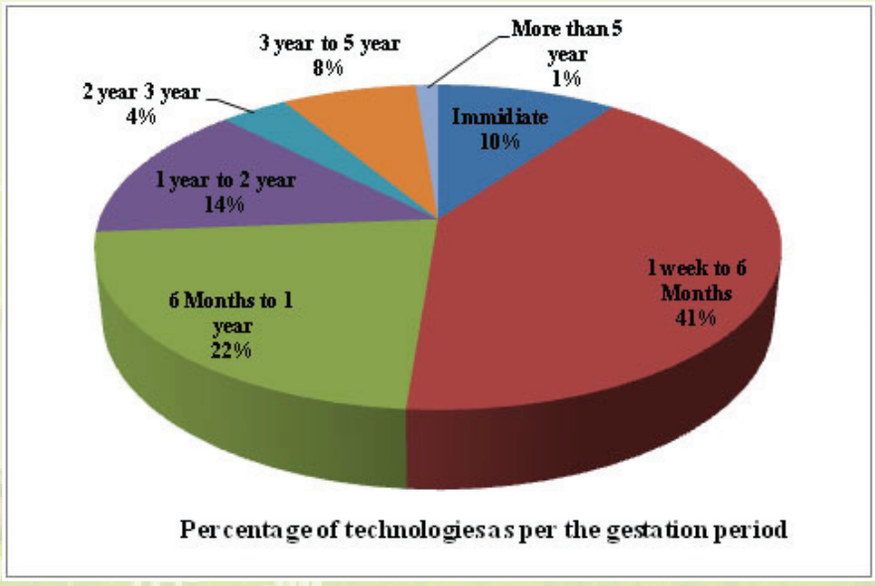


Figure 1: Gestation period for the technologies

From the above figure it can be seen that most of the CSIR Technologies (73%) have a gestation period from immediate to one year, if further categorized, it can be seen that 10% of the technologies can immediately yield outcome of production, while 41% of technologies have a gestation period from one week to six months and 22% have gestation period of 6 months to one year. Very low percentage of technologies have higher gestation period like 1 year, 3 year or 5 year.

**Indicative Investment:** On the basis of nature of Indicative investment, rural technologies of CSIR may be divided into two categories- Cultivation based, where investment may be measured in terms of amount required per unit of land brought under cultivation. In the present sample of 82 technologies for which analysis was done, 16 technologies were found to be cultivation based, meaning thereby investment per unit of land brought under cultivation. Under this category the investment was given as amount per hectare of land brought under cultivation and investment required per square meter of land under cultivation for technologies involving costlier investments. For the technologies requiring investment in terms of amount per hectare of the land following trend (Figure 2 and 3) was observed:

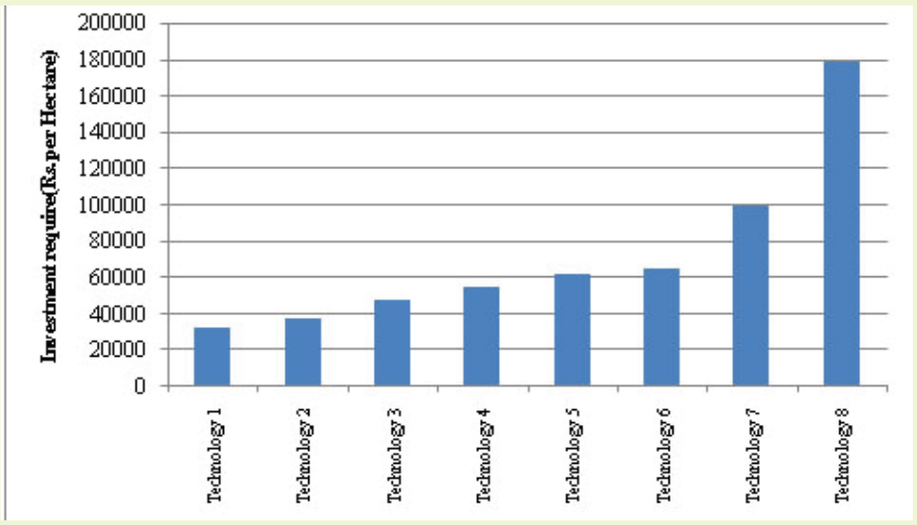


Figure 2: Indicative investment per unit of land brought under cultivation

It can be seen from the figure above that lowest investment required is ₹ 20,000 per hectare while highest investment required is ₹ 1,80,000 per hectare. The average investment per hectare was found to be ₹ 72,500 per hectare.

For technologies involving costlier investments in terms of ₹ Per 500 sq meter of land under cultivation, invest required can be shown as below:

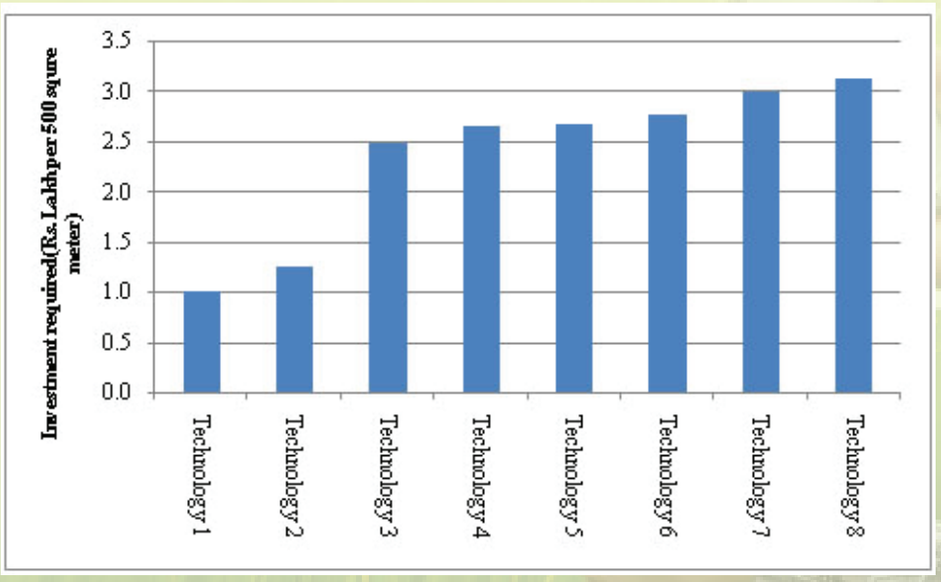


Figure 3: Indicative investment per unit of land brought under cultivation

For the remaining 66 technologies, the data for 44 technologies is shown in term of the investment required in terms of equipments to be set up for establishing processing units. This is shown as below (Figure 4):

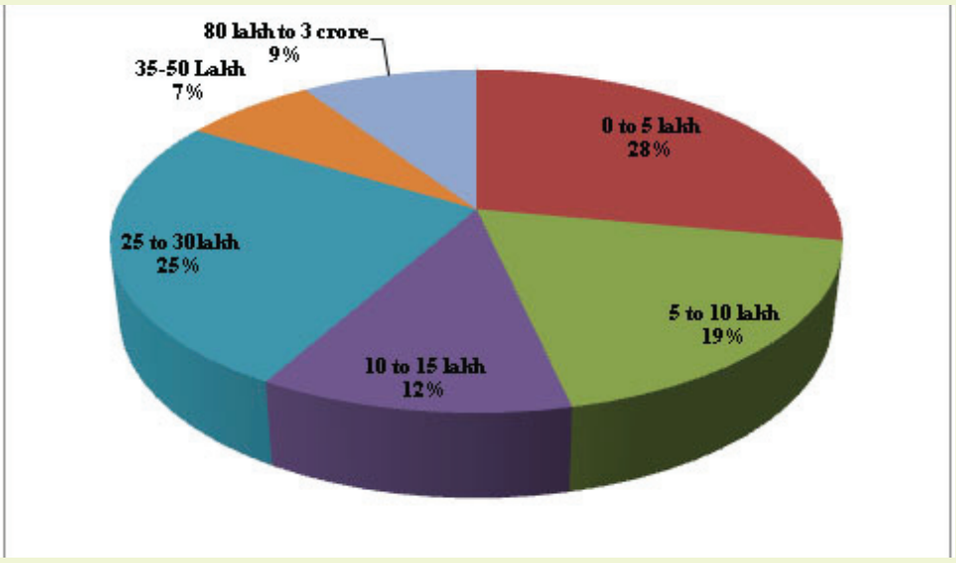


Figure 4: Indicative investment for putting technology into production

It can be seen that for most of the technologies (28%) the investment required is in the range from 0-5 Lakh or in the range of 25-30 Lakh (25%), this is followed by percentage of technologies (19%) requiring investment in the range of 5-10 lakh. It can be observed that 59% of the technologies require investment in the range of 0-15 lakh.

**Status of commercialization:** 53 technologies (64%) are completely commercialized while 10 technologies (8.2%) are at some stage of development and 12 technologies (14%) are ready to be commercialized.

**Availability of Resources required for production:** For 75% (60 technologies) the resources required for production are available locally while for 9 technologies (10%) resources are to be arranged from outside of local proximity.

**Part of Circular Economy:** Circular economy refers to the reuse of the product. For these technologies 67 out of 82 (76%) can be part of circular economy.

**Number of training days required to get familiar with the technology:** It can be seen from the figure below that for majority of technologies (72%) only 15 days training is required, which shows most of the CSIR Technologies are very easy to get familiar with (Figure 5).

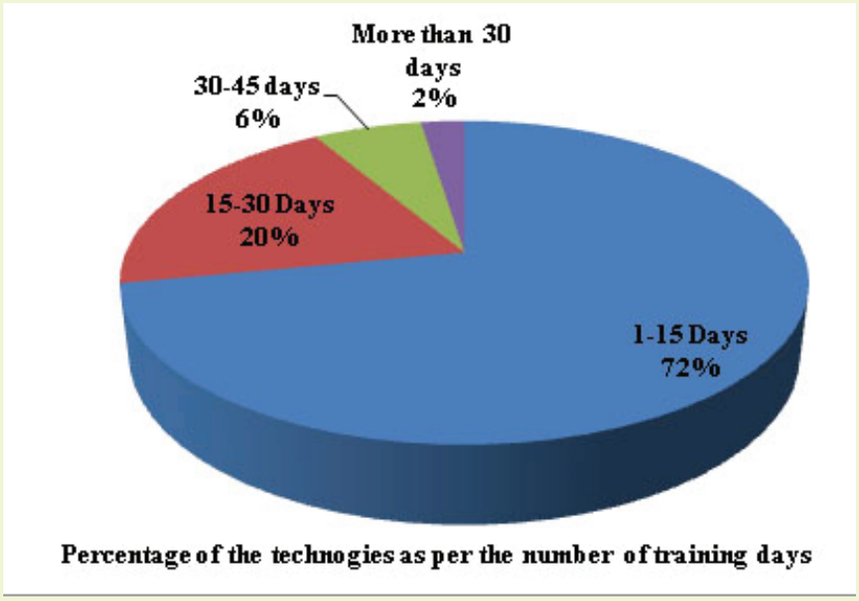


Figure 5: Technologies as per the number of training days required

**Technology development by region:** Most of the CSIR technologies have been developed in northern region of the country as shown in Figure 6.

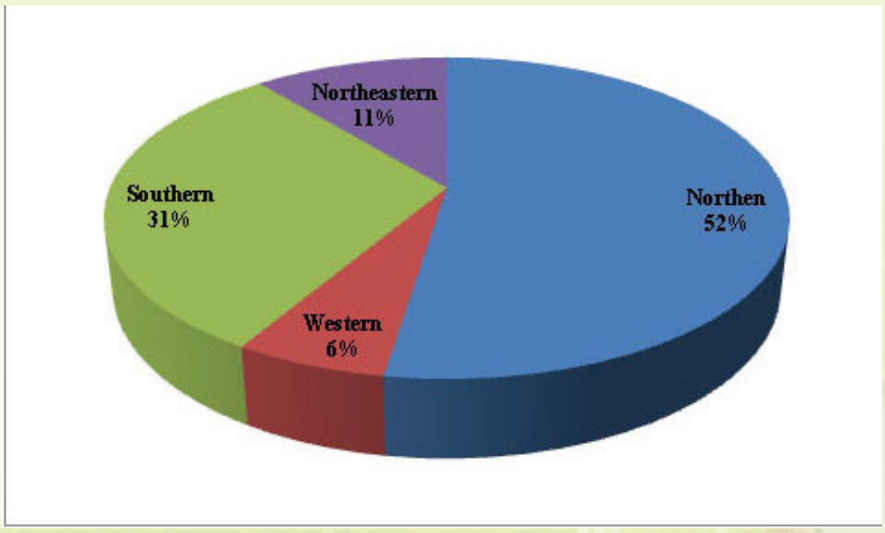


Figure 6: Technologies developed as per the regions

**Technology development by state:** Technologies developed by CSIR labs in various states have been shown in the figure 7. It can be seen that CSIR labs in Himachal Pradesh and Karnataka have developed more technologies than other CSIR Labs.

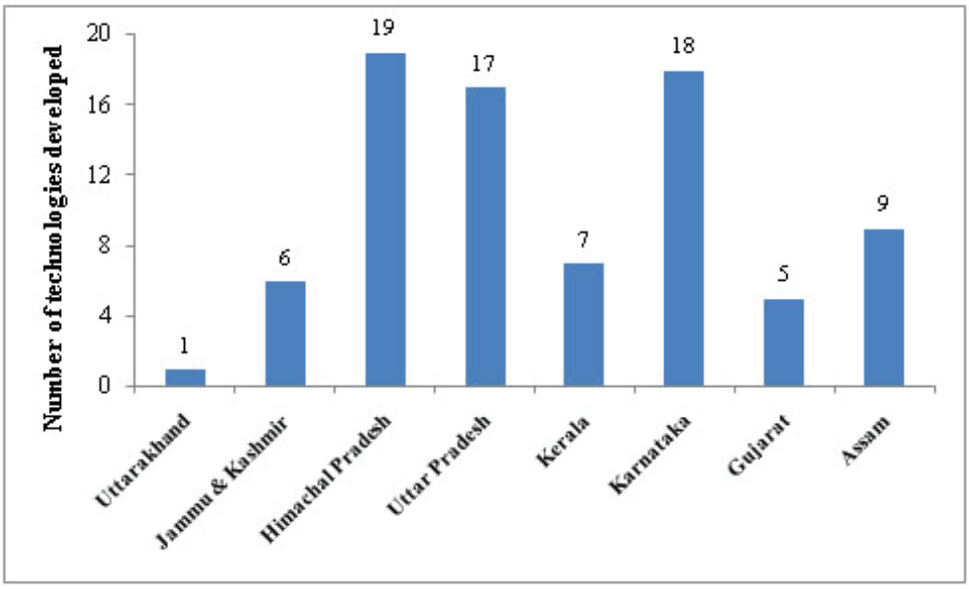


Figure 7: Technologies developed as per the states of the country

**Conclusions: Following conclusions can be drawn from trends emerging from the data**

- Majority of CSIR Rural technologies have low gestation period
- Almost 50% of CSIR Rural technologies require very low amount of investment (0-10 Lakh) for being put into production
- High percentage of these technologies have already been commercialized
- For majority of these technologies the required resources for using them are available locally
- A high percentage of these technologies(76%) can be a part of circular economy indicating reuse of the finished products
- Very low numbers of training days are required for making users familiar with these technologies

**Way ahead**

The ongoing efforts under the CSIR-UBA-VIBHA collaboration are focused on understanding the feasibility of technology dissemination in rural areas of India. Together, these institutions are working on the development of a one-of-its-kind elaborate framework through multi-stakeholder consultations that can set a benchmark and provide indicators for assessing the suitability of a particular technology for a specific geographic region of the country. The indicated framework is expected to streamline the process of technology selection from a myriad of available technologies and enable quick decision-making suited to the needs of a particular community while addressing the larger goals of inclusive and sustainable development of Indian villages on their journey to Atmanirbharta.

# Contents

# Improved Jaggery Making Plant "Gur Bhatti"

## [CSIR-IIP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Improved Jaggery Making Plant "Gur Bhatti" |
| 2. | About technology (in short) | Jaggery making is one of the prominent cottage industries of rural India. The industry was struggling with the issues of low profitability and stringent pollution norms. The present technology therefore relates to an improved design of Jaggery making plant (Gur Bhatti) that results in 15% increased daily Jaggery production capacity and nearly 25% Fuel (Bagasse) savings. The plant smoke emissions are also reduced to minimum levels. With more than 50 installations so far, the present technology has played an important role in providing employment to rural masses, improved the quality of life by lowering local pollution and also helped in generating additional income to sugarcane farmers. |
| 3. | What is the scientific approach to choose the particular technology? | The technical interventions in design of furnace and chimney improve the combustion of fuel and heat transfer. This ultimately improves the process efficiency. Simplicity of design, easy availability of material of construction, low capital inputs and easy maintenance makes this improved plant suitable for the rural area with sugarcane cultivation. Increasing shift of people towards natural sweeteners has opened a wide market for Jaggery and Jaggery Products. |
| 4. | After what duration the first output can be seen? | Jaggery making is a seasonal activity (5 - 6 months a year). On the basis of financial inputs, the payback period is one season. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Raw material for the process is Sugarcane and a Crusher is required for taking out juice. Electricity/Petroleum fuel is required to run the crusher. The plant construction mainly requires civil and steel fabrication work. |
| 6. | What is the area foot print of the Process? | Uttar Pradesh (U.P.), Maharashtra and Odisha are among the major sugarcane producing states of India. Out of 6 million tons of Jaggery produced in India, 60% is produced in U.P. CSIR-IIP improved Jaggery plant technology is implemented mainly in western U.P. area. Therefore, there is a large scope of implementing this technology in entire U.P. and in rest of the sugarcane producing states of India. As per the estimate, there are 40,000 small Jaggery plants running all over India that can be replaced or improved using this technology. |

| | | |
|---|---|---|
| 7. | What kind of Climatic and Geographical location is required? | The most suitable location for the Improved Jaggery making plant is sugarcane cultivating areas and near sugarcane fields. |
| 8. | Gestation period of the project? | One sugarcane cultivation season. |
| 9. | Minimum Economic Unit Size? | 1 ton/day Jaggery production. |
| 10. | Indicative Investment | ₹ 6 - 7 lakh (excluding cost of land). |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Sugarcane farmer – Jaggery making plant – Local market / Super market / Export |
| 12. | Can it be part of Circular economy? | No. The final product of the process (Jaggery) is consumed by the end user. However, 25% of the fuel used in the process (Bagasse) is saved and can be used as input to other cottage industries e.g. Mushroom growing. |
| 13. | What will be the Chain of Value addition? | Sugarcane cultivation (organic) – Jaggery Production (15% additional production capacity + 25% Fuel Saving + Low smoke emissions) - Labelling & Marketing – Other Jaggery Products – Income of farmers and rural masses. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No, the plant requires civil and fabrication work with the inputs of skilled persons. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | The plant can be constructed locally by imparting skills to the local artisans. However, the required material of construction, boiling pans and crusher will be procured from the market. |
| 16. | How many Training Days or months required for the technology to be learned properly? | A training of 5 - 7 days for an unskilled person and 2 - 3 days for a skilled person is required for technology to be learned properly. |
| 17. | How to be implemented from the root to tip | Identification of suitable interested beneficiary – Assessment of beneficiary (Financial / Agricultural / Land holding etc.) – Assessment of raw material – Selection of Plant capacity / Nos. – Employability of rural masses – Funding opportunity – Branding / Marketing |
| 18. | If it can be implemented at Family level or external manpower is required? | External manpower is required to run the plant. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 7 – 8 persons per plant |
| 20. | What is the Status of Commercialization | The technology has been transferred to suitable interested farmers / rural entrepreneur on non-exclusive basis in western U.P. region with more than 50 installations. |

| | | |
|---|---|---|
| 21. | Scale of Funding required all total? | A total investment of ₹ 6 - 7 lakhs will be required for an entirely new improved Jaggery plant installation which excludes the cost of land. However, a retrofitting option is also available for existing plant owners which may cost roughly around 40 – 50 thousand ₹ per plant. |
| 22. | Budget with breakage? | Boiling Pans = ₹ 2.00 lakhs, Fire Grates = ₹ 40,000/- Masonry Items = ₹ 2.00 lakhs, Crusher = ₹ 2.00 lakhs, Miscellaneous items = 20,000/-, Labour = ₹ 30,000/- The above mentioned are approximate costs and are likely to vary as per location and availability. |
| 23. | What type of Certification Required for the product? (If required) | FSSAI (Food Safety & Standards Authority of India) certification is required for the marketing of Jaggery in supermarkets. However, no certification is required for local market. |
| 24. | Risk involved? | Lower market price of refined sugar, Lower sugarcane cultivation, More stringent environmental / Emission norms. |

# Agro-technology of Lemon grass (*Cymbopogon khasianus x C. pendulus, Poaceae*) [CKP-25], Kalam

## [CSIR-IIIM]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Agro-technology of Lemon grass *(Cymbopogon khasianus x C. pendulus, Poaceae)* [CKP-25], Kalam |
| 2. | About technology (in short) | It is an interspecific hybrid strain of C. khasianus x C. pendulus and C. pendulus x C. Khasianus were developed by CSIR-IIIM, which was named CKP-25 and Kalam, respectively. These varieties are superior to other variety being grown presently in terms of oil yield. Depending on the season to season, the oil recovery is 0.45 to 1.00% with 82 to 85% citral content. |
| 3. | What is the scientific approach to choose the particular technology? | It is very useful in perfumery, flavouring & pharmaceutical industry. |
| 4. | After what duration the first output can be seen? | After transplanting the slips (plants) its takes six month to twelve month for commercial yield. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Land, Water, Fertilizers and Manpower |
| 6. | What is the area foot print of the process? | Medicinal and Aromatic plants |
| 7. | What kind of climatic and geographical location is required? | Tropical and Sub-tropical Climate |
| 8. | Gestation period of the project? | Five years |
| 9. | Minimum economic unit size? | Output (Net return): ₹ 80,000- 1,00,000 per ha. per annum. |
| 10. | Indicative Investment | Cost of cultivation: ₹ 55000-70,000 per ha. per Year. |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | CSIR-IIIM (QPM supplier) — Farmers (Producer)—Industry (User). |
| 12. | Can it be part of circular economy? | Yes |

| | | |
|---|---|---|
| 13. | What will be the chain of value addition? | Industry make the value added product. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Cultivation and Processing of Medicinal and Aromatic plants by the Farmers/ growers based on CSIR technologies, is expected to provide enhanced income and new employment opportunities in village/ rural sector. |
| 16. | How many Training Days or months required for the technology to be learned properly? | Approximate 15-20 days sufficient to learn about the Agro-technology for commercial cultivation. |
| 17. | How to be implemented from the root to tip | Awareness cum training programmes and demonstration of technology at IIIM farm as well as farmers field. |
| 18. | If it can be implemented at family level or external manpower is required? | It is the family occupation but the manpower is depending upon the area of cultivation. |
| **Additional Information** | | |
| 19. | How many manpower required? | 25 manpower per ha. per Year (65-75 man days per ha. per year) |
| 20. | What is the Status of Commercialization | Varieties are commercially cultivated in 500- 700 hectare throughout the country. |
| 21. | Scale of funding required all total? | NA |
| 22. | Budget with breakage? | NA |
| 23. | What type of certification required for the product? (If required) | Quality assurance certificate is required. |
| 24. | Risk involved? | Based on climatic condition. |

# **Agro-technology of Rosagrass** (*Cymbopogon nardus/ khasianus*) *RRL* (*J*)*CN- 5 & IIIM* (*J*)*CK- 10*

## [CSIR-IIIM]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Agro-technology of Rosagrass *(Cymbopogon nardus/ khasianus) RRL (J)CN- 5 & IIIM (J)CK- 10* |
| 2. | About technology (in short) | *Cymbopogon* belongs to Poaceae family which is one of the most important essential oil bearing genera. The members of this genus usually occur abundantly in tropics and sub tropics regions of Asia, Africa and America. These varieties were developed by CSIR-IIIM which is rich in Geraniol (60 - 80%), Geranyl acetate (15-25%) and CIS-Ocimene (12-13%), the major constituent from this species. |
| 3. | What is the scientific approach to choose the particular technology? | It is very useful in perfumery, flavouring & pharmaceutical industry. |
| 4. | After what duration the first output can be seen? | After transplanting the slips (plants) its takes six month to twelve month for obtaining commercial yield. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Land, Water, Fertilizers and Manpower |
| 6. | What is the area foot print of the process? | Medicinal and Aromatic plants |
| 7. | What kind of climatic and geographical location is required? | Tropical and sub-tropical Climate |
| 8. | Gestation period of the project? | Five Years |
| 9. | Minimum economic unit size? | Net profit ranges from ₹ 1,20,000 to ₹ 1,50,000 in first year and ₹ 1,50,000 to 2,00,000 in second and subsequent years. |
| 10. | Indicative investment | Cost of cultivation: ₹ 50,000-60,000 per ha per Year. |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | CSIR-IIIM (QPM supplier) – Farmers (Producer)– Industry (User). |
| 12. | Can it be part of circular economy? | Yes |

| | | |
|---|---|---|
| 13. | What will be the chain of value addition? | Industry make the value added product |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Cultivation and Processing of Medicinal and Aromatic plants by the Farmers/ growers based on CSIR technologies, is expected to provide enhanced income and new employment opportunities in village/ rural sector. |
| 16. | How many training days or months required for the technology to be learned properly? | Approximate 15-20 days sufficient to learn about the Agro-technology for commercial cultivation. |
| 17. | How to be implemented form the root to tip | Awareness cum training programmes and demonstration of technology at IIIM farm as well as farmers field. |
| 18. | If it can be implemented at family level or external manpower is required? | It is the family occupation but the manpower is depending upon the area of cultivation. |
| **Additional Information** | | |
| 19. | How many manpower required? | 20-25 manpower per ha. per year (60-70 man days per ha. per year) |
| 20. | What is the status of commercialization | Varieties are commercially cultivated in more than 1500 hectare throughout the country. |
| 21. | Scale of Funding required all total? | NA |
| 22. | Budget with breakage? | NA |
| 23. | What type of Certification Required for the product? (If required) | Quality assurance certificate is required. |
| 24. | Risk involved? | Depend On climatic condition and management. |

# **Agro-technology of Mentha spps.** (*M. longifolia, M. Piprata, M. spicata, M. Arvensis*)

## [CSIR-IIIM]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Agro-technology of *Mentha spps. (M. longifolia, M. Piprata, M. spicata, M. Arvensis)* |
| 2. | About technology (in short) | Mentha is an annual aromatic herb which is grown easily in tropical and sub-tropical region. The varieties of menthe developed by CSIR-IIIM are a major source of Menthol, Menthone, Linalool, L-carvone, Limonene etc. Mostly propagated by Suckers and should be planted in the month of January to mid February. |
| 3. | What is the scientific approach to choose the particular technology? | Essential oil used in pharmaceutical, flavour & fragrance industry. |
| 4. | After what duration the first output can be seen? | After transplanting the suckers, its takes six month for commercial yield. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Land, Water, Fertilizers and Manpower |
| 6. | What is the area foot print of the Process? | Medicinal and aromatic plants |
| 7. | What kind of climatic and geographical location is required? | Requires ample sunshine and rainfall during harvesting period. Areas with average annual rainfall of 95 -105 cm and average temperature of up to 40°C associated with relative humidity ranging from 50 to 75% are considered suitable for its cultivation. |
| 8. | Gestation period of the project? | Six month to one year |
| 9. | Minimum economic unit size? | Net profit ranges from ₹ 1,00,000 to ₹ 1,20,000 per hectare. |
| 10. | Indicative investment | Cost of cultivation: ₹ 35,000-40,000 per ha. per year. |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | CSIR-IIIM (QPM supplier) — Farmers (Producer)—Industry (User). |
| 12. | Can it be part of circular economy? | Yes |

| | | |
|---|---|---|
| 13. | What will be the chain of value addition? | Industry make the value added product |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | NA |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Cultivation and Processing of Medicinal and Aromatic plants by the farmers/ growers based on CSIR technologies, is expected to provide enhanced income and new employment opportunities in village/ rural sector. |
| 16. | How many training days or months required for the technology to be learned properly? | Approximate 15-20 days sufficient to learn about the Agro-technology for commercial cultivation. |
| 17. | How to be implemented form the root to tip | Awareness cum training programmes and demonstration of technology at IIIM farm as well as Farmers field. |
| 18. | If it can be implemented at family level or external manpower is required? | It is the family occupation but the manpower is depending upon the area of cultivation. |
| **Additional Information** | | |
| 19. | How many manpower required? | 25 manpower per ha. per Year (45-50 man days per ha. per year) |
| 20. | What is the status of commercialization | Mentha spps are commercially cultivated in 100 hectare throughout the country. |
| 21. | Scale of funding required all total? | NA |
| 22. | Budget with breakage? | NA |
| 23. | What type of certification required for the product? (If required) | Quality assurance certificate is required. |
| 24. | Risk involved? | It is based on good agricultural practices and climatic condition. |

# Agro-technology of Jammu Monarda (*Monarda citriodora*) Var. IIIM (J) MC02

## [CSIR-IIIM]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Agro-technology of Jammu Monarda *(Monarda citriodora)* Var. IIIM (J) MC02 |
| 2. | About technology (in short) | Jammu Monarda is an annual aromatic plant. It is also known by its common name lemon beebalm. In India, Jammu Monarda was first developed by Indian Institute of Integrative Medicine in the year 1999. The plant grows upto a height of 50-90 cm above the ground level. Jammu Monarda is known for its essential oil in which an aromatic major chemical constituent is present called as Thymol in which 55 to 75% of Thymol is present in its essential oil. |
| 3. | What is the scientific approach to choose the particular technology? | Jammu Monarda is one of the important source of Thymol due to which it is used in the pharmaceutical, flavour and fragrance industries. It's essential oil contains many antiseptic properties which is used for the preparation of various hand sanitizer and soaps. |
| 4. | After what duration the first output can be seen? | Monarda can easily cultivated in well drained sandy loam soil which having pH 6.5 to 8. Its require 6 month for maturity. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Land, water, fertilizers and manpower |
| 6. | What is the area foot print of the Process? | Medicinal and aromatic plants |
| 7. | What kind of climatic and geographical location is required? | Monarda is a rabi season crop. Warm and humid climate is favourable for its growth and development. In India, it can easily be cultivated under tropical, subtropical and temperate climate having temperature range between 15 to 40°C. For the better germination of seeds temperature ranges between 20 to 25°C is required. |
| 8. | Gestation period of the project? | Six month |
| 9. | Minimum economic unit size? | On an average 100 - 125 kg/ha. of essential oil can be obtained. Net profit ranges from ₹ 80,000 to ₹ 1,00,000 per hectare. |
| 10. | Indicative investment | Cost of cultivation: ₹ 30,000-35,000 per ha. per year. |

| Salient Feature of Process/Technology Information | | |
|---|---|---|
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | CSIR-IIIM (QPM supplier) — Farmers (Producer)—Industry (User). |
| 12. | Can it be part of circular economy? | Yes |
| 13. | What will be the chain of value addition? | Industry make the value added product. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Cultivation and Processing of Medicinal and Aromatic plants by the Farmers/ growers based on CSIR technologies, is expected to provide enhanced income and new employment opportunities in village/ rural sector. |
| 16. | How many training days or months required for the technology to be learned properly? | Approximate 15-20 days sufficient to learn about the Agro-technology for commercial cultivation. |
| 17. | How to be implemented form the root to tip | Awareness cum training programmes and demonstration of technology at IIIM farm as well as Farmers field. |
| 18. | If it can be implemented at family level or external manpower is required? | It is the family occupation but the manpower is depending upon the area of cultivation. |
| **Additional Information** | | |
| 19. | How many manpower required? | 25 manpower per ha. per Year (45-50 man days per ha. per year) |
| 20. | What is the status of commercialization | Jammu Monarda is commercially cultivated in 100 hectare throughout the country. |
| 21. | Scale of funding required all total? | NA |
| 22. | Budget with breakage? | NA |
| 23. | What type of certification required for the product? (If required) | Quality assurance certificate is required. |
| 24. | Risk involved? | On the basis of climatic condition and good agricultural practices. |

# Agro-technology of Ocimum species (Var. Og 14 & Ob 15)

## [CSIR-IIIM]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Agro-technology of Ocimum species (Var. Og 14 & Ob 15) |
| 2. | About technology (in short) | Ocimum grassimum (Var. Ob 14) is a Clove-scented, a hybrid strain developed as an alternate source of clove oil, rich in eugenol (80-85%). As well as Ocimum basilicum (var. Ob 15) is an indigenous to South Indian basil which has been well acclimatized in the sub-troical climatic conditions of Jammu region. The strain has been developed as a rich source of methyl chavicol (85-90%) which is characterized for its conversion into trans-anethol, a flavouring material extensively used in food flavours, mouth freshners and gripe water etc. |
| 3. | What is the scientific approach to choose the particular technology? | The major constituent Eugenol and Methyl chavicol is important essential oil isolate, is of great value in perfume, flavour and pharmaceutical industry. |
| 4. | After what duration the first output can be seen? | Ocimum is perennial and annual herbs can easily cultivated in well drained sandy loam soil which having pH neutral to slightly alkaline condition. It requires 6 to 12 month for maturity. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Land, water, fertilizers and manpower |
| 6. | What is the area foot print of the process? | Medicinal and aromatic plants. |
| 7. | What kind of Climatic and Geographical location is required? | Its grown under tropical and sub-tropical climatic condition with average rainfall varies from 50- 100 cm and average temperature up to 40°C associated with relative humidity ranging from 50% to 75% are considered suitable for its cultivation. |
| 8. | Gestation period of the project? | 6 to 12 month |
| 9. | Minimum economic unit size? | Net profit ranges from ₹ 1, 10,000 to ₹ 1,50,000 per hectare. |
| 10. | Indicative investment | Cost of cultivation: ₹ 45,000-50,000 per ha. per year. |

| Salient Feature of Process/Technology Information | | |
|---|---|---|
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | CSIR-IIIM (QPM supplier) — Farmers (Producer)—Industry (User) |
| 12. | Can it be part of circular economy? | Yes |
| 13. | What will be the chain of value addition? | Industry make the value added product. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Cultivation and Processing of Medicinal and Aromatic plants by the Farmers/ growers based on CSIR technologies, is expected to provide enhanced income and new employment opportunities in village/ rural sector. |
| 16. | How many training days or months required for the technology to be learned properly? | Approximate 15-20 days sufficient to learn about the Agro-technology for commercial cultivation. |
| 17. | How to be implemented form the root to tip | Awareness cum training programmes and demonstration of technology at IIIM farm as well as Farmers field. |
| 18. | If it can be implemented at family level or external manpower is required? | It is the family occupation but the manpower is depending upon the area of cultivation. |
| **Additional Information** | | |
| 19. | How many manpower required? | 25-30 manpower per ha. per year (50-75 man days per ha. per year) |
| 20. | What is the status of commercialization | Ocimum Varieties of IIIM is commercially cultivated in approx. 500- 600 hectare throughout the country. |
| 21. | Scale of funding required all total? | NA |
| 22. | Budget with breakage? | NA |
| 23. | What type of certification required for the product? (If required) | Quality assurance certificate is required. |
| 24. | Risk involved? | On the basis of climatic condition. |

# Agro-technology of Lavender (*Lavandula angustifolia*) [RRL 12]

## [CSIR-IIIM]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Agro-technology of Lavender (*Lavandula angustifolia)* [RRL 12] |
| 2. | About technology (in short) | Lavender is an incredible and much sought aromatic plant having significant position in trade all over the world due to its essential oil which has multifarious uses and market outlets. Main constituents are Linalool, Linalyl acetate, 1,8 cineole, borneol, caryophyllene, terpineol, ocimenes, Lavandulyl acetate. It is useful in perfumery, flavour and cosmetic industry. |
| 3. | What is the scientific approach to choose the particular technology? | The major constituent Linalool, linalyl acetate, 1,8 - cineole, borneol, caryophyllene, terpineol, ocimenes, Lavandulyl acetate is important essential oil constituents, is of great demand in perfume, flavour and pharmaceutical industry. |
| 4. | After what duration the first output can be seen? | First commercial yield obtained in 3rd Year onwords. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Land, water, fertilizers and manpower |
| 6. | What is the area foot print of the process? | Medicinal and aromatic plants |
| 7. | What kind of climatic and geographical location is required? | It's grown under temperate climatic condition with snow bound areas. |
| 8. | Gestation period of the project? | 3 to 14 Years |
| 9. | Minimum economic unit size? | Net profit ranges from ₹ 2,00,000 to ₹ 2,50,000 per hectare per year, 3rd year onwards. |
| 10. | Indicative investment | Cost of cultivation: ₹ 60,000-70,000 per ha. per year. |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | CSIR-IIIM (QPM supplier) — Farmers (Producer)— Industry (User). |
| 12. | Can it be part of circular economy? | Yes |

| | | |
|---|---|---|
| 13. | What will be the chain of value addition? | Industry make the value added product. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Cultivation and Processing of Medicinal and Aromatic plants by the Farmers / growers based on CSIR technologies, is expected to provide enhanced income and new employment opportunities in village/ rural sector. |
| 16. | How many training days or months required for the technology to be learned properly? | Approximate 15-20 days sufficient to learn about the Agro-technology for commercial cultivation. |
| 17. | How to be implemented form the root to tip | Awareness cum training programmes and demonstration of technology at IIIM farm as well as Farmers field. |
| 18. | If it can be implemented at Family level or external manpower is required? | It is the family occupation but the manpower is depending upon the area of cultivation. |
| **Additional Information** | | |
| 19. | How many manpower required? | 30-35 manpower per ha. per Year (75-90 man days per ha. per year). |
| 20. | What is the status of commercialization | *Lavender* variety of IIIM *is* commercially cultivated in approx. 200- 300 hectare in temperate region of J& K and North East states of India. |
| 21. | Scale of funding required all total? | NA |
| 22. | Budget with breakage? | NA |
| 23. | What type of certification required for the product? (If required) | Quality assurance certificate is required trough certified agencies. |
| 24. | Risk involved? | On the basis of climatic condition and good agricultural practices. |

# Ready to Serve Teas

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | **Answers** |
| 1. | **Title of the technology** | Ready To Serve Teas |
| 2. | About technology (in short) | Tea is the second most consumed beverage after water that has gained wide interest due to numerous health benefits. A process has been developed to prepare concentrates from tea with refreshing taste and natural health attributes of tea. The concentrate can be reconstituted with hot as well as cold water. This technology is beneficial for upliftment of tea industry through value addition of low-grade teas. |
| 3. | What is the scientific approach to choose the particular technology? | A sustainable process for value addition of low-grade teas for preparation of ready to serve teas. |
| 4. | After what duration the first output can be seen? | One week after complete setup. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Made teas (premium and low grades), water |
| 6. | What is the area foot print of the process? | Tea industry value addition |
| 7. | What kind of climatic and geographical location is required? | Not- specific |
| 8. | Gestation period of the project? | 1 Week |
| 9. | Minimum economic unit size? | 200 L Batch |
| 10. | Indicative investment | ₹ 80-90 Lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | Tea from tea factories -<br>Processing- Packaging -Marketing. |
| 12. | Can it be part of circular economy? | Yes |
| 13. | What will be the chain of value addition? | Low grade teas – Valued added tea beverage. |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | No |
| 16. | How many training days or months required for the technology to be learned properly? | 1 month |
| 17. | How to be implemented form the root to tip | Procurement of tea from tea factories - Processing- Packaging - Marketing |
| 18. | If it can be implemented at Family level or external manpower is required? | No |
| **Additional Information** | | |
| 19. | How many manpower required? | 2-3 |
| 20. | What is the status of commercialization | Know How by CSIR-IHBT |
| 21. | Scale of funding required all total? | ₹ 80-90 Lakhs |
| 22. | Budget with breakage? | Recurring - ₹ 20-30 Lakhs<br>Non-recurring - ₹ 50 -60 Lakhs<br>Technology transfer fee will be additionally charged |
| 23. | What type of certification required for the product? (If required) | FSSAI |
| 24. | Risk involved? | No |

# Cultivation of Stevia: a low-calorie natural sweetener

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation of Stevia: a low-calorie natural sweetener |
| 2. | About technology (in short) | Institute has developed and released 'Him Stevia'(CSIR-IHBT-ST-01), which contains higher proportion of Reb-A content as compared to stevioside. The cultivar 'Him Stevia' has high content of Reb-A (~7.4%) compared to stevioside (~5.8%), Reb-A/stevioside ratio is 1.25 and total glycoside content of about 14.5% (on dry weight basis).<br>Good Agricultural Practices have also been developed by CSIR-IHBT for higher biomass yield for different agroclimatic conditions. On an average, dry leaf yield of stevia is 3.5–4.0 t/ha/year, which fetches market price of Rs. 120/ kg, resulting in net return of ₹ 2.40-3.00 lakhs/ ha/year. Dry leaf yield of stevia has been increased up to 28 % through advanced agrotechnology developed by CSIR- IHBT. |
| 3. | What is the scientific approach to choose the particular technology? | The cultivar 'Him Stevia' (CSIR-IHBT-ST-01; selection U-22-5-1) of Stevia rebaudiana Bertoni (Bertoni) has been developed by CSIR-IHBT, Palampur through hybridization and selection approach. The cultivar was selected through half-sib family selection followed by clonal selection.<br>CSIR-IHBT has developed Good Agricultural Practices for higher biomass yield for different agroclimatic conditions like nutrient management technique, water management, standardization of crop geometry and plant population. Agro-technologies for cultivation under conservation agriculture and salt stress conditions have also been developed. So that stevia can be grown in different parts of India. |
| 4. | After what duration the first output can be seen? | The first output will be seen after 6 months. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Agricultural land, planting materials (seed/seedling), irrigation facility, field labour, drying shade etc. |
| 6. | What is the area foot print of the process? | Stevia can be grown in any amount of land , but to run a viable processing unit 20 ha. land is required to supply the biomass throughout the year. |

| | | |
|---|---|---|
| 7. | What kind of climatic and geographical location is required? | Stevia is grown under tropical and sub-tropical conditions. The plant prefers warm and sunny weather, long day-length and 65-80% relative humidity for higher leaf production. It grows well in sandy loam soil with pH range of 5.0-7.5. High rainfall (>2000 mm) and water logging conditions are not suitable for the commercial cultivation of the crop. |
| 8. | Gestation period of the project? | Only 6 month, after 6 month the produce will come. |
| 9. | Minimum economic unit size? | For cultivation one acre of land, but to run a viable processing unit 50 acres (20 ha.) land is required to supply the biomass throughout the year. |
| 10. | Indicative investment | For cultivation: 1.80 lakh per ha. |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | Source of Raw material: From own cultivation or from farmers.<br>Machinery: Huge machinery is not required, only basic implements for agricultural operation<br>Marketing: Established national and International market. |
| 12. | Can it be part of circular economy? | Yes |
| 13. | What will be the chain of value addition? | Ready to serve stevia liquid and powder sachet,<br>High quality steviol glycosides powder with purity >95%. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | The complete value chain can be made local. Farmers are already generating quality planting materials and cultivating with the help of CSIR-IHBT. |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | • Generation of quality planting material<br>• Cultivation of stevia<br>• Buy back arrangement with Industry<br>• Establishment of stevia processing unit (MSME, Private party) |
| 16. | How many training days or months required for the technology to be learned properly? | Two days training is required for agrotechnology of stevia. |
| 17. | How to be implemented form the root to tip | • Contact with concerned organisation for training<br>• Arrangement of agricultural inputs<br>• Generation of quality planting material<br>• Cultivation of stevia<br>• Buy back arrangement with Industry |
| 18. | If it can be implemented at family level or external manpower is required? | It can be implemented at Family level for small scale cultivation, but for large scale cultivation external manpower (field worker) is required. |
| **Additional Information** | | |
| 19. | How many manpower required? | Two manpower is required to manage a viable agricultural farm. |

| | | |
|---|---|---|
| 20. | What is the status of commercialization | The agrotechnology of stevia has been transferred to several parties for large-scale commercial cultivation in Punjab, Haryana, Uttrakhand, HP, Uttar Pradesh, Andhra Pradesh, Gujrat, Odisha, Jharkhand and Chhattisgarh. |
| 21. | Scale of funding required all total? | Cost of Cultivation: about ₹ 1.80 lakh/ha/yr (including cost of seeds).<br>Cost of seed: ₹ 15000/kg<br>Seed require : 250 g /ha. |
| 22. | Budget with breakage? | As mentioned in Sr. No. 21. |
| 23. | What type of certification required for the product? (If required) | NA |
| 24. | Risk involved? | NO |

# Improved bee hive for quality and hygienic extraction of honey

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | **Answers** |
| 1. | **Title of the technology** | Improved bee hive for quality and hygienic extraction of honey |
| 2. | About technology (in short) | • Traditional method of harvesting of honey is time consuming, labour intensive, mortality of bees during harvesting, non-hygienic and poor quality which get low price in the market. Therefore CSIR-CSIO and CSIR-IHBT developed improved bee hive and evaluated successfully in the field with the following advantages<br>• Extraction and harvesting of honey without disturbing the frames and honey bees.<br>• No mortality of honey bees during harvesting as compared to honey extractors.<br>• Harvested honey is hygienic and high quality which fetches good price in the market.<br>• Bee hive is cost effective, easy to operate and requires less human intervention during extraction of honey. |
| 3. | What is the scientific approach to choose the particular technology? | The honey production and its quality in India are up to the mark as per the global standard. Traditional method of harvesting of honey is time consuming, labour intensive, mortality of bees during harvesting, non-hygienic and poor quality which get low price in the market. In India, there is no improved bee hive (flow hive) and honey extractor is available in the market for quality and hygienic extraction of honey. Therefore, CSIR-CSIO, Chandigarh and CSIR-IHBT, Palampur developed improved bee hive and evaluated successfully in the field. |
| 4. | After what duration the first output can be seen? | Three months after installation in the field. |
| 5. | What kind of resources required (raw material, energy, water, others)? | Wood, Wax, Fibre/plastic etc. |
| 6. | What is the area foot print of the process? | |
| 7. | What kind of climatic and geographical location is required? | Tropical, subtropical and temperate climate. |
| 8. | Gestation period of the project? | One year |
| 9. | Minimum economic unit size? | 500 |

| | | |
|---|---|---|
| 10. | Indicative Investment | ₹ 50 lakhs (Budget vary with no. of units required) |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | Local market |
| 12. | Can it be part of circular economy? | Yes |
| 13. | What will be the chain of value addition? | NA |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Both (Circular and local). |
| 16. | How many training days or months required for the technology to be learned properly? | 1-2 months depends on skills of the person. |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at family level or external manpower is required? | External manpower |
| **Additional Information** | | |
| 19. | How many manpower required? | 2 |
| 20. | What is the status of commercialization | Under process |
| 21. | Scale of funding required all total? | ₹ 50 lakhs |
| 22. | Budget with breakage? | Manpower and consumables.<br>Technology transfer fee will be additionally charged. |
| 23. | What type of certification required for the product? (If required) | NA |
| 24. | Risk involved? | No |

# AGRO-TECHNOLOGY FOR GERBERA

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Agro-Technology For Gerbera |
| 2. | About technology (in short) | • Him Saumya, Him Gaurav, Him Abha, Him Apoorva, Him Keerti, Him Glow, Him Peace<br>• Tissue culture as well as nursery production protocols available<br>• Having vase life of more than 12 days<br>• Net Profit per year in 500 sq.m. under polyhouse conditions: ₹ 1.84 lakhs. |
| 3. | What is the scientific approach to choose the particular technology? | Import substitute, high value crop. |
| 4. | After what duration the first output can be seen? | 6 months |
| 5. | What kind of resources required (raw material, energy, water, others)? | Polyhouse, planting material, growing media, fertilizers, irrigation, packaging material. |
| 6. | What is the area foot print of the Process? | Suitable for protected cultivation under plains, low and mid hills |
| 7. | What kind of Climatic and Geographical location is required? | -do- |
| 8. | Gestation period of the project? | 2nd year onwards |
| 9. | Minimum Economic Unit Size? | 1000 sqm |
| 10. | Indicative Investment | ₹ 2.78 lakhs/ 500 sqm. |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | Tissue culture labs/ nurseries<br>Market: gazipur flower market |
| 12. | Can it be part of circular economy? | Yes |
| 13. | What will be the chain of value addition? | - |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | - |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Local |

| | | |
|---|---|---|
| 16. | How many training days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | - |
| 18. | If it can be implemented at family level or external manpower is required? | Both |
| **Additional Information** | | |
| 19. | How many manpower required? | 2 persons/ 1000 sqm |
| 20. | What is the status of commercialization | TRL:7 |
| 21. | Scale of funding required all total? | - |
| 22. | Budget with breakage? | ₹ 2.78 lakhs/ 500 sqm. |
| 23. | What type of certification required for the product? (If required) | - |
| 24. | Risk involved? | Market demand |

# AGRO-TECHNOLOGY FOR CALLA LILY

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Agro-Technology For Calla Lily |
| 2. | About technology (in short) | • Can be used as cut-flowers, potted plants and also as landscape plants for bog gardens<br>• Him Sumukh and Him Shweta cultivars<br>• Nursery production protocols available<br>• Having vase life of more than 10 days<br>• Net Profit per year in 500 sq.m. under open field conditions: ₹ 1.00 lakh |
| 3. | What is the scientific approach to choose the particular technology? | Import substitute, high value crop. |
| 4. | After what duration the first output can be seen? | 1 year |
| 5. | What kind of resources required (raw material, energy, water, others)? | Planting material, fertilizers, irrigation, packaging material. |
| 6. | What is the area foot print of the process? | Suitable for open cultivation under low and mid hills |
| 7. | What kind of climatic and geographical location is required? | -do- |
| 8. | Gestation period of the project? | 2nd year onwards |
| 9. | Minimum economic unit size? | 2000 sqm |
| 10. | Indicative investment | ₹ 1.25 lakhs/ 500 sqm |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | Nurseries<br>Market: Gazipur Flower Market. |
| 12. | Can it be part of circular economy? | Yes |
| 13. | What will be the chain of value addition? | - |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | - |

| | | |
|---|---|---|
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Local |
| 16. | How many training days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | - |
| 18. | If it can be implemented at Family level or external manpower is required? | Both |
| **Additional Information** | | |
| 19. | How many manpower required? | 2 persons/ 2000 sqm. |
| 20. | What is the status of commercialization | TRL:7 |
| 21. | Scale of funding required all total? | - |
| 22. | Budget with breakage? | ₹ 1.25 lakhs/ 500 sqm. |
| 23. | What type of certification required for the product? (If required) | - |
| 24. | Risk involved? | Market demand |

# AGRO-TECHNOLOGY FOR LILIUM

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | AGRO-TECHNOLOGY FOR LILIUM |
| 2. | About technology (in short) | • Developed agro-technology of lilium for offseason flower production<br>• Net Profit per year in 500 sq. m. under open field conditions: ₹ 1.62 lakh |
| 3. | What is the scientific approach to choose the particular technology? | Import substitute, high value crop |
| 4. | After what duration the first output can be seen? | 1 year |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Planting material, fertilizers, irrigation, packaging material |
| 6. | What is the area foot print of the Process? | Suitable for open cultivation under plain, low.mid and high hills. |
| 7. | What kind of Climatic and Geographical location is required? | -do- |
| 8. | Gestation period of the project? | 2nd year onwards |
| 9. | Minimum Economic Unit Size? | 500 sqm |
| 10. | Indicative Investment | ₹ 2.50 lakhs/ 500 sqm |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Nurseries<br>Market: Gazipur Flower Market |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | - |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | • - |

| | | |
|---|---|---|
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | - |
| 18. | If it can be implemented at Family level or external manpower is required? | Both |
| **Additional Information** | | |
| 19. | How many Manpower required? | 1 person/ 500 sqm |
| 20. | What is the Status of Commercialization | TRL:9 |
| 21. | Scale of Funding required all total? | - |
| 22. | Budget with breakage? | ₹ 2.50 lakhs/ 500 sqm |
| 23. | What type of Certification Required for the product? (If required) | - |
| 24. | Risk involved? | Market demand |

# AGRO-TECHNOLOGY FOR MARIGOLD

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | AGRO-TECHNOLOGY FOR MARIGOLD |
| 2. | About technology (in short) | • Suitable for open cultivation in plains, low and mid hills<br>• Net Profit per year in 1 ha under open field conditions: ₹ 3.00 lakh |
| 3. | What is the scientific approach to choose the particular technology? | Increase yield |
| 4. | After what duration the first output can be seen? | 6 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Planting material, fertilizers, irrigation, packaging material |
| 6. | What is the area foot print of the Process? | Suitable for open cultivation under plain, low, mid hills |
| 7. | What kind of Climatic and Geographical location is required? | -do- |
| 8. | Gestation period of the project? | 6$^{th}$ month onwards |
| 9. | Minimum Economic Unit Size? | 1 ha |
| 10. | Indicative Investment | ₹ 1.00 lakhs/ ha |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Nurseries<br>Market: Local market / temples |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | - |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | - |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |

| | | |
|---|---|---|
| 16. | How many Training Days or months required for the technology to be learned properly? | 1 day |
| 17. | How to be implemented form the root to tip | - |
| 18. | If it can be implemented at Family level or external manpower is required? | Both |
| **Additional Information** | | |
| 19. | How many Manpower required? | 2 person/ ha |
| 20. | What is the Status of Commercialization | TRL:>6 |
| 21. | Scale of Funding required all total? | - |
| 22. | Budget with breakage? | ₹ 1.00 lakh/ha |
| 23. | What type of Certification Required for the product? (If required) | - |
| 24. | Risk involved? | Market demand |

# AGRO-TECHNOLOGY FOR CARNATION

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | AGRO-TECHNOLOGY FOR CARNATION |
| 2. | About technology (in short) | Net Profit per year in 500 sq m under polyhouse conditions: ₹ 2.10 lakhs |
| 3. | What is the scientific approach to choose the particular technology? | Import substitute, high value crop |
| 4. | After what duration the first output can be seen? | 6 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Polyhouse, Planting material, fertilizers, irrigation, packaging material |
| 6. | What is the area foot print of the Process? | Suitable for protected cultivation under mid hills |
| 7. | What kind of Climatic and Geographical location is required? | -do- |
| 8. | Gestation period of the project? | 2nd year onwards |
| 9. | Minimum Economic Unit Size? | 500 sqm |
| 10. | Indicative Investment | ₹ 3.13 lakhs/500 sqm |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Tissue culture labs / nurseries<br>Market: Gazipur Flower Market |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | - |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | - |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |

| | | |
|---|---|---|
| 16. | How many Training Days or months required for the technology to be learned properly? | 3 days |
| 17. | How to be implemented form the root to tip | - |
| 18. | If it can be implemented at Family level or external manpower is required? | Both |
| **Additional Information** | | |
| 19. | How many Manpower required? | 2 person/500 sqm |
| 20. | What is the Status of Commercialization | TRL:>6 |
| 21. | Scale of Funding required all total? | - |
| 22. | Budget with breakage? | ₹ 3.13 lakhs/500 sqm |
| 23. | What type of Certification Required for the product? (If required) | - |
| 24. | Risk involved? | Market demand |

# AGRO-TECHNOLOGY FOR ALSTROEMERIA

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | AGRO-TECHNOLOGY FOR ALSTROEMERIA |
| 2. | About technology (in short) | Net Profit per year in 500 sqm under poly house conditions: ₹ 2.10 lakhs |
| 3. | What is the scientific approach to choose the particular technology? | Import substitute, high value crop |
| 4. | After what duration the first output can be seen? | 1 year |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Polyhouse, Planting material, fertilizers, irrigation, packaging material |
| 6. | What is the area foot print of the Process? | Suitable for protected cultivation under mid hills |
| 7. | What kind of Climatic and Geographical location is required? | -do- |
| 8. | Gestation period of the project? | 2nd year onwards |
| 9. | Minimum Economic Unit Size? | 500 sqm |
| 10. | Indicative Investment | ₹ 3.00 lakhs/500 sqm |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Tissue culture labs/ nurseries<br>Market: Gazipur Flower Market |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | - |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | - |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |

| | | |
|---|---|---|
| 16. | How many Training Days or months required for the technology to be learned properly? | 3 days |
| 17. | How to be implemented form the root to tip | - |
| 18. | If it can be implemented at Family level or external manpower is required? | Both |
| **Additional Information** | | |
| 19. | How many Manpower required? | 2 person/500 sqm |
| 20. | What is the Status of Commercialization | TRL:>6 |
| 21. | Scale of Funding required all total? | - |
| 22. | Budget with breakage? | ₹ 3.13 lakhs/500 sqm |
| 23. | What type of Certification Required for the product? (If required) | - |
| 24. | Risk involved? | Market demand |

# AGRO-TECHNOLOGY FOR CUT-ROSES

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | AGRO-TECHNOLOGY FOR CUT-ROSES |
| 2. | About technology (in short) | Net Profit per year in 500 sqm under polyhouse conditions: ₹ 1.83 lakhs |
| 3. | What is the scientific approach to choose the particular technology? | Import substitute, high value crop |
| 4. | After what duration the first output can be seen? | 1 year |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Polyhouse, Planting material, fertilizers, irrigation, packaging material |
| 6. | What is the area foot print of the Process? | Suitable for protected cultivation under plains, low and mid hills |
| 7. | What kind of Climatic and Geographical location is required? | -do- |
| 8. | Gestation period of the project? | 2nd year onwards |
| 9. | Minimum Economic Unit Size? | 500 sqm |
| 10. | Indicative Investment | ₹ 2.68 lakhs/500 sqm |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Nurseries<br>Market: Gazipur Flower Market |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | - |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | - |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |

| | | |
|---|---|---|
| 16. | How many Training Days or months required for the technology to be learned properly? | 3 days |
| 17. | How to be implemented form the root to tip | - |
| 18. | If it can be implemented at Family level or external manpower is required? | Both |
| **Additional Information** | | |
| 19. | How many Manpower required? | 2 person/ 500 sqm |
| 20. | What is the Status of Commercialization | TRL:>7 |
| 21. | Scale of Funding required all total? | - |
| 22. | Budget with breakage? | ₹ 2.68 lakhs/500 sqm |
| 23. | What type of Certification Required for the product? (If required) | - |
| 24. | Risk involved? | Market demand |

# AGRO-TECHNOLOGY FOR CHRYSANTHEMUM

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | AGRO-TECHNOLOGY FOR CHRYSANTHEMUM |
| 2. | About technology (in short) | • Cultivars: Him Aditya, Him Pushkar, Him Shikhar, Him Ujjwala, Him Shringar<br>• Nursery production protocols available |
| 3. | What is the scientific approach to choose the particular technology? | Import substitute, high value crop |
| 4. | After what duration the first output can be seen? | 1 year |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Polyhouse, Planting material, fertilizers, irrigation, packaging material |
| 6. | What is the area foot print of the Process? | Suitable for protected cultivation under plains, low and mid hills |
| 7. | What kind of Climatic and Geographical location is required? | -do- |
| 8. | Gestation period of the project? | 2nd year onwards |
| 9. | Minimum Economic Unit Size? | 500 sqm |
| 10. | Indicative Investment | ₹ 2.66 lakhs/500 sqm |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Nurseries<br>Market: Gazipur Flower Market |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | - |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | - |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |

| | | |
|---|---|---|
| 16. | How many Training Days or months required for the technology to be learned properly? | 3 days |
| 17. | How to be implemented form the root to tip | - |
| 18. | If it can be implemented at Family level or external manpower is required? | Both |
| **Additional Information** | | |
| 19. | How many Manpower required? | 2 person/ 500 sqm |
| 20. | What is the Status of Commercialization | TRL:>6 |
| 21. | Scale of Funding required all total? | - |
| 22. | Budget with breakage? | ₹ 2.66 lakhs/500 sqm |
| 23. | What type of Certification Required for the product? (If required) | - |
| 24. | Risk involved? | Market demand |

# Barley Coffee – Roasted Barley Grain Beverages

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Barley Coffee – Roasted Barley Grain Beverages |
| 2. | About technology (in short) | CSIR IHBT, Palampur has develop and standardize the process for grain beverage from selected hull-less barley grains of high altitude regions Kaza, Lahaul & Spiti (Himachal Pradesh). Barley grain beverage is caffeine free alternative of coffee drink with a specific aroma and health benefits. In addition, it gives similar mouth feel and relish with respect to original taste of coffee beverage. |
| 3. | What is the scientific approach to choose the particular technology? | Coffee beans are known to be rich in caffeine; bitter in taste, strong oily flavor as well as regular consumption can have serious implications on human health. Coffee substitutes are non-coffee products used to imitate coffee without caffeine, can be used for medical, economic and regular habit reasons. |
| 4. | After what duration the first output can be seen? | Within one month from the month of installation of machinery and equipments |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Local barley grain, water, and 25Kw Power load |
| 6. | What is the area foot print of the Process? | Approximate 3000 - 4000 square feet area required for pre- processing, cutting/grading, drying & packaging, storage etc. |
| 7. | What kind of Climatic and Geographical location is required? | Proposed project can be setup anywhere in India, where continuous electricity supply and easily availability of raw materials |
| 8. | Gestation period of the project? | Six Months |
| 9. | Minimum Economic Unit Size? | 1000 kg per day processing |
| 10. | Indicative Investment | ₹ 95 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Hull less barley of High Altitute region |
| 12. | Can it be part of Circular economy? | Yes |

| | | |
|---|---|---|
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | NA |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | NA |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1-2 months |
| 17. | How to be implemented form the root to tip | CSIR-IHBT has develop and standardized complete knowhow related to this technology |
| 18. | If it can be implemented at Family level or external manpower is required? | External manpower is required to implement proposed unit |
| **Additional Information** | | |
| 19. | How many Manpower required? | 04 Skilled manpower |
| 20. | What is the Status of Commercialization | Technology is ready for commercialization |
| 21. | Scale of Funding required all total? | ₹ 95 lakhs |
| 22. | Budget with breakage? | Recurring: ₹ 10 lakhs<br>Non Recurring: ₹ 85 lakhs<br>Technology transfer fee will be additionally charged |
| 23. | What type of Certification Required for the product? (If required) | FSSAI, New Delhi |
| 24. | Risk involved? | NO |

# Crispy fruits and vegetable technology

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Crispy fruits and vegetable technology |
| 2. | About technology (in short) | The food processing industry is one of the largest industries in India, it is ranked fifth in terms of production, consumption, export and expected growth. The Indian food market is estimated at over $ 200 billion likely to grow from around $ 70 billion in 2008 to $ 150 billion by 2025<br>Advantages of the product /technology<br>• Fruits & vegetables can be dried at low temperature<br>• without damaging their physical and nutritional value<br>• Not need to be refrigerated after processing<br>• Preserved without chemicals<br>• Can be reconstituted quickly<br>• Shelf life up to six months |
| 3. | What is the scientific approach to choose the particular technology? | The technology for production of crispy fruits and vegetable can help to reduce the post harvest loses, which are estimated to be about 25% of its production due to inadequate storage and processing facilities, crispy fruits are high grade consumer products made available in packaged form. |
| 4. | After what duration the first output can be seen? | Within one month from the month of installation of machinery and equipments |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Seasonal available fruits and vegetable or other processed products, 50 kW powder load, 1000 ltrs. per day |
| 6. | What is the area foot print of the Process? | Approximate 3000-4000 square feet area required for pre-processing, cutting /grading, drying & packaging, storage etc. |
| 7. | What kind of Climatic and Geographical location is required? | Proposed project can be setup anywhere in India or abroad where continuous electricity availability at cheaper price |
| 8. | Gestation period of the project? | Eight months |
| 9. | Minimum Economic Unit Size? | 200-300 kg per day (fresh input )or depend upon selection of raw material |
| 10. | Indicative Investment | ₹ 3 Crores |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | • Local fruits and vegetables growers<br>• Indigenous machinery fabricator & supplier<br>• Certified marketing channels |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Using this technology can increase shelf life of any agri produce with high quality end product having several months shelf life at room temperature |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | NA |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | NA |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1-2 months |
| 17. | How to be implemented form the root to tip | CSIR-IHBT has develop and standardized complete knowhow related to this technology |
| 18. | If it can be implemented at Family level or external manpower is required? | External manpower is required to implement proposed unit |
| **Additional Information** | | |
| 19. | How many Manpower required? | 5-6 Manpower |
| 20. | What is the Status of Commercialization | Ready to commercialize |
| 21. | Scale of Funding required all total? | ₹ 300 lakhs |
| 22. | Budget with breakage? | Reccuring : ₹ 40 Lakhs<br>Non Reccuring : ₹ 260 lakhs<br>Technology transfer fee will be additionally charged |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | NO |

# Ready to eat Foods

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the Technology** | Ready to eat Foods |
| 2. | About Technology (in short) | Indian ready-to-eat market was valued at ₹ 225 Cr. in 2013 and expected to grow with increasing demand for convenience and on-the-go foods by 25-30% over the next 6 years to Rs. 2900 Cr. by 2020. Consumers are rapidly adapting to convenient portion packs of hygienic, branded and well packaged food products. Reduction of heating time by 30-50% with improved food appearance, better nutrition and taste are the factors popularizing retort packaging in India.<br>CSIR-IHBT has developed an indigenous technology for commercial production of ready-to-eat foods without adding any preservatives. The greatest advantage is that these products remain fresh for seven months without loss in taste and flavour. Regulatory studies have shown prebiotic health benefits of these products. |
| 3. | What is the scientific approach to choose the particular technology? | • The developed products are new of their kind.<br>• Chemical and Preservative free<br>• Long shelf-life and convenience packages<br>• Prebiotic health benefits |
| 4. | After what duration the first output can be seen? | Within one month from the month of installation of machinery and equipment |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Seasonal available vegetable and pulses processed for ethnic and local cuisines, 2500kg per day |
| 6. | What is the area foot print of the Process? | Approximate 3500-4500 square feet area required for pre- processing, cutting /grading, drying & packaging, storage etc. |
| 7. | What kind of Climatic and Geographical location is required? | Proposed project can be setup anywhere in India, where continuous electricity supply and easily availability of raw materials |
| 8. | Gestation period of the project? | Si x months |
| 9. | Minimum Economic Unit Size? | 2500 kg per day i.e. 1400 cans |
| 10. | Indicative Investment | ₹ 150 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | • Local pulses, legumes and vegetable growers<br>• Indigenous machinery fabricator & supplier |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Using this technology can increase demand of local legumes, pulses and vegetables for market of traditional and ethnic cuisines with high quality end product having several months shelf life at room temperature |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | NA |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | NA |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1-2 months |
| 17. | How to be implemented form the root to tip | CSIR-IHBT has develop and standardized complete knowhow related to this technology |
| 18. | If it can be implemented at Family level or external manpower is required? | External manpower is required to implement proposed unit |
| **Additional Information** | | |
| 19. | How many Manpower required? | 08 Skilled manpower |
| 20. | What is the Status of Commercialization | Technology is ready for commercialization |
| 21. | Scale of Funding required all total? | ₹ 150 lakhs |
| 22. | Budget with breakage? | Recurring : ₹ 20 lakhs<br>Non Recurring : ₹ 130 lakhs<br>Technology transfer fee will be additionally charged |
| 23. | What type of Certification Required for the product? (If required) | FSSAI, New Delhi |
| 24. | Risk involved? | NO |

# Herbal Incense Cones

# [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Herbal Incense Cones |
| 2. | About technology (in short) | Herbal incense cones developed using flower wastes from various temples with natural herbs. The level of harmful pollutants has been determined in herbal incense cones compared with various commercial Dhoop and Agarbatti samples available in market. The levels of pollutants were significantly higher in commercial Dhoop and Agarbatti samples. The ones developed by CSIR-IHBT hardly emits any of these pollutants. |
| 3. | What is the scientific approach to choose the particular technology)? | Floral waste into value added product or waste management |
| 4. | After what duration the first output can be seen? | One week after complete setup |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Flowers, natural herbs, resinoids, essential oils, water and others. |
| 6. | What is the area foot print of the Process? | Utilization of waste flowers |
| 7. | What kind of Climatic and Geographical location is required? | Not specific |
| 8. | Gestation period of the project? | One week |
| 9. | Minimum Economic Unit Size? | ₹ 10-15 /20 Cones |
| 10. | Indicative Investment | ₹ 10-15 Lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Source of Raw material- Temples, Machinery to Possible Market- |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | 1. Collection of waste flowers from temples<br>2. Processing of raw material<br>3. Manufacturing of incense cones<br>4. Packing and marketing |

<table>
<tr><td>14.</td><td>Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally</td><td>Yes</td></tr>
<tr><td>15.</td><td>How everything from top to bottom to be made in the village itself (Circular and local)?</td><td>These can be made by hand.</td></tr>
<tr><td>16.</td><td>How many Training Days or months required for the technology to be learned properly?</td><td>1 Month</td></tr>
<tr><td>17.</td><td>How to be implemented form the root to tip</td><td>1. Collection of waste flowers from temples<br>2. Processing of raw material<br>3. Manufacturing of incense cones Packing and marketing</td></tr>
<tr><td>18.</td><td>If it can be implemented at Family level or external manpower is required?</td><td>It can be implemented to family level easily</td></tr>
<tr><td colspan="3">Additional Information</td></tr>
<tr><td>19.</td><td>How many Manpower required?</td><td>5</td></tr>
<tr><td>20.</td><td>What is the Status of Commercialization</td><td>Commercialised to 3 companies</td></tr>
<tr><td>21.</td><td>Scale of Funding required all total?</td><td>₹ 10-15 Lakh</td></tr>
<tr><td>22.</td><td>Budget with breakage?</td><td>
<table>
<tr><th>S. No.</th><th>Equipment</th><th>Nos.</th><th>Total (in ₹)</th></tr>
<tr><td>1.</td><td>Raw material</td><td>1</td><td>1,00,000</td></tr>
<tr><td>2.</td><td>Dhoop cone formulation machine</td><td>1</td><td>3,50,000</td></tr>
<tr><td>3.</td><td>Sieve shaker</td><td>1</td><td>50,000</td></tr>
<tr><td>4.</td><td>Powder Mixing Machine (Ball Mill Machine)</td><td>1</td><td>1,00,000</td></tr>
<tr><td>5.</td><td>Pulveriser</td><td>1</td><td>1,00,000</td></tr>
<tr><td>6.</td><td>Mechanical Drier</td><td>1</td><td>2,00,000</td></tr>
<tr><td>7.</td><td>Mixer and grinder</td><td>2</td><td>50,000</td></tr>
<tr><td>8.</td><td>Others miscellaneous items</td><td></td><td>1,00,000</td></tr>
<tr><td></td><td>Total cost (Appx.)</td><td></td><td>10,50,000</td></tr>
</table>
Technology transfer fee will be additionally charged</td></tr>
<tr><td>23.</td><td>What type of Certification Required for the product? (If required)</td><td>-</td></tr>
<tr><td>24.</td><td>Risk Involved</td><td>No</td></tr>
</table>

# Vitamin $D_2$ enriched *Shiitake* mushroom production and processing

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Vitamin $D_2$ enriched *Shiitake* mushroom production and processing |
| 2. | About technology (in short) | The salient features and applications of the *shiitake* mushroom production and processing technology are as following:<br>• *Shiitake* and its value added products may cater to the population affected with vitamin D deficiency. For vegetarians, mushrooms are the only food source of Vitamin D.<br>• Fresh and dried shiitake mushroom is popular for its meaty texture and smoky flavour.<br>• Shorter production time of 2 months (typically takes 8-12 months).<br>• Capsule of 350 mg shiitake powder meets 100% RDA of Vitamin D.<br>• Vitamin $D_2$ enriched shiitake powder may be used to prepare a range of value added products like *Shiitake* pickles, *shiitake* soups, Shiitake drinks, Shiitake chocolates, etc. |
| 3. | What is the scientific approach to choose the particular technology)? | Vitamin D deficiency is prevalent in >70% of Indian population. Beyond bone health, the deficiency is associated with cancer, autoimmune diseases, infections, type 2 diabetes, hypertension, cardiovascular disease, etc. For vegetarians, mushrooms are the only food source of Vitamin D. Mostly in the Himalayan States *Shiitake* is produced in natural conditions as the climate is suitable for its cultivation. However, in natural conditions *shiitake* mushroom cultivationis done in wooden logs and it takes 8-12 months for fruiting, it requires large area and it has poor yield due to excess contamination. To cope up with the challenges faced by natural production of *Shiitake* mushroom, CSIR-IHBT has developed the technology of production of Vitamin $D_2$ enriched *Shiitake* mushroom in captive conditions by utilizing the sawdust substrate available as waste from timber industry. Shiitake mushroom can be produced in record 2 months' duration hence harvesting can be done throughout the year. The yield of fresh mushroom is 0.5-0.6 kg per 1 kg dry weight of sawdust substrate. *Shiitake* mushroom are rich in vitamin D precursor ergosterol, and with optimized photo conversion experiments Vitamin $D_2$ concentration can be considerably enhanced. Shiitake mushroom are popular edible mushroom rich in vitamin D precursor ergosterol. |

<table>
<tr><td>4.</td><td>After what duration the first output can be seen?</td><td>Shiitake mushroom can be produced in record 2 months' duration.</td></tr>
<tr><td>5.</td><td>What kind of Resources Required (Raw material, Energy, water, others)?</td><td>The raw material to produce shiitake mushroom under captive cultivation is cheap hard wood broad leaf saw dust substrate available locally in different timber houses. For additional supply of raw materials paper mills, large timber houses can be contacted for supply of sawdust substrates from nearby region. Other requirements for spawn and shiitake production such as wheat grains, wheat bran, etc. can be locally procured from local traders.<br><br>Spawn Preparation process and raw material required:<br><br>Raw material cost used for preparation of 20 spawn bags:<br><br>
<table>
<tr><th>Raw materials</th><th></th><th>Cost (Approx.)</th></tr>
<tr><td>Wheat grains</td><td>₹ 20 per Kg</td><td>₹ 200</td></tr>
<tr><td>Polypropylene bags</td><td>₹ 3 per bag</td><td>₹ 120</td></tr>
<tr><td>Cotton plugs</td><td>₹ 225/roll)</td><td>₹ 75</td></tr>
<tr><td>Polypropylene Rings</td><td>₹ 2 per ring</td><td>₹ 40</td></tr>
<tr><td>Chemicals(Calcium carbonate = 310 per 500 g Calcium Sulphate = Rs 305 per 500 g)</td><td>100 grams (each 25 grams)</td><td>₹ 120</td></tr>
<tr><td colspan="2">Total</td><td>₹ 555</td></tr>
</table>
Cost per spawn Bag = ₹ 555/20 = ₹ 28/-<br>Estimated production of Spawn Per month = 100 bags<br>Estimated cost of raw materials = ₹ 2800/-<br>Shiitake production raw material required:<br>Raw material required for preparation of 20 Shiitake bags:<br><br>
<table>
<tr><th>Raw materials</th><th></th><th>Cost (Approx.)</th></tr>
<tr><td>Sawdust</td><td>₹ 5 per kg</td><td>₹ 60</td></tr>
<tr><td>Wheat bran</td><td>₹ 20 per Kg</td><td>₹ 60</td></tr>
<tr><td>Polypropylene bags</td><td>₹ 3 per bag</td><td>₹ 120</td></tr>
<tr><td>Cotton plugs</td><td>₹ 225/roll</td><td>₹ 75</td></tr>
<tr><td>Polypropylene Rings</td><td>₹ 2 per ring</td><td>₹ 40</td></tr>
<tr><td>Chemicals (Calcium carbonate = 310 per 500 g Calcium Sulphate = ₹ 305 per 500 g)</td><td>100 grams (each 25 grams)</td><td>₹ 120</td></tr>
<tr><td colspan="2">Total</td><td>₹ 475</td></tr>
</table>
Cost per Shiitake Bag = ₹ 475/20 = ₹ 24/-<br>Estimated production of Shiitake Bag Per month = 300 bags.<br>Estimated cost of raw materials = ₹ 7200/-</td></tr>
</table>

| | | |
|---|---|---|
| 6. | What is the area foot print of the Process? | 25 X 25 feet (for batch production of 50 kgs) |
| 7. | What kind of Climatic and Geographical location is required? | *Shiitake* mushroom production can be carried out throughout the year under controlled conditions. The focus of the technology has been towards the development of cost-effective method for *shiitake* production, and value addition for ensuring food security and innovative food processing with an underpinning on food safety to provide health and nutrition to all sections of the population. |
| 8. | Gestation period of the project? | 2 months |
| 9. | Minimum Economic Unit Size? | Infrastructure Requirements<br>For the captive production of *shiitake* mushroom under controlled conditions. Two rooms, packing space, autoclave area and laminar room with an area foot print of approximately 25 X 25 feet is required for 50 kg *shiitake* mushroom production.<br>Incubation room requires a split air conditioner, and aluminum racks with temperature maintained at 21-25°C for yearlong cultivation. If seasonal cultivation is preferred by farmers, the month of September and early October is the appropriate time of incubation.<br>Fruiting room requires a set of split air conditions, aluminum racks and a humidifier. Fruiting is done under control conditions i.e. temperature 16-18°C and 80-95% humidity. For seasonal farmers, starting from month of November till the end of February fruiting conditions can be maintained without any use of air conditioners.<br>Mushroom bag preparation room requires autoclave for sterilization, iron grating and furnace for boiling of spawn, laminar airflow for inoculation of spawn, UV and tray dryer for further processing, drying and value addition. |
| 10. | Indicative Investment | ₹ 12-15 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | The raw material to produce *shiitake* mushroom under captive cultivation is cheap hard wood broad leaf saw dust substrate available locally in different timber houses. For additional supply of raw materials paper mills, large timber houses can be contacted for supply of sawdust substrates from nearby region. Other requirements for spawn and shiitake production such as wheat grains, wheat bran, etc. can be locally procured from local traders. |
| 12. | Can it be part of Circular economy? | Yes, the technology utilizes waste from timber houses for high value mushroom production and the waste generated in form of spent, is a degraded organic material that may be used as manure and soil conditioner in the farm land. |

<table>
<tr><td>13.</td><td>What will be the Chain of Value addition?</td><td>Value chain analysis for 100 kg fresh and dried mushroom
<table>
<tr><th>Item</th><th>Total Investment (₹)</th><th>Gross Returns (₹)</th><th>Net Returns (₹)</th><th>Benefit/ Cost Ratio</th></tr>
<tr><td>Fresh Shiitake</td><td>33000</td><td>88000</td><td>47000</td><td>1.42</td></tr>
<tr><td>Dried Shiitake</td><td>48000</td><td>99000</td><td>51000</td><td>1.06</td></tr>
</table></td></tr>
<tr><td>14.</td><td>Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally</td><td>Once the required machineries are procured, rest recurring requirement can be obtained locally. Hard wood waste from local timber houses can be used as substrate, spawn can be prepared using wheat grains and the spent of the mushroom can be converted to organic manure to be used in farmland as soil conditioner.</td></tr>
<tr><td>15.</td><td>How everything from top to bottom to be made in the village itself (Circular and local)?</td><td>Recurring requirements for the Shiitake mushroom production can be fulfilled locally. Also the spent can be utilized in the farmlands.</td></tr>
<tr><td>16.</td><td>How many Training Days or months required for the technology to be learned properly?</td><td>How many Training Days or months required for the technology to be learned properly?
<table>
<tr><td></td><td>Shiitake mushroom training duration</td><td>Days</td></tr>
<tr><td>1.</td><td>Culture maintenance, Spawn production training programme</td><td>10</td></tr>
<tr><td>2.</td><td>Shiitake processing training programme</td><td>10</td></tr>
<tr><td>3.</td><td>Packaging and marketing training programme</td><td>5</td></tr>
<tr><td></td><td>Total</td><td>25</td></tr>
</table></td></tr>
<tr><td>17.</td><td>How to be implemented form the root to tip</td><td>Process for shorter cultivation cycle of Shiitake mushroom in synthetic logs<br>Shiitake mushroom captive conditions is performed by utilizing the sawdust substrate available as waste from timber industry. Shiitake mushroom is produced in record 1.5-2 months' duration. The yield of fresh mushroom is 0.5-0.6 kg per 1 kg dry weight of sawdust substrate.<br>Comparative nutritional analysis of Oven dried and Freeze-dried shiitake mushroom (100 gm)
<table>
<tr><th>S. No</th><th>Parameters</th><th>Oven dried samples</th></tr>
<tr><td>1.</td><td>Moisture, % by wt.</td><td>7.14</td></tr>
<tr><td>2.</td><td>Total Ash, % by wt.</td><td>6.65</td></tr>
<tr><td>3.</td><td>Fat, % by wt</td><td>2.55</td></tr>
<tr><td>4.</td><td>Crude fiber, % by wt</td><td>7.20</td></tr>
<tr><td>5.</td><td>Protein, % by wt</td><td>28.01</td></tr>
<tr><td>6.</td><td>Carbohydrate, % by wt.</td><td>48.45</td></tr>
<tr><td>7.</td><td>Calorific value, K.cal/100g</td><td>328.79</td></tr>
<tr><td>8.</td><td>Iron, mg/100g</td><td>2.47</td></tr>
<tr><td>9.</td><td>Zinc, mg/100g</td><td>6.30</td></tr>
<tr><td>10.</td><td>Vitamin A, µg/g</td><td>BDL*of 0.150</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td>Quantification of UV treated Shiitake samples for Vitamin $D_2$
<table>
<tr><td>Samples</td><td>Vitamin D2 (µg/g)</td></tr>
<tr><td>Caps 20</td><td>44.3 ± 0.91</td></tr>
<tr><td>Caps 25</td><td>42.9 ± 1.14</td></tr>
<tr><td>Gills 30</td><td>99.83 ±9.8</td></tr>
<tr><td>Gills 40</td><td>7.9 ± 0.94</td></tr>
<tr><td>Stipes 20</td><td>25.6 ± 0.52</td></tr>
<tr><td>Stipes 30</td><td>77.4 ± 0.79</td></tr>
</table>
Third party analysis:<br>
The third-party analysis of shiitake mushroom was performed at NABL certified Interstellar Testing centre and SGS India Pvt. Ltdto further verify the results.<br>
Vitamin $D_2$ estimation results from Interstellar Testing Centre Pvt. Ltd, Panchkula, Haryana.
<table>
<tr><td>Sample</td><td>Vitamin $D_2$ (µg/g)</td></tr>
<tr><td>Oven-dried</td><td>112.1</td></tr>
</table>
Vitamin $D_2$ estimation results from SGS India Pvt. Ltd. IMT Manesar, Gurgaon, Haryana.
<table>
<tr><td>Samples</td><td>Vitamin $D_2$ (µg/g)</td></tr>
<tr><td>Control</td><td>9.5</td></tr>
<tr><td>Sun-dried</td><td>14.6</td></tr>
<tr><td>Oven-dried</td><td>136.9</td></tr>
<tr><td>Freeze-dried</td><td>153.1</td></tr>
</table>
</td></tr>
<tr><td>18.</td><td>If it can be implemented at Family level or external manpower is required?</td><td>Yes, it can be implemented at the family level.</td></tr>
<tr><td colspan="3">Additional Information</td></tr>
<tr><td>19.</td><td>How many Manpower required?</td><td>For 50 kg batch cultivation two manpower is required</td></tr>
<tr><td>20.</td><td>What is the Status of Commercialization</td><td>Agreement signed for the transfer of the technology of Captive production of Shiitake mushroom with M/s Innotech AgroPustikam Pvt. Ltd., Guwahati Biotech Park, IIT Guwahati, Assam; M/s Pravin Masalewale, Hadapsar Industrial Estate, Hadapsar, Pune, Maharashtra and, Mr. Satish Kumar, M/s Ray's Tech Hamirpur, Himachal Pradesh. M/s Innotech AgroPostikum Pvt. Ltd., Guwahati, Assam, have also signed the agreement for setting up the Incubation Centre at CSIR-IHBT. Currently, they are utilizing our facilities and 20 kilograms' production of shiitake mushrooms are supplied per month to the stakeholders.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>External grant obtained on the technology developed under this project of Captive production of Shiitake mushroom has led us obtain an ECF of ₹ 2.04 crore. The approval letter is obtained recently:<br><br>MoMSME has sanctioned three Shiitake production clusters at Sikkim worth ₹ 2.449 crore each.</td></tr>
<tr><td>21.</td><td>Scale of Funding required all total?</td><td>A total budget of ₹ 15 lakhs will be sufficient to start with a batch production of 50 Kg (Excluding the civil and land cost).</td></tr>
<tr><td>22.</td><td>Budget with breakage?</td><td>Budget breakup: Cost of equipment required for shiitake mushroom cultivation, value addition and processing.
<table>
<tr><th>S. No</th><th>Name of the equipment & Machineries</th><th>Nos.</th><th>Cost (in ₹)</th></tr>
<tr><td>1</td><td>Autoclave</td><td>1</td><td>3,50,000</td></tr>
<tr><td>2</td><td>Laminar air flow</td><td>1</td><td>70,000</td></tr>
<tr><td>3</td><td>Air conditioners</td><td>2</td><td>1,00,000</td></tr>
<tr><td>4</td><td>Humidifier</td><td>1</td><td>20,000</td></tr>
<tr><td>5</td><td>Racks</td><td>-</td><td>80,000</td></tr>
<tr><td>6</td><td>Tray dryer</td><td>1</td><td>1,50,000</td></tr>
<tr><td>7</td><td>UV lamps</td><td>1</td><td>50,000</td></tr>
<tr><td>8</td><td>Boiling Pan 600 Litre capacity</td><td>1</td><td>13,000</td></tr>
<tr><td>9</td><td>Iron Grating for Furnace and mesh</td><td>1</td><td>6,000</td></tr>
<tr><td>10</td><td>Mushroom packaging Machine</td><td>1</td><td>2,50,000</td></tr>
<tr><td colspan="3">Total</td><td>₹ 10,89,000</td></tr>
</table>
Technology transfer fee will be additionally charged</td></tr>
</table>

| | | |
|---|---|---|
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | 1. Availability of timber waste in the area<br>2. Dependence on skilled labour and proper monitoring<br>3. Availability of quality wheat grains for spawn production<br>4. Electrical power supply |

# Iron and zinc enriched spirulina based food products (Nut and chocolate bars, Instant soup mixes, Beverage mixes)

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Iron and zinc enriched spirulina based food products (Nut and chocolate bars, Instant soup mixes, Beverage mixes) |
| 2. | About technology (in short) | The products have been developed for combating micronutrient malnutrition, mainly iron and zinc. According to National Family and Health Survey 4 (2015-16) 53% of Indian women and 38% of Indian children are anaemic and deficient in micronutrients. The product offers a cost-effective platform for supplementation of micronutrients.<br>The salient features of the products are<br>• 100% Natural, preservative free<br>• Up to 2g Spirulina per serving.<br>• 25% RDA levels of Iron and Zinc per serving (25 g).<br>• Beta-carotene content – 122 µg/serving (25g).<br>• 4 g protein/serving (25 g).<br>• Source of omega-6 Gamma Linolenic Acid<br>• Shelf life 6 months |
| 3. | What is the scientific approach to choose the particular technology? | Microalgae, mainly Spirulina has been approved as nutraceutical and source of essential nutrients such as iron, beta-carotene and protein. Use of Spirulina has been approved by FSSAI under schedule VI of Food Safety Standards for Nutraceuticals, 2016.<br>Research work at CSIR-IHBT revealed that supplementation of *Spirulina* to malnourished rats reversed conditions of iron deficient anaemia and protein malnutrition. Further repeated dose supplementation study indicated body weight gain, improved haematology and serum profile. |
| 4. | After what duration the first output can be seen? | Within 1 month from date of commissioning of plant and installation of machinery. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Dehydrated Spirulina powder, Nuts (peanuts, almonds), Seeds (Sesame, flax sunflower, watermelon, pumpkin), Oats, cereals and millet flours, honey, jaggery, sugar, butter, cooking oil. |

| | | |
|---|---|---|
| 6. | What is the area foot print of the Process? | Output – 500 kg per day<br>Total land requirement – 5000 sq. feet<br>Building area – 3500 sq. feet<br>required for raw material storage, pre- processing, production line, finished good storage etc. |
| 7. | What kind of Climatic and Geographical location is required? | The technology can be executed anywhere in India with continuous electricity supply ease of logistics access |
| 8. | Gestation period of the project? | 6 months |
| 9. | Minimum Economic Unit Size? | 500 kg per day of any given product resulting in |
| 10. | Indicative Investment | ₹ 35 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw materials such as nuts, seeds, sweeteners and food ingredients – Locally sourced.<br>Machinery – Indigenous and fabricated at local level. |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | The technology can enhance the value and demand for *Spirulina* production, effective utilization of jaggery and honey and nuts in finished products fetching better economic returns to small farmers. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | NA |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1 month |
| 17. | How to be implemented form the root to tip | The technology know how is readily available. The complete handholding will be provided which include machinery selection, raw material identification and processing and analytical services. |
| 18. | If it can be implemented at Family level or external manpower is required? | External manpower is required. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 8 to 10 nos. |
| 20. | What is the Status of Commercialization | Product is ready for commercialization |
| 21. | Scale of Funding required all total? | ₹ 35 lakhs |

| | | |
|---|---|---|
| 22. | Budget with breakage? | • Capital expenses – ₹ 25 lakhs<br>• Working capital – ₹ 7.5 lakhs<br>• Technology transfer and licenses – ₹ 2.5 lakhs |
| 23. | What type of Certification Required for the product? (If required) | FSSAI, New Delhi<br>Additionally HACCP and ISO 22000 |
| 24. | Risk involved? | No environmental or industrial hazard or risk identified in the technology |

# PROTEIN AND FIBER ENRICHED CEREAL BARS (VARIANTS: GRANOLA BARS, PROTEIN BARS, LOW CALORIE BARS)

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | PROTEIN AND FIBER ENRICHED CEREAL BARS (VARIANTS: GRANOLA BARS, PROTEIN BARS, LOW CALORIE BARS) |
| 2. | About technology (in short) | The products have been developed for combating protein malnutrition. According to National Family and Health Survey 4 (2015-16) 38% of Indian women and 36% of Indian children are protein malnourished. The product offers a cost-effective platform for supplementation of proteins. Further, the market for protein enriched instant foods and functional foods is increasing and is valued at USD 3 billions with an annual growth of 7%.<br>• The salient features of the products are<br>• 100% Natural, Preservative free<br>• Multi grain- rich in millets and pulses<br>• Natural fruit and honey based based<br>• 4 to 5 g protein/ serving<br>• 3 g complex dietary fiber per serving<br>• Less than 6 g sugar/ serving<br>• Saturated fat content less than 2.5g/ serving<br>• Meets 15% of RDA for calcium.<br>• Shelf life 6 months |
| 3. | What is the scientific approach to choose the particular technology)? | Proteins in the form of convenient foods are easily accepted among consumers. Considering the increasing demand for protein rich foods, CSIR-IHBT has developed multigrain based protein and fiber enriched bars. The health benefits of lower calorie intake and dietary fibre is well understood and has tremendous impact in diabetic foods and market. |
| 4. | After what duration the first output can be seen? | Within 1 month from date of commissioning of plant and installation of machinery. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Multigrain cereal products (puffs, flakes), Nuts (peanuts, almonds), Seeds (Sesame, flax sunflower, watermelon, pumpkin), Oats, cereals and millet flours, honey, jaggery, sugar, butter, cooking oil. |

| | | |
|---|---|---|
| 6. | What is the area foot print of the Process? | Output – 500 kg per day (About 10000 bars of 40 grams size)<br>Total land requirement – 5000 sq. feet<br>Building area – 3500 sq. feet<br>required for raw material storage, pre- processing, production line, finished good storage etc. |
| 7. | What kind of Climatic and Geographical location is required? | The technology can be executed anywhere in India with continuous electricity supply ease of logistics access |
| 8. | Gestation period of the project? | 6 months |
| 9. | Minimum Economic Unit Size? | 500 kg per day of any given product resulting in |
| 10. | Indicative Investment | ₹ 45 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw materials such as nuts, seeds, sweeteners and food ingredients – Locally sourced<br>Machinery – Indigenous and fabricated at local level |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | The technology can enhance the value and demand effective utilization of jaggery and honey and nuts in finished products fetching better economic returns to small farmers. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | NA |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1 month |
| 17. | How to be implemented form the root to tip | The technology know how is readily available. The complete handholding will be provided which include machinery selection, raw material identification and processing and analytical services. |
| 18. | If it can be implemented at Family level or external manpower is required? | External manpower is required. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 8 to 10 nos. |
| 20. | What is the Status of Commercialization | Product is ready for commercialization |
| 21. | Scale of Funding required all total? | ₹ 45 lakhs |

| | | |
|---|---|---|
| 22. | Budget with breakage? | • Capital expenses – ₹ 30 lakhs<br>• Working capital – ₹ 12.50 lakhs<br>• Technology transfer and licenses – ₹ 2.5 lakhs |
| 23. | What type of Certification Required for the product? (If required) | FSSAI, New Delhi<br>Additionally HACCP and ISO 22000 |
| 24. | Risk involved? | No environmental or industrial hazard or risk identified in the technology. |

# Multigrain High protein mixes

## [CSIR-IHBT]

| Basic Information | | |
|---|---|---|
| | **Items** | **Answers** |
| 1. | **Title of the technology** | Multigrain High protein mixes |
| 2. | About technology (in short) | The products have been developed for combating protein malnutrition. According to National Family and Health Survey 4 (2015-16) 38% of Indian women and 36% of Indian children are protein malnourished. The product offers a cost-effective platform for supplementation of proteins. Further, the market for protein enriched instant foods and functional foods is increasing and is valued at USD 3 billions with an annual growth of 7%.<br><br>The salient features of the products are<br><br>• 100% Natural high energy drink<br>• No maltodextrins & malt powders<br>• Multigrain based<br>• High energy >100 Kcal/ serving.<br>• 7g protein/serving<br>• 4g dietary fiber/serving<br>• Meets 15% RDA of Calcium and Iron Preservative free<br>• Non-hygroscopic – easy to store.<br>• Shelf life 1 year |
| 3. | What is the scientific approach to choose the particular technology? | Proteins in the form of convenient foods are easily accepted among consumers. Considering the increasing demand for protein rich foods, CSIR-IHBT has developed multigrain based high protein mixes that can be used as beverages, fortifying agents in other prepared foods.<br><br>Animal studies indicated the ability of the formulation to promote recovery from protein malnutrition and protein deficient anaemia. |
| 4. | After what duration the first output can be seen? | Within 1 month from date of commissioning of plant and installation of machinery. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Cereals, millets, pulses and jaggery, milk solids and spices. |

| | | |
|---|---|---|
| 6. | What is the area foot print of the Process? | **Output** – 500 kg per day<br>**Total land requirement** – 5000 sq. feet<br>**Building area** – 3500 sq. feet<br>required for raw material storage, pre- processing, production line, finished good storage etc. |
| 7. | What kind of Climatic and Geographical location is required? | The technology can be executed anywhere in India with continuous electricity supply ease of logistics access. |
| 8. | Gestation period of the project? | 6 months |
| 9. | Minimum Economic Unit Size? | 200 kg per day of any given product resulting in |
| 10. | Indicative Investment | ₹ 25 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw materials such as cereals, pulses and millets, spices and sweeteners and other food ingredients – Locally sourced.<br>Machinery – Indigenous and fabricated at local level. |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | The technology can enhance the value and demand for effective utilization of underutilized millets an. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | No |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | NA |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1 month |
| 17. | How to be implemented form the root to tip | The technology know how is readily available. The complete handholding will be provided which include machinery selection, raw material identification and processing and analytical services. |
| 18. | If it can be implemented at Family level or external manpower is required? | External manpower is required. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 8 to 10 nos. |
| 20. | What is the Status of Commercialization | Product is ready for commercialization |
| 21. | Scale of Funding required all total? | ₹ 25 lakhs |

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| 22. | Budget with breakage? | • Capital expenses – ₹ 18 lakhs<br>• Working capital – ₹ 5 lakhs<br>• Technology transfer and licenses – ₹ 2.0 lakhs |
| 23. | What type of Certification Required for the product? (If required) | FSSAI, New Delhi<br>Additionally HACCP and ISO 22000 |
| 24. | Risk involved? | No environmental or industrial hazard or risk identified in the technology. |

# Preparation of Herbal Gulals

## [CSIR-NBRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Preparation of Herbal Gulals |
| 2. | About technology (in short) | Herbal gulal is a perfect blend of organic and natural extracts of fruits, leaves, and barks with a fusion of flowers and herbs that add up an excellent aroma in the air setting up the stage for the joyous festival that is just round the corner. |
| 3. | What is the scientific approach to choose the particular technology? | The powder provides a synergistic mixture of coloured dry powder which has good sticking capacity to skin and can be easily removed by soft mop. The dry colours have cosmetic effect on skin too as the make face feel a bit soft. It provides an option to replace synthetic dye based dry colour composition by natural ones, which is safe and eco-friendly. |
| 4. | After what duration the first output can be seen? | One year |
| 5. | What kind of Resources Required (Raw material, Energy, Water, others)? | Raw material: Flowers, leaves, seeds, fruits, barks etc. Machinery: Grinder, extractor, oven, tray and mixer, water and electricity connection. |
| 6. | What is the area foot print of the Process? | All the resources available locally. Demand is at the national level. |
| 7. | What kind of climatic and geographical location is required? | No specific requirement. |
| 8. | Gestation period of the project? | Six months |
| 9. | Minimum Economic Unit Size? | ₹ 15 per 100 gram pkt |
| 10. | Indicative investment | ₹ 3-5 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative supply chain (source of raw material, machinery to possible market) | Flowers, leaves, seeds, fruits, barks etc. Machines locally available. Market available at all the levels. |
| 12. | Can it be part of circular economy? | Yes |
| 13. | What will be the chain of value addition? | Collected the flowers, leaves, seeds, fruits, barks etc. Processed to prepare gulal at processing site. Packed and marketed. |

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|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (circular and local)? | Local, villages around a famous temple can be deployed for collection, sorting and primary processing. Small scale processing unit can be set us in the village or nearby town. |
| 16. | How many training Days or months required for the technology to be learned properly? | Two weeks |
| 17. | How to be implemented form the root to tip | MSME with rural SHGs could be the model. |
| 18. | If it can be implemented at family level or external manpower is required? | External manpower will be required. |
| **Additional Information** | | |
| 19. | How many manpower required? | 5-10, depend upon the production capacity. |
| 20. | What is the status of commercialization | The existing technology partners in colour industries such as M/s Sri Ganesh, Cock etc. |
| 21. | Scale of funding required all total? | ₹ 3-5 lakh, depending upon capacity and scale of production. |
| 22. | Budget with breakage? | Processing room, land (depend upon place), Grinder, extractor, oven, tray and mixer (3-5 lakh), number of skilled and semiskilled manpower (depend upon the capacity of production). |
| 23. | What type of certification Required for the product? (If required) | Can be started after licensing from CSIR-NBRI. |
| 24. | Risk involved? | Competition from synthetic gulal makers. |

# Dry Flower Crafts

## [CSIR-NBRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Dry Flower Crafts |
| 2. | About technology (in short) | CSIR-NBRI, Lucknow is the pioneer institution for development of dehydration technique of flowers and foliages, and making various distinctive and artistic decorative products from these. Dehydrated flowers and foliage are excellent due to their special beauty, long lasting value and can be enjoyed in any season. The technique has tremendous importance in social development in terms of employment generation and commercial potentiality, both for domestic and export market.<br><br>Dehydration of flowers and foliage is done by different methods.<br><br>CSIR-NBRI has standardised methods for different plant materials like air drying and embedding drying (for 3D structures through room drying, sun drying, oven drying, vacuum drying and microwave oven drying. Air drying is the most simple method under natural conditions whereas the embedding drying is to avoid shrinkage and other morphological changes in dehydrated materials. Press drying (for 2 D structures) is one of the most common methods for drying flowers and foliage. The original shape of the plant material cannot be maintained. This method is basically used for preparations of greeting cards, landscapes, wall hangings, herbarium, scenery, table mats, coasters and greeting envelopes etc. This technique is very ideal for making high quality herbarium specimen and for making different types of value added beautiful high quality products. Adopting this technology of value addition, the beneficiaries can earn money and it is a good source of employment generation in rural sector for farmers, rural women and unemployed youth. The value added floriculture is a simple field based technology which has easy adoptability by the rural people without much scientific and technological requirement. |
| 3. | What is the scientific approach to choose the particular technology? | • Dehydration means to dry something under artificially produced heat and controlled temperature, humidity and air-flow. |

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| | | • Dehydration (removal of moisture) of flowers and foliage is done by different methods like Air flaying, Embedding and drying, Room drying, Sun drying, and Oven drying. Borax, sand, corn meal and silica gel are the most commonly used drying materials. Time required to dry plant material depends and plant and the material used for drying.<br>• Embedding is one of the most important processes for dehydration. Silica gel or sand is mostly used as drying material. In this method the plant material is preserved in its original shape, size and colour and used to develop 3 D products.<br>• Press drying is another most common method for drying flowers and foliage. The original shape of the material cannot be maintained by this method but the original colour is retained.<br>• Factors influencing dehydration are temperature, humidity and airflow.<br>• Huge care after dehydration is required. |
| 4. | After what duration the first output can be seen? | 3 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Water: For irrigation of plants only.<br>Electricity: 3-5 KW electricity connection.<br>Raw material: Flowers, leaves and stems from the plants, grown in the garden of the unit.<br>Consumables: Blotting paper, scissors, forceps, adhesive, transparent glass/plastic containers, glass discs, tray, thermocol, coloured/velvet sheets of different colours; wax, enamel paint, silica gel, desiccators, glass containers of assorted sizes.<br>Minor equipment: Hot air oven, plant press, lamination machine, storage almirah, work tables with storage. |
| 6. | What is the area foot print of the Process? | Only glass containers are to be brought from distant place. |
| 7. | What kind of Climatic and Geographical location is required? | Can be deployed in every climatic and geographical location of our country. |
| 8. | Gestation period of the project? | Three months |
| 9. | Minimum Economic Unit Size? | Not applicable |
| 10. | Indicative Investment | ₹ 1-1.5 lakh rupees |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Locally available plant material is to be grown in the garden. Glass containers are to be sourced from outside. Minor equipments are available locally. |
| 12. | Can it be part of Circular economy? | No |

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| 13. | What will be the Chain of Value addition? | Design component can be improved by involving institutions like National Institute of design while glass material can be improved by involving of institutions like CSIR-Central Glass & Ceramic Research Institute. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Can be done locally in the village itself. |
| 16. | How many Training Days or months required for the technology to be learned properly? | One week. |
| 17. | How to be implemented form the root to tip | By setting of the facility in an area naturally rich with diverse flowers and foliages the gestation period can be reduced. Next major step is providing market linkage to make the venture successful. |
| 18. | If it can be implemented at family level or external manpower is required? | Yes. At the small scale. |
| | **Additional Information** | |
| 19. | How many Manpower required? | Depends upon the production capacity.<br>Four distinct activities: Cultivation, drying, product making and gardening. |
| 20. | What is the Status of Commercialization | Not done yet. |
| 21. | Scale of Funding required all total? | ₹ 1-1.5 lakh |
| 22. | Budget with breakage? | Minor equipment: ₹ 0.60 lakh<br>Garden development: ₹ 0.20 lakh<br>Consumables for 2-D product: ₹ 0.20 lakh<br>Glass containers: ₹ 0.50 lakh |
| 23. | What type of Certification Required for the product? (If required) | No<br>However, a certificate of training from CSIR-NBRI would be beneficial. |
| 24. | Risk involved? | Nil |

# Plant tissue culture technology

## [CSIR-NBRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Plant Tissue Culture Technology |
| 2. | About technology (in short) | Tissue culture can be defined as an *in vitro* aseptic culture of cells, tissues, organs or whole plant under controlled nutritional and environmental conditions, often to produce the clones of plants. The controlled conditions provide the culture an environment suitable for growth and multiplication of plant and include proper supply of nutrients, pH medium, adequate temperature and proper gaseous and liquid environment. A single explant can be multiplied into several thousand plants in relatively short time period and space under controlled conditions, irrespective of the season and weather on a year round basis. |
| 3. | What is the scientific approach to choose the particular technology? | Totipotency is the genetic potential of a plant cell to produce the entire plant. Based on this characterstic plant tissue culture technology is being widely used for large scale plant multiplication. This technology has a major industrial importance in the area of plant propagation, disease elimination, plant improvement and production of secondary metabolites. Use of micropropagation for endangered, threatened and rare species, and to produce plants of superior quality yielding genotypes with better disease resistance and stress tolerance capacities.<br>In addition, Plant tissue culture technology is used for crop improvement by the production of somaclonal and gametoclonal variants. |
| 4. | After what duration the first output can be seen? | Usually the time duration is 4-6 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | • Chosen plant (Medicinal, floriculture or orchids)<br>• Autoclave machine<br>• Laminar air flow<br>• Media for plant growth such as murashige skoog (MS) medium, sucrose, agar<br>• Flat-bottom culture tubes with closures<br>• Spray bottle, alcohol, spray bottle, forceps or tweezers, gloves, cutting equipments (scalpel and razor blade), sterile petri dishes, beaker, container |

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| | | • Bleach sterilizing solution (1% sodium hypochlorite)<br>• Beakers or containers of sterile water<br>• A well-lit area away from direct sunlight or use tubelights<br>• Plant growth hormones<br>• Plant culture room |
| 6. | What is the area foot print of the Process? | |
| 7. | What kind of Climatic and Geographical location is required? | Moderate climatic condition and the place where availability of electricity and water is easy. |
| 8. | Gestation period of the project? | 12 -36 months |
| 9. | Minimum Economic Unit Size? | |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | It will be circular. |
| 16. | How many Training Days or months required for the technology to be learned properly? | It will require maximum 4-6 weeks. |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | No, there will be need of external manpower. |
| **Additional Information** | | |
| 19. | How many Manpower required? | Maximum seven manpower.<br>Three skilled labours, two with highest qualification of post graduation and work experience of working in laboratory, one technician with maximum qualification of graduation and one non-skilled labour. |

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| 20. | What is the Status of Commercialization | |
| 21. | Scale of Funding required all total? | |
| 22. | Budget with breakage? | Items for one year — Cost ₹<br>Autoclave machine — 1lakhs<br>Media and hormones — 35k<br>Fridge — 30k<br>Eqipments — 1lakhs<br>Table and shelving unit — 5 lakhs<br>Workers salaries — 8 lakhs<br>Miscellaneous — 40k<br>Total — 16.05 lakhs |
| 23. | What type of Certification Required for the product? (If required) | Pathogen free material from any molecular biology lab. |
| 24. | Risk involved? | Contamination in tissue culture is one of the main problem. Apart from contamination, hardening in the green house and acclimatization to the field conditions is the final problem in the in vitro raised plants. |

# Herbal Gulal from Floral Temple Waste

## [CSIR-NBRI]

| Basic Information | | |
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| | **Items** | Answers |
| 1 | **Title of the technology** | Herbal Gulal from Floral Temple Waste |
| 2 | About technology (in short) | Flowers are used for variety of purposes. Since they are perishable items, they are usually discarded as waste after a day or two. To make use of waste flower colour has been extracted from them to make gulal. Dry colours are used worldwide in various festivals, dances and household decoration. In India, large amount of colours are used in traditional Holi festival. |
| 3 | What is the scientific approach to choose the particular technology? | The colours extracted from waste flowers are mixed with natural ingredients. The powder provides a synergistic mixture of coloured dry powder which has good sticking capacity to skin and can be easily removed by soft mop.It is non-toxic to skin. |
| 4 | After what duration the first output can be seen? | One year |
| 5 | What kind of Resources Required (Raw material, Energy, water, others)? | Raw material: Floral waste from temples<br>Machinery: Grinder, Extractor, Oven, Tray and Mixer<br>Water and electricity connection. |
| 6 | What is the area foot print of the Process? | All the resources available locally. Demand is at the national level. |
| 7 | What kind of Climatic and Geographical location is required? | No specific requirement. |
| 8 | Gestation period of the project? | Six months |
| 9 | Minimum Economic Unit Size? | 100 gm per ₹ 15 |
| 10 | Indicative Investment | ₹ 3-5 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11 | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Waste flowers available locally. Machines locally available. Market available at all the levels. |
| 12 | Can it be part of Circular economy? | Yes |
| 13 | What will be the Chain of Value addition? | Floral waste is sorted at temple. Processed to prepare gulal at processing site. Packed and marketed. |

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| 14 | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes |
| 15 | How everything from top to bottom to be made in the village itself (Circular and local)? | Local, villages around a famous temple can be deployed for collection, sorting and primary processing. Small scale processing unit can be set us in the village or nearby town. |
| 16 | How many Training Days or months required for the technology to be learned properly? | Two weeks |
| 17 | How to be implemented form the root to tip | MSME with rural SHGs could be the model. |
| 18 | If it can be implemented at Family level or external manpower is required? | External manpower will be required. |
| **Additional Information** | | |
| 19 | How many Manpower required? | 5-10, depend upon the production capacity. |
| 20 | What is the status of commercialization | Not transferred yet to any industry. |
| 21 | Scale of funding required all total? | ₹ 3-5 lakh, depending upon capacity and scale of production. |
| 22 | Budget with breakage? | Processing room, land ( depend upon place), Grinder, Extractor, Oven, Tray and Mixer(3-5 lakh),Number of skilled and semiskilled manpower (depend upon the capacity of production). |
| 23 | What type of Certification Required for the product? (If required) | Can be started after licensing from CSIR-NBRI. |
| 24 | Risk involved? | Competition from synthetic gulal makers. |

# Process for production of white pepper from black/ green pepper

## [CSIR-NIIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Process for production of white pepper from black/green pepper. |
| 2. | About technology (in short) | "White pepper", the skin-removed black or fresh pepper is the most valued form of pepper. Current demand of white pepper exceeds 150,000 metric tons per annum. White pepper value is almost double that of black pepper. Currently the main method for making white pepper is traditional retting, which affects the product quality significantly.<br><br>The NIIST white pepper technology is an innovative clean bioprocess, which helps fast and bulk production of white pepper without losing its spicy principles. The process is designed to cleave the pectin molecular bonding between the skin and oil glands of the pepper kernel by the action of enzymes produced in-situ. This is facilitated in tanks by circulating liquid from a reservoir of microbial culture grown on degraded pepper skin medium. This bioprocess completes skin removal in 2 days for green and 4 days for black pepper under designed conditions.<br><br>The clean bioprocess has been transferred to more than 25 entrepreneurs and few companies. The process enables to recover the by-products - methane gas and organic fertiliser that benefits process water reuse. The process continues to attract pepper industry inside and outside the country. The cost of implementation is low and the set up can be easily fabricated rurally, allowing value addition of the pepper and thereby increasing farmer income. |
| 3. | What is the scientific approach to choose the particular technology? | The scientific principle is the degradation and removal of pectin in the pepper "skin" through enzymatic action. The enzymes are generated in situ by a mixed anaerobic consortium which used the pepper skin solids as the carbon source. Recirculation of the liquid medium from the culture reservoir allows enzymes to be in contact with pepper and efficiency removal of digested skin. |

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| 4. | After what duration the first output can be seen? | First cycle of operation require about 14 days as the culture needs to gets established. Afterwards each cycle of white pepper production may take only 2-4 days. As far as plant commissioning to product output is concerned, the time duration is about 1-2 months. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | The plant for white pepper production can be easily scaled and it is also possible to operate in small scale suitable for individual farmer requirements. Fabrication can be done with multiple materials of construction ranging from HDPE tanks to Concrete and PVC pipes. Water requirement is minimal as it is recirculated. Energy requirement is only for operation of pump, that too intermittently. Raw material requirement are black/green pepper and water. |
| 6. | What is the area foot print of the process? | Depends on scale of operation. A 2 ton /batch Plant would require approximately 20 $m^2$ area for accommodating all infrastructure and to have enough operation space. |
| 7. | What kind of Climatic and Geographical location is required? | Climate should not be too cold. Warm and humid climate (The same as needed for pepper production) preferable. |
| 8. | Gestation period of the project? | The project is already implemented successfully at multiple locations. From commissioning to first produce, the maximum delay is only 1-2 month.<br>Raw material to product duration is 2-4 days once the culture is established. |
| 9. | Minimum Economic Unit Size? | 100 kg/batch (once in 4 days) |
| 10. | Indicative Investment | Low capacity systems without biogas production: ₹ 1-2 lakhs. |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw material (black pepper) source can be the farmer's own produce, or purchased in bulk from market.<br>Most of the machinery can be procured locally/fabricated.<br>Common motors/pumps and piping fittings and HDPE tanks can be used for construction of plant. |
| 12. | Can it be part of Circular economy? | Yes, The process is sustainable utilizing local resources and there is a high value addition. Water and resource utilization is minimal and income goes to the local farmers. There is also possibility of energy generation through utilization of biogas, which is a by-product. The other by-product, waste solids has fertilizer value. |
| 13. | What will be the Chain of Value addition? | White Pepper earns almost double the price of black pepper and there is a significant value addition. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, raw materials (black pepper) can be sourced locally and so are all materials for plant construction and operation. It can also provide employment to a minimum number of unskilled persons if operated at sufficient scale. |

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| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local fabricators can be provided with the design and drawings and can be educated on how the system works. Hand holding on design changes to suit the demand, fabrication etc can be provided by CSIR-NIIST. |
| 16. | How many Training Days or months required for the technology to be learned properly? | One month |
| 17. | How to be implemented form the root to tip | Turn key solutions and/or consultancy can be provided by CSIR-NIIST for installation and operation at multiple scales. |
| 18. | If it can be implemented at Family level or external manpower is required? | Yes, Small scale operation require only minimal manpower and resources. |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends on scale of operation. For small plants, upto 2 tons per batch, three persons – one semi-skilled and two unskilled would be sufficient. Manpower can be easily trained. |
| 20. | What is the Status of Commercialization | The clean bioprocess has been transferred to more than 25 entrepreneurs and few companies. Being operated at multiple places, enhancing farmer income. |
| 21. | Scale of Funding required all total? | Depends on the scale of operation.<br>Low capacity systems without biogas production can be made with a funding of maximum about 1-2 lakhs. The amount can be reduced if using cheap local materials of construction. |
| 22. | Budget with breakage? | Details shall be made available by NIIST depending on the scale of operation and desired MOC. |
| 23. | What type of Certification Required for the product? (If required) | Depends on local regulations.<br>Fssai certification may be needed for final product. |
| 24. | Risk involved? | Growth of unwanted microbes spoiling the fermentation and this can result in foul smell and reduced quality. Can be avoided by following proper hygienic practises. |

# Technology for agricultural waste (wheat bran, sugarcane bagasse and fruit peels) based biodegradable plates, cups and cutleries

## [CSIR-NIIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Technology for agricultural waste (wheat bran, sugarcane bagasse and fruit peels) based biodegradable plates, cups and cutleries. |
| 2. | About technology (in short) | Scientists from agro processing and technology division of csir niist have successfully demonstrated the process for development of biodegradable cutleries in the form of plates and cutleries from various agro residues. The developed product is shelf stable up to the period of 10 to 12 months and heat resistant upto the temperature of 100°C, produced plate and cutleries having good tensile strength, resist hot water and easily degradable. |
| 3. | What is the scientific approach to choose the particular technology? | Bench level process development, scale up in pilot plant, data collection, mechanical and quality properties studies, biodegradability studies, |
| 4. | After what duration the first output can be seen? | 2 years |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw materials: wheat bran, Rice husk, sugarcane bagasse and fruit peels and natural binders. |
| 6. | What is the area foot print of the process? | Edible and biodegradable cutleries and plates and glasses. |
| 7. | What kind of Climatic and Geographical location is required? | NA |
| 8. | Gestation period of the project? | For project implementation timeframe is 1 year. |
| 9. | Minimum Economic Unit Size? | 100 kg |
| 10. | Indicative Investment | Raw materials availability. |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | All over in India |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | Beneficial for farmers, Agri entrepreneurs, Plastic manufacturing industries and food packaging industries. |
| 13. | What will be the Chain of Value addition? | Alternate to single user plastics, after degradation utilized as fertilizer, food animal feed and fish feed. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes, fabrication and product development distributed through food packaging industries and plastic manufacturing industries to replace the plastic. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Farmers themselves they can manage to setup in hose hold scale processing where raw materials plenty available such as wheat bearn,rice husk, sugarcane bagasse and fruit peels. |
| 16. | How many training days or months required for the technology to be learned properly? | 2 Days |
| 17. | How to be implemented form the root to tip | Project implementation on consultancy basis through the help of a project engineering company. |
| 18. | If it can be implemented at Family level or external manpower is required? | yes, family persons also manageable. |
| **Additional Information** | | |
| 19. | How many Manpower required? | For setup of 500 to 1000 kg processing raw materials two skilled persons required and two workers for supporting. |
| 20. | What is the Status of Commercialization | Installed several |
| 21. | Scale of funding required all total? | Project cost depends on the processing capacity and type of products. |
| 22. | Budget with breakage? | For 100 kg of raw material capacity per day with semiautomatic having 15lkhas initial investment. |
| 23. | What type of Certification Required for the product? (If required) | Statutory licenses which are to be taken by the biodegradable manufacturing company for making the product. |
| 24. | Risk involved? | Market survey is more important when high value products are targeted. |

# Dehumidified drier for food and agri products

## [CSIR-NIIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Dehumidified drier for food and agri products |
| 2. | About technology (in short) | CSIR NIIST had developed and commercialized dehumidification drying for dehydration of food & agri products. This technology involves drying the material under controlled temperature and uniform distribution of air to retain the functional properties and micronutrients &flavour. The multipurpose application of the model involves the processing of heat sensitive exotic spices, fruits & vegetables, flowers etc for drying under adverse climatic conditions when it is harvested. |
| 3. | What is the scientific approach to choose the particular technology? | Bench level process development, scale up in pilot plant, data collection and QC studies, tech transfer & commercialization. |
| 4. | After what duration the first output can be seen? | 2 years |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Fresh raw materials such as vegetables, spices, fruits, herbs, leaves etc, |
| 6. | What is the area foot print of the Process? | Low temperature dehydration at modified atmosphere. |
| 7. | What kind of Climatic and Geographical location is required? | NA |
| 8. | Gestation period of the project? | For project implementation timeframe is 1 year |
| 9. | Minimum Economic Unit Size? | 100 Kg |
| 10. | Indicative Investment | Raw material availability |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | All over in India |
| 12. | Can it be part of Circular economy? | Beneficial for farmers as well as agri entrepreneurs |

| | | |
|---|---|---|
| 13. | What will be the Chain of Value addition? | Scope for value addition, shelf life enhancement and export market for a variety of dehydrated produces from fruits & vegetables, spices & herbs, onion, mushroom, flowers and leaves with superior quality. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, to be fabricated through engineering companies engaged in manufacture of food/agri processing equipment's. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Farmers groups can take part in setting up a processing unit at clusters where ginger is available at lower price. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | Project implementation on consultancy basis through the help of a project engineering company. |
| 18. | If it can be implemented at Family level or external manpower is required? | No |
| **Additional Information** | | |
| 19. | How many Manpower required? | For a 1 TPD processing plant about 10 -12 workers requires: 2 supervisory, 4 skilled workers and 5 unskilled workers. |
| 20. | What is the Status of Commercialization | Installed units several places in all over India. |
| 21. | Scale of Funding required all total? | Project cost depends on the processing capacity and type of products. |
| 22. | Budget with breakage? | For setting up a 1 TPD processing plant the cost of dryer alone will be about ₹ 35 Lakhs. |
| 23. | What type of Certification Required for the product? (If required) | Statuatory licenses which are to be taken by the food manufacturing company for making the product. |
| 24. | Risk involved? | Market survey is more important when high value products are targeted. |

# Fresh ginger processing technology

## [CSIR-NIIST]

| Basic Information | | |
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| | **Items** | Answers |
| 1. | **Title of the technology** | Fresh Ginger Processing Technology |
| 2. | About technology (in short) | CSIR - National Institute for Interdisciplinary Science & Technology, Trivandrum have developed and commercialized Fresh Ginger Processing Technology since 2000 for producing value added products such as ginger oil, dry ginger powder etc. The institute has set up three processing units in the north east and has transferred this technology to many other industries. CSIR NIIST provides the knowhow, technical assistance in sourcing of the machinery, engineering consultancy, training the operating staff, assist in erection & commissioning and troubleshooting. Same technology can be adopted for post-harvest operations of other spices like turmeric, cardamom etc. Considering the climatic conditions of North east, cost effective mechanical drying of the various agri crops can also looked into for value addition and shelf life enhancement. |
| 3. | What is the scientific approach to choose the particular technology? | Bench level process development, scale up in pilot plant, data collection and QC studies, tech transfer & commercialization. |
| 4. | After what duration the first output can be seen? | 2 years |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw ginger, water, steam for making value added products such as oil, powder, flakes etc. |
| 6. | What is the area foot print of the Process? | Post harvest value addition of fresh ginger by making clean / waxed ginger, ginger flakes, ginger powder & ginger oil. |
| 7. | What kind of Climatic and Geographical location is required? | NA |
| 8. | Gestation period of the project? | For project implementation timeframe is 1 year |
| 9. | Minimum Economic Unit Size? | 100 kg |
| 10. | Indicative Investment | |

| Salient Feature of Process/Technology Information | | |
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| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Mmarket) | Raw material from north east, kerala, karnataka etc. Machineries all over in india. |
| 12. | Can it be part of Circular economy? | Beneficial for farmers as well as high value export market. |
| 13. | What will be the Chain of Value addition? | Primary processing products such as ginger flakes, dry ginger powder etc in local markets and ginger oil as high value product market. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, to be fabricated through engineering companies engaged in manufacture of food/agri processing equipments. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Farmers groups can take part in setting up a processing unit at clusters where ginger is available at lower price. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1 week |
| 17. | How to be implemented form the root to tip | Tech transfer and project implementation on consultancy basis through the help of a project engineering company. |
| 18. | If it can be implemented at Family level or external manpower is required? | No |
| **Additional Information** | | |
| 19. | How many Manpower required? | For a 2 TPD processing plant about 25 workers requires: 3 supervisory, 8 skilled workers and 14 unskilled workers. |
| 20. | What is the Status of Commercialization | Installed units several places in all over India. |
| 21. | Scale of Funding required all total? | Project cost depends on the processing capacity and type of products. |
| 22. | Budget with breakage? | For setting up a 5 TPD processing plant & machineries alone the approx budget is ₹ 2.5 Crores with essential oil distillation facility. If the plant is for primary processing without oil distillation machinery cost will be ₹ 1.5 Crores. |
| 23. | What type of Certification Required for the product? (If required) | Statutory licenses which are to be taken by the food manufacturing company for making the product. |
| 24. | Risk involved? | Market survey is more important when high value products are targeted. Severe competition exists in the essential oil market from the large scale companies. |

# Gel bonding process for bricks and composite pre-fab walls

## [CSIR-NIIST]

| Basic Information | | |
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| | **Items** | Answers |
| 1. | **Title of the technology** | Gel bonding process for bricks and composite pre-fab walls |
| 2. | About technology (in short) | Ceramic-polymer hybrid gel treated under specific reaction conditions is used as a water compatible binder system for manufacturing bricks and composite pre-fab walls products. |
| 3. | What is the scientific approach to choose the particular technology? | Currently bricks are made from earthern clays which required firing at 980°C. Fire wood firing as well as gas/oil fired furnaces are used to make the bricks. The conventional bricks manufacturing process release $CO_2$ in air and extensively consume the natural raw material causing ecology problems. Hence a new idea of cold-bonded process using gel binders are proposed. Inorganic silicate gels stabilized with polymeric agents have good bonding strength and the cured bricks shows strength as high as 100 $N/cm^2$. In this case gypsum, lime and sand are normally used. It is a rural technology and a simple casting process only involved. |
| 4. | After what duration the first output can be seen? | Six months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Gypsum, Fly ash, lime, sand [preferably industry wastes from mining and casting industries], inorganic silicate precursors [sodium silicate/calcium silicate/potassium silicate], polymeric bonding agents [ polyacrylic/ SBR/ PU/ PVA / EVA etc.,] and glass fibres. |
| 6. | What is the area foot print of the Process? | Affordable building materials |
| 7. | What kind of Climatic and Geographical location is required? | Process involves Sun light curing. Warm climate is preferred. |
| 8. | Gestation period of the project? | 12 months |
| 9. | Minimum Economic Unit Size? | 1000 bricks /day |
| 10. | Indicative Investment | ₹ 8.00 lakhs |

| Salient Feature of Process/Technology Information | | |
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| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Gypsum, Fly ash, lime, sand, silicate binder and polymeric bonding agents, glass fibres etc are indigenously available. No heavy machinery is involved. Only wooden moulds are required. |
| 12. | Can it be part of Circular economy? | YES |
| 13. | What will be the Chain of Value addition? | Gypsum is a by-product produced by SPIC, and TTP and FACT units. Foundry sand, silica sand, rock dust etc., are produced from the mining/metallurgy and M-sand processing units. All these industrial by products are effectively used for making value added products. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | YES. The moulds as well as machines can be made within the country. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Raw materials should be procured from the near by industrial units. |
| 16. | How many Training Days or months required for the technology to be learned properly? | One month |
| 17. | How to be implemented from the root to tip | Project mode |
| 18. | If it can be implemented at Family level or external manpower is required? | Family level is possible if any graduate is there. Otherwise, external /skilled labour are required. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 7 |
| 20. | What is the Status of Commercialization | Demonstrated to the industries [MSMEs] |
| 21. | Scale of Funding required all total? | ₹ 8 lakh |
| 22. | Budget with breakage? | Raw materials : ₹ 25,000/- per year<br>Moulds : ₹ 20,000/- [wooded or rubber]<br>Industry shed : ₹ 2,00,000/- [Permamnent]<br>Water : ₹ 3000/- [per year]<br>Labour : 2 |

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| | | Supervisor 1<br>Man power salary; 3,00,000/- [per year]<br>Recurring : 1,00,000/- [per year]<br>Approximately 8.00 lakhs |
| 23. | What type of Certification Required for the product? (If required) | ISO certification for PWD approval |
| 24. | Risk involved? | No Risk is involved |

# Process for production of weather resistant coir geotextiles

## [CSIR-NIIST]

| Basic Information | | |
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| | **Items** | Answers |
| 1. | **Title of the technology** | Process for production of weather resistant coir geotextiles. |
| 2. | Brief introduction of technology | Geotextile based on natural fibres especially coir is used for protection of river banks, seashores as well as in road construction replacing synthetic geotextiles which are not eco-friendly. The main draw back is the early degradation of this mat within 6 months under natural weathering. In the current process a semi-permanent grafting with natural materials and post curing made it weather resistant which can stay for 4-5 years. This process and materials are non-toxic as well. |
| 3. | Scientific approach behind the development of technology | Normal coatings can wash off easily, but a reactive grafting with water resistant natural molecules can give a permanent coating. |
| 4. | Time duration for first output produced using the technology to become visible | 3-4 days |
| 5. | Resources required (Raw material, Energy, water, others) to deploy the technology for production | Spray guns, chemicals, drying or UV curing ovens. |
| 6. | Chain of Value addition | Only 10% increase in cost of treatment but frequent replacement can be avoided earning more revenue by savings and ecoprotection. |
| 7. | Are all the components required from raw material/machinery to final packaged product available locally or made locally, like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Preparation of the production set up/plant can be accomplished easily through local fabrication and the requirements can all be sourced locally. |
| 8. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw material is produced locally, chemicals and achinery can also be sourced locally. |

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| 9. | Can technology be part of Circular economy? | Yes, The process is sustainable utilizing local resources and there is a high value addition. Water and resource utilization is minimal and income goes to the local farmers. There is also possibility of energy generation through utilization of biogas, which is a by-prmoduct. The other by-product, waste solids has fertilizer value. |
| 10. | Gestation period of the project | The project is already scaled up and field trials are completed. |
| 11. | Certification Required to undertake production and launch the product sales in the market | Not needed |
| 12. | Manpower required(please specify number, and qualification/ skill required) | 4 persons per day is minimum requirement for a batch operation. Manpower can be easily trained. |
| 13. | Can the required manpower be sourced from local resources i.e. available locally? | Yes, Operation require only minimal skills which can be imparted easily. |
| 14. | Can technology be implemented at family level or external manpower is required | Yes, Small scale operation require only minimal manpower and resources. |
| 15. | What is the area foot print of the Process | Depends on scale of operation. A 25 kg /batch Plant would require aapproximately 20 $m^2$ area for accommodating all infrastructure and to have enough operation space. |
| 16. | Kind of Climatic and Geographical location required to deploy technology | Climate should not be too cold. Warm and humid climate preferable. |
| 17. | How many Training Days or months required for the technology to be learned properly? | 7 days |
| 18. | How technology can be implemented from the root to tip | Turn key solutions and/or consultancy can be provided by CSIR-NIIST for installation and operation at multiple scales. |
| 19. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local fabricators can be provided with the design and drawings and can be educated on how the system works. Hand holding on design changes to suit the demand, fabrication etc can be provided by CSIR-NIIST. |
| 20. | Scale of Funding required | Depends on the scale of operation<br>Low capacity systems can be made with a funding of maximum about ₹ 1.0 lakh. |
| 21. | Budget with breakage | Details shall be made available by NIIST depending on the scale of operation and desired MOC. |
| 22. | Type of Risk involved, if any | Absence of sufficient open space or ventilation can create some odour. |

# Process Know-How for the Development of Bio-degradable Lignocellulosic Fibre-based Mulching Mats and Sheets for Modern Farming

## [CSIR-NIIST]

| Basic Information | | |
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| | **Items** | Answers |
| 1. | **Title of the technology** | Process Know-How for the Development of Bio-degradable Lignocellulosic Fibre-based Mulching Mats and Sheets for Modern Farming |
| 2. | About technology (in short) | Mulching is a covering, usually made of petroleum-based plastics, spread on the ground around plants to prevent excessive evaporation or erosion, inhibit weed growth, enrich soil conditions, support drip-irrigation, etc. for better crop growth. Currently used plastic mulches are made of polypropylene or polyethylene that provide many positive advantages such as light weight and low cost. However, removal and disposal of these plastic mulch is a serious environmental concern as it deteriorates upon sun exposure. Additionally, since it is not porous, plant roots may suffocate and rot.<br><br>Mulching is a covering, usually made of petroleum-based plastics, spread on the ground around plants to prevent excessive evaporation or erosion, inhibit weed growth, enrich soil conditions, support drip-irrigation, etc. for better crop growth. Currently used plastic mulches are made of polypropylene or polyethylene that provide many positive advantages such as light weight and low cost. However, removal and disposal of these plastic mulch is a serious environmental concern as it deteriorates upon sun exposure. Additionally, since it is not porous, plant roots may suffocate and rot.<br><br>Mulching mats produced from biodegradable materials like coir/jute has several distinct advantages over conventional polymeric mulches. For example, they are eco-friendly due to their biodegradability, suppress weeds, prevent direct sunlight exposure protecting the plant from excess water loss due to evaporation and hence control humidity. Currently, natural rubber latex is used as binder for coir mulching mats. However, the price of natural rubber latex is volatile depending on the season. Further, |

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| | | it has processing issues to achieve preferable thickness, poor bonding with fibers, etc. Thus, we have developed a process know-how for the fabrication of biodegradable mulching mats using any lignocellulosic fibres (e.g. coir, jute, etc.) and bio-based polymer binder. A semi-automatic pilot-scale facility for the demonstration and fabrication of biodegradable mulching mats and sheets is available.<br>• These mulching mats are biodegradable and eco-friendly substitute to single-use plastic mulching films.<br>• Thinner, flexible rollable and low water absorption, compared to latex-based mulching mats.<br>• Longer life, breathability and support drip-irrigation, add value to soil upon degradation. |
| 3. | What is the scientific approach to choose the particular technology? | Green synthesis, polymerization |
| 4. | After what duration the first output can be seen? | Production cycle of single mat of size, 1x1 $m^2$ can be completed in 20 mins. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Plant fibers (coir/jute), non-edible oils, solvents, electricity, manpower |
| 6. | What is the area foot print of the Process? | Total areafor accommodating all infrastructure would require approximately 4x10 $m^2$. |
| 7. | What kind of Climatic and Geographical location is required? | Tropical and sub-tropical locations with dry climatic condition is desirable. Process can be designed for both wet and humid conditions as well. |
| 8. | Gestation period of the project? | • 3 - 6 months for fabrication of facility.<br>• From commissioning to first production of mulching mat, the maximum delay is only 1 day. |
| 9. | Minimum Economic Unit Size? | Approx. 4x10 $m^2$. |
| 10. | Indicative Investment | ₹ 50 lakhs for setting up the facility (excluding building, electrical connection, etc.). |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw materials are Plant fibers (coir/jute), non-edible oils, solvents which is produced locally. Machinery can also be sourced locally fabricated by MSME.<br>Market is both local and international. |
| 12. | Can it be part of Circular economy? | Yes, The process is sustainable utilizing local resources and there is a high value addition to coir or any plant fibers. Even waste fibers or baby fibers can be utilized. Therefore, farmers or coir industries will get the benefits of waste valorisation. These mulching mats are biodegradable and add value to soil upon degradation because of its high fertilizer value. Also support drip-irrigation. |

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| 13. | What will be the Chain of Value addition? | Value addition to coir or any plant fibers. About 55 -60% of raw coir is exported without any value addition and the same being imported as various value-added products. Further, coir industries find difficult to utilize waste fibers or baby fibers. In this connection, our technology can innovate the MSMEs in coir sector and topopularize Make-in-India products thatwill be the mantra for 'Atmanirbhar Bharat' to rise to the occasion. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Establishment of the production facility/plant can be accomplished easily through local fabrication and all the raw material requirements can be sourced and fabricated locallyby MSMEs. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | MSMEs can be provided with the design and drawings and can be educated on how the system works. Hand holding on design changes to suit the demand, fabrication etc can be provided by CSIR-NIIST, Thiruvananthapuram. |
| 16. | How many Training Days or months required for the technology to be learned properly? | One month |
| 17. | How to be implemented form the root to tip | Consultancy can be provided by CSIR-NIIST for installation and operation of mulching mat/sheet fabrication facility at multiple scales. |
| 18. | If it can be implemented at Family level or external manpower is required? | It can be implemented at the family level, provided one should have technical skills for the operations and maintenance of the facility. |
| **Additional Information** | | |
| 19. | How many Manpower required? | • Facility operation requires minimum two manpowerand resources.<br>• One technician for the operations and maintenance of the facility.<br>• One helper. |
| 20. | What is the Status of Commercialization | • Commercialization of the process development is in the pipeline in collaboration with National Coir Research and Management Institute (NCRMI, Kerala) and COIRFED Industry (8 - 12 months).<br>• Patent is under preparation. |
| 21. | Scale of Funding required all total? | • A semi-automatic demonstration facility is established at CSIR-NIIST, Thiruvananthapuram.<br>• A fully automated pilot-scale production facility requires ₹ 75 lakhs (excluding building, electrical connection, etc.). |
| 22. | Budget with breakage? | Details shall be made available by CSIR-NIIST depending on the scale of operation and desired MOC. |

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| 23. | What type of Certification Required for the product? (If required) | Final product may require certifications depends on local regulations.<br>Biodegradability test certificate from Pollution Control Board.<br>Termite and fungal resistant test certificates (IPIRTI, Bangalore). |
| 24. | Risk involved? | NA |

# Cultivation and processing of of Vetiver CIM-Vridhi (Khus)

## [CSIR-CIMAP]

| Basic Information | | |
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| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation and processing of of Vetiver CIM-Vridhi (Khus) |
| 2. | About technology (in short) | A short duration variety, matures in 10-12 months suitable for drought/marginal lands/water logged area.<br>Dry root yield: 20-25 q/ha.<br>Oil Yield: 20-25 kg/ha. |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in water logged areas and having better yield and quality which is acceptable in national and international market. |
| 4. | After what duration the first output can be seen? | 12 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs & distillation unit |
| 6. | What is the area foot print of the Process? | Primary processing for extraction of essential oil from roots. |
| 7. | What kind of Climatic and Geographical location is required? | Tropical/Subtropical areas |
| 8. | Gestation period of the project? | 12 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | ₹ 5-7 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, agricultural land, cultivation, distillation, essential oil to market. |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Extraction of essential oil from the roots, fractionation, product development. |

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| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Distillation unit may be fabricated locally based on CSIR-CIMAP design. All the value chain completed through technical support by CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Yes, hands on training based on rural technologies<br>Yes, circular. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, quality planting material, varieties, package of practices, distillation unit and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 80 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 9.75 lakhs for 5 acre (₹ 75,000/acre/year) |
| 22. | Budget with breakage? | ₹ 3.75 Lakh for cost of cultivation including planting material, labour and cost of distillation and ₹ 6.00 Lakh for establishment of distillation unit. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation and processing of Menthol mint var.-CIM-Kranti

## [CSIR-CIMAP]

| Basic Information | | |
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| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation and processing of Menthol mint var.-CIM-Kranti |
| 2. | About technology (in short) | Cold tolerant, suitable for commercial cultivation to generate extra income without any additional input and extra land use for cultivation during both winter as well as summer season, Oil Yield: 50 kg/ha in winter and 150-200 kg/ha in summer, Menthol content : 68-75%. |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in subtropical climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 04 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs & distillation unit |
| 6. | What is the area foot print of the Process? | Primary processing for extraction of essential oil |
| 7. | What kind of Climatic and Geographical location is required? | Tropical/Subtropical climate |
| 8. | Gestation period of the project? | 06 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, distillation, essential oil |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Extraction of essential oil from the herbs/leaves, fractionation, product development |

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| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Distillation may be fabricated locally based on CSIR-CIMAP design. All the value chain may be completed through technical support from CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Yes, hands-on-training<br>Yes, circular |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, quality planting material, varieties, package of practices, distillation unit and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 60 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 7.25 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 2.25 lakh for cost of cultivation including planting material and ₹ 5.00 Lakhs for distillation unit. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation and processing of Geranium (*Pelargonium graveolens*) Bio G-171

## [CSIR-CIMAP]

| Basic Information | | |
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| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation and processing of Geranium (*Pelargonium graveolens*) Bio G-171 |
| 2. | About technology (in short) | Oil Yield: 40-50 kg/ha, Oil content: 0.24%, Geraniol Content: 18-21% |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in subtropical climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 06 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs & distillation unit |
| 6. | What is the area foot print of the Process? | Primary processing for extraction of essential oil |
| 7. | What kind of Climatic and Geographical location is required? | Tropical/sub-tropical cold and dry climate 25-30°C and humidity of 60% is best for it, UP, MP, Bihar, Haryana, Punjab, Uttarakhand. |
| 8. | Gestation period of the project? | 12 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, distillation, essential oil |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Extraction of essential oil from the herbs, fractionation, product development. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Distillation may be fabricated locally based on CSIR-CIMAP design. All the value chain may be completed through technical support from CSIR-CIMAP. |

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| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Yes, hands on training<br>Circular |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, quality planting material, varieties, package of practices, distillation unit and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 70 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 8.50 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 2.50 lakh for cost of cultivation including planting material and ₹ 6.00 Lakhs for distillation unit. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation and processing of Lemongrass Vr.-Krishna [CSIR-CIMAP]

| Basic Information | | |
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| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation and processing of Lemongrass Vr.-Krishna |
| 2. | About technology (in short) | Herb yield: 20-25 t/ha/yr<br>Oil yield: 200-225 kg/ha/yr<br>Citral content: 75-80% |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in warm and humid climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 06 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs & distillation unit |
| 6. | What is the area foot print of the Process? | Primary processing for extraction of essential oil |
| 7. | What kind of Climatic and Geographical location is required? | Warm and humid climate is best for cultivation of lemongrass, the north Indian sub-tropical conditions are best. |
| 8. | Gestation period of the project? | 60 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, distillation, essential oil |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Extraction of essential oil from the herbs, fractionation, product development. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Distillation unit may be fabricated locally based on CSIR-CIMAP design. All the value chain may be completed through technical support from CSIR-CIMAP. |

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| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Yes, hand on training<br>Yes, circular |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, quality planting material, varieties, package of practices, distillation unit and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 65 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 7.00 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 2.00 lakh for cost of cultivation including planting material and ₹ 5.00 Lakhs for distillation unit. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation and processing of Palmarosa (*Cymbopogon martini var. motia*)Var.- CIM-Harsh

## [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation and processing of Palmarosa *(Cymbopogon martini* var. motia*)Var.*- CIM-Harsh |
| 2. | About technology (in short) | Medium tall, dark green leaves, long inflorescence, Drought resistant , Herb Yield: 450 q/ha, Oil Yield: 150-175 kg/ha, Geraniol content: 80-90%. |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in clear warm weather with low relative humid climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 06 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs & distillation unit |
| 6. | What is the area foot print of the Process? | Primary processing for extraction of essential oil |
| 7. | What kind of Climatic and Geographical location is required? | Clear warm weather with low relative humidity is necessary for optimum growth in north Indian climate. |
| 8. | Gestation period of the project? | 60 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, distillation, essential oil |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Extraction of essential oil from the herbs, fractionation, product development. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Distillation may be fabricated locally based on CSIR-CIMAP design. All the value chain may be completed through technical support by CSIR-CIMAP. |

| | | |
|---|---|---|
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Yes, hands on training<br>Yes, circular |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, quality planting material, varieties, package of practices, distillation unit and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 50 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 7.70 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 2.00 lakh for cost of cultivation including planting material and ₹ 5.00 Lakhs for distillation unit. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation and processing of CIM-SAUMYA (*Ocimum basilicum*)

## [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation and processing of CIM-SAUMYA *(Ocimum basilicum)* |
| 2. | About technology (in short) | Developed through half sib selection, Short duration, dwarf, early flowering, Growth habit: Semi closed, Herb yield : 290q/ha<br>Oil yield : 100-150 kg/ha, Oil content : 0.68 %,<br>Oil quality : methyl chavicol 62.54%, linalool 24.61% |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in rainy season with 22-28°C humidity climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 04 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs & distillation unit |
| 6. | What is the area foot print of the Process? | Primary processing for extraction of essential oil |
| 7. | What kind of Climatic and Geographical location is required? | Tropical, Sub-tropical and rainy season with 22-28°C and humidity 75-80 is best for cultivation. |
| 8. | Gestation period of the project? | 04 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, distillation, essential oil |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Extraction of essential oil from the herbs, fractionation, product development. |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Distillation may be fabricated locally based on CSIR-CIMAP design. All the value chain may complete through technical support by CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Yes, hand on training<br>Yes, circular |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, quality planting material, varieties, package of practices, distillation unit and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 40 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 7.25 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 25,000 for cost of cultivation including planting material and ₹ 6.00 Lakhs for distillation unit. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation and Processing of *Chamomila recutita* Va- CIM-Sammohak

## [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation and Processing of *Chamomila recutita* Va- CIM-Sammohak |
| 2. | About technology (in short) | • Developed through mutation breeding<br>• Tall variety with green stem<br>• High number of flowers per plant<br>• Dry flower yield : 5-8 q/ha<br>• Oil yield : 5-6 Kg/ha<br>• Chemuzuline content : 10-12% |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in temperate and sub-temperate climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 04 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs & distillation unit |
| 6. | What is the area foot print of the Process? | Primary processing for extraction of essential oil |
| 7. | What kind of Climatic and Geographical location is required? | Temperate and sub-temperate climate best |
| 8. | Gestation period of the project? | 04 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, distillation, essential oil |
| 12. | Can it be part of Circular economy? | Yes |

| | | |
|---|---|---|
| 13. | What will be the Chain of Value addition? | Extraction of essential oil from the dried flowers, fractionation, product development. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes, Distillation may be fabricated locally based on CSIR-CIMAP design. All the value chain may complete through technical support by CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Yes, hand on training<br>Yes, circular |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, varieties, package of practices, distillation unit and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 80 mandays |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 9.00 Lakh (for 5 acres) |
| 22. | Budget with breakage? | ₹ 2.00 lakh for cost of cultivation including planting material and ₹ 7.00 Lakh for distillation unit. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation and Processing of Yellow Satawar (*Asparagus adscendens* Roxb.) CIM-Sunahari

## [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation and Processing of Yellow Satawar (*Asparagus adscendens* Roxb.) CIM-Sunahari |
| 2. | About technology (in short) | CIM-Sunahari is the first variety of Yellow Satawar which is developed in CSIR-CIMAP.<br>The saponins extracted from dry roots from this strain are also high (10-11%). |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in tropical and sub-tropical climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 12-18 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs & boiling and dryer unit |
| 6. | What is the area foot print of the Process? | Primary processing |
| 7. | What kind of Climatic and Geographical location is required? | Tropical and sub-tropical climate with 50 to 100 cm rainfall and $40^0$ C is best for this crop, well drainage, sandy loam, soil is suitable. |
| 8. | Gestation period of the project? | 12-18 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, grading, boiling, drying and packing |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Digging of roots, wash properly and boil it for 1 hour. After peeling the boiled roots are dried in sun light and pack for marketing. |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | All the value chain may complete through technical support by CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Yes, hand on training<br>Yes, circular |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, varieties, package of practices and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 85 mandays |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 5.00 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 1,00,000 per acre for cost of cultivation including planting material. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation Ashwagandha (*Withania somnifera*.) CIM-Pratap

## [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation Ashwagandha (*Withania somnifera*.)<br>CIM-Pratap |
| 2. | About technology (in short) | • Developed through half sib selection<br>• Long tape root with less fibre<br>• Suitable for cultivation in drought prone areas<br>• Herb yield : 4-5 q/ha<br>• Dry root yield : 10-15 q/ha.<br>• Withanolide content : 0.31%<br>• Withaferin A content : 0.720 % |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in semi-tropical and rainfed climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 6 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs |
| 6. | What is the area foot print of the Process? | Primary processing |
| 7. | What kind of Climatic and Geographical location is required? | Semi-tropical areas receiving 660-750 mm rain fall are suitable for its cultivation as rainfed. |
| 8. | Gestation period of the project? | 6-8 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, grading, drying and packing |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Powder and tablets from roots. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | All the value chain may be completed through technical support by CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | By providing training/demonstration |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, varieties, package of practices and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 50 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 2.00 Lakh (for 5 acres) |
| 22. | Budget with breakage? | ₹ 40,000 per acres for cost of cultivation including planting material. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Cultivation of Kalmegh (*Andrographis paniculata*) CIM-Megha

## [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Cultivation of Kalmegh (*Andrographis paniculata*) CIM-Megha |
| 2. | About technology (in short) | • Developed as seed progeny selection<br>• High yield of dry biomass : 30-35 q /h<br>• Andrographolide content :1.90 %<br>• Plant height : 58-69 cm<br>• Leaf length : 5.0-5.9 cm<br>• Leaf width : 1.48-1.64 cm<br>• Plant spread : 48.3-50.0 cm<br>• Canopy shape : Open<br>• Leaf colour : Dark green |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in tropical/subtropical climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 3-4 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs |
| 6. | What is the area foot print of the Process? | Proper collection, grading and storage |
| 7. | What kind of Climatic and Geographical location is required? | Tropical/subtropical and sensitive to winter season. |
| 8. | Gestation period of the project? | 3-4 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, distillation, essential oil |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Grading, pulverization and making of tablets |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | All the value chain complete through technical support by CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | By providing hands on training |
| 16. | How many Training Days or months required for the technology to be learned properly? | 3 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, varieties, package of practices and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 45 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 1.50 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 30,000/acre for cost of cultivation including planting material and post harvesting. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# *Cultivation of Rauvolfia serpentina* variety CIM-Sheel

# [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | *Cultivation of Rauvolfia serpentina* variety CIM-Sheel |
| 2. | About technology (in short) | • Developed through mutation breeding<br>• Grow luxuriantly with dark green leaves and an erect growth habit<br>• Dry root yield: 15-20 q/ha<br>• Reserpine content: 0.030-0.035 % in dry root |
| 3. | What is the scientific approach to choose the particular technology) | The variety may be cultivated in tropical/subtropical climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 18 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs |
| 6. | What is the area foot print of the Process? | Primary processing |
| 7. | What kind of Climatic and Geographical location is required? | Tropical/subtropical and sensitive to winter season |
| 8. | Gestation period of the project? | 18 months |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Digging of roots, grading and making of powder/tablets |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | All the value chain complete through technical support by CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | By providing training/demonstration |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, varieties, package of practices and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 80 mandays |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 2.50 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 50,000/acre for cost of cultivation including planting material and post harvest technologies. |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# *Pogestemon patchouli variety CIM-Samarth*

# [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | *Pogestemon patchouli* variety CIM-Samarth |
| 2. | About technology (in short) | • Developed through selection<br>• Faster regeneration capabilities, performs well both under open and shaded conditions<br>• Tolerant to diseases<br>• Fresh herb yield : 20-21 t/ha<br>• Oil yield: 50-55 kg/ha<br>• Oil content : 1.55-2.50% |
| 3. | What is the scientific approach to choose the particular technology? | The variety may be cultivated in tropical/subtropical climate area and having better aided and quality which is acceptable in international market. |
| 4. | After what duration the first output can be seen? | 4-5 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Agricultural inputs |
| 6. | What is the area foot print of the Process? | Drying of leaves and extraction of essential oils |
| 7. | What kind of Climatic and Geographical location is required? | Tropical/subtropical climate 22-28$^0$ C temperatures and 75-80% humidity. Suitable of cultivation in shades or orchards. |
| 8. | Gestation period of the project? | 2-3 years |
| 9. | Minimum Economic Unit Size? | One hectare |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Planting material, cultivation, distillation, essential oil |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Primary processing for extraction of essential oil |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | All the value chain completed through technical support by CSIR-CIMAP. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | By providing training/demonstration |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right soil, varieties, package of practices, distillation unit and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 70 mandays/acre |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 8.50 Lakhs (for 5 acres) |
| 22. | Budget with breakage? | ₹ 50,000 for cost of cultivation including planting material and ₹ 6.00 Lakhs for distillation unit |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Making of incense sticks and fragrant cones from offered flowers

## [CSIR-CIMAP]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Making of incense sticks and fragrant cones from offered flowers |
| 2. | About technology (in short)/USP of the technology | • There is no use of charcoal.<br>• A woman can earn ₹ 5000-10000/- p.m. as additional income.<br>• Flower powder and jiget combination (5:1) reduces Jiget by about 9% as against coal powder and jiget combination (3:1).<br>• Produces about 25% higher number of agarbattis with 30-40% more burning time.<br>• Being devoid of charcoal powder, artisans found CSIR-CIMAP combination as 'skin friendly' which also keeps work place clean and pollution free. |
| 3. | What is the scientific approach to choose the particular technology? | Environmental friendly approach |
| 4. | After what duration the first output can be seen? | Three month |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Used flower/Bio-resources, Jigat powder, water, energy, manpower |
| 6. | What is the area foot print of the Process? | Locally the process standardize for making incense sticks and utilize offered flowers. |
| 7. | What kind of Climatic and Geographical location is required? | Not required specific climatic |
| 8. | Gestation period of the project? | 3-6 months |
| 9. | Minimum Economic Unit Size? | |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Machinery, offered/waste flowers, sticks, jigat power or any adhesive material essential oil. |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Making of incense sticks from offered flower |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | All the material available locally |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Circular |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | Scientific intervention of CSIR-CIMAP for selection of right package of practices and support in marketing. |
| 18. | If it can be implemented at Family level or external manpower is required? | Both Family/external labour required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 25 mandays for process 100 kg offered flowers |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 2.00 Lakhs for process of 100 kg of offered flowers |
| 22. | Budget with breakage? | ₹ 50,000 Pulveriser, Raw material ₹ 1,00,000, Working capital ₹ 50,000 |
| 23. | What type of Certification Required for the product? (If required) | BIS/ISO |
| 24. | Risk involved? | Market fluctuation |

# Production of Jowar Flakes

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Production of Jowar Flakes |
| 2. | About technology (in short) | Jowar flakes are a new type of products. They are not traditional like rice flakes which are known since time immemorial. But jowar flakes are produced on the same lines as rice flakes are produced. The coarse nature of the grain has been the cause for not making the jowar flakes. The flakes were being produced in the olden days by pounding. As jowar is a coarse grain, it was difficult to pound. With the advent of modern machines, flaking has become easy paving way for the production of jowar flakes. Thus, the CFTRI has developed a process for producing jowar flakes. |
| 3. | What is the scientific approach to choose the particular technology? | The main raw material used in the manufacture of jowar flakes is jowar. The total production of jowar in our country is little over 12.9 million tonnes. Of this Maharashtra's contribution is highest It produces 6.635 m. tonnes, while Madhya Pradesh and Karnataka produce 1.783 and 1.624 m. tonnes taking second and third position. |
| 4. | After what duration the first output can be seen? | ~16 hours |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | The raw material is Jowar, water is required for soaking. Energy for the entire plant would be about 50 – 60kW. |
| 6. | What is the area foot print of the Process? | 100 $m^2$ |
| 7. | What kind of Climatic and Geographical location is required? | No special requirements |
| 8. | Gestation period of the project? | Payback period ~ 3.5 years |
| 9. | Minimum Economic Unit Size? | 300 – 400 kg/h |
| 10. | Indicative Investment | ₹ 30.00 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw material available in almost all states of India. |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | Yes. Jowar bran (the only by product of the process) generated (about 6-8%) during polishing can be further processed to extract valuable food ingredients like dietary fibre, phenolics, fat etc., |
| 13. | What will be the Chain of Value addition? | The flaked jowar can be converted to ready-to-eat flakes after blistering, can be coated with minerals and vitamins, flavoured (sweet and savoury) and can be consumed as a breakfast cereals. In addition, the process can also deliver only polished jowar which is sought after in a few states. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | All process machinery are available indigenously. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | This process will be beneficial in villages that are engaged in cultivating Jowar. Setting up the facility like a flaker, roaster, etc. The farmer can add value to the grain and at the same time diversify the less utilized grain. In addition, with changes in processing parameters and addition of few machines flakes from other grains can also be manufactured in the same set up. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days minimum |
| 17. | How to be implemented form the root to tip | By demonstration and training. |
| 18. | If it can be implemented at Family level or external manpower is required? | External man power is required |
| **Additional Information** | | |
| 19. | How many Manpower required? | Mechanic – 1, Casual labour – 4, skilled workers – 2. |
| 20. | What is the Status of Commercialization | A few entrepreneurs have already taken the technology from the Institute. |
| 21. | Scale of Funding required all total? | |
| 22. | Budget with breakage? | |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Proper storage of Jowar is emphasized. Market survey of the products to be undertaken prior to setting up of the plant to ensure a robust value chain. |

# NutraChikki with added Spirulina

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | NutraChikki with added Spirulina |
| 2. | About technology (in short) | Chikki is a ready to eat traditional sweet snack consumed by all sections of population in India. The product can be utilized under the label ready to eat sweet snack or enriched snacks and supplied to school children or pre-schoolers or any other specific target group as a ready to eat food and a concentrated source of energy and protein. *Spirulina*, a blue green alga (cyanobacterium) has been extensively studied and is now in widespread usage throughout the world as a health food and a dietary supplement.Spirulina is a concentrated source of protein, vitamins, especially $B_{12,}$Provitamin A (β carotene) and Vitamin E, minerals, especially iron. It is also rich in gamma linolenic acid (GLA), an omega 3 fatty acid. |
| 3. | What is the scientific approach to choose the particular technology? | Access to all the raw material and availability of trained manpower at local level. A tie up with the marketing channel partner would be helpful in reaching the market. A tie up with the Govt. nutrition programmes targeted at combating malnutrition in children and women will provide a ready market. |
| 4. | After what duration the first output can be seen? | There is no gestation period involved. No sophisticated machinery is involved and the whole process know-how could be adopted at rural level without any lag. Therefore, the first output can be expected within a week of setting up of the processing unit. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Peanuts Jaggery Spirulina etc. energy for heating. |
| 6. | What is the area foot print of the Process? | A total area of 500 square meter is recommended with about 150 square meter of constructed area. |
| 7. | What kind of Climatic and Geographical location is required? | The processing unit is climatic or geographical location neutral. |
| 8. | Gestation period of the project? | No gestation period is envisaged. Availability of a processing shed, raw material and trained manpower can lead to the production without any delay. |

| | | |
|---|---|---|
| 9. | Minimum Economic Unit Size? | 100 Kg of Chikki per day |
| 10. | Indicative Investment | About ₹ 25 Lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | List of probable suppliers of machinery would be provided in the Technical Dossier. The suppliers of Ground Nut, Jaggery and Spirulina Powder have to be identified by the manufacturer. The specifications of the raw materials would be provided in the Technical Dossier. |
| 12. | Can it be part of Circular economy? | Yes. There is minimal loss of value during processing. The energy requirements could also be met through renewable sources. |
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes. The main raw materials i.e., ground nut and jaggery could be sourced locally from the farmers/rural entrepreneurs. The Spirulina could also be cultivated at rural scale at local level based on CSIR-CFTRI process. Therefore, all the raw material could be sourced from local rural area. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | All the raw material could be sourced locally and product could be made at the local level. |
| 16. | How many Training Days or months required for the technology to be learned properly? | Two days of training at CSIR-CFTRI including the demonstration and explanation of process steps and class room sessions on critical aspects of product making. |
| 17. | How to be implemented form the root to tip | The self-help groups can be provided with the training/ demonstration of the process. Linkages would be needed for funding, equipment procurement and installation and marketing of the product. |
| 18. | If it can be implemented at Family level or external manpower is required? | It can be implemented at Family level. |
| **Additional Information** | | |
| 19. | How many Manpower required? | About 5. If the production is done by the family, the cost of manpower would be reduced. |
| 20. | What is the Status of Commercialization | The process know-how has been successfully transferred to more than Five entrepreneurs. The process know-how has also been transferred to one self-help group. |
| 21. | Scale of Funding required all total? | ₹ 25 Lakhs. |

| | | |
|---|---|---|
| 22. | Budget with breakage? | Land and side development : ₹ 1,25,000/-<br>Building and civil works : ₹ 6,00,000/-<br>Plant and machinery : ₹ 11,00,000/-<br>Auxilliary equipment's : ₹ 60,000/-<br>Pre-operative expenses : ₹ 2,54,000/-<br>Working capital margin : ₹ 2,75,000/-<br>Total project cost : ₹ 25,00,000/- |
| 23. | What type of Certification Required for the product? (If required) | It is advised to get FSSAI registration for the production unit. Local municipality level registration etc. would be required. |
| 24. | Risk involved? | Successful marketing would require proper strategy. Competition from other manufacturers would also pose risk. |

# Bread Manufacturing

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | **Bread Manufacturing** |
| 2. | About technology (in short) | Wheat production has doubled in the last 20 years. At present, India is self-sufficient in wheat and in the years to come it may have surplus wheat. Mostly wheat is consumed in North India in the form of chapatti, roti, and while in Southern States. It is slowly catching up. There is a need for popularizing wheat and wheat products throughout the country for extending the supplies of other foods. Bread is an important ready to eat food product which is becoming increasingly popular amongst the Indian population.<br><br>Bread is the product of baking a mixture of flour, water, salt, yeast and other ingredients. The basic process involves mixing of ingredients until the flour is converted into a stiff paste or dough, followed by baking the dough into a loaf.<br><br>Product characteristics are:<br><br>i) It is a intermediate moisture food<br>ii) It works as an energy food<br>iii) It is a breakfast food |
| 3. | What is the scientific approach to choose the particular technology? | The technology has been developed scientifically so as to produce a safe and hygiene product |
| 4. | After what duration the first output can be seen? | Immediately after the manufacturing plant has been established , the product can be seen on a day to day basis. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw materials required for the production of bread is wheat flour/maida. Others include sugar, vegetable oil, yeast, salt, improvers and preservatives. The packaging material is usually poly propylene. All the raw materials used for the bread processing are available locally. |
| 6. | What is the area foot print of the Process? | Approximately 500 sq. feet (min) |
| 7. | What kind of Climatic and Geographical location is required? | Suitable for all Climatic and Geographical locations in our country. |

| | | |
|---|---|---|
| 8. | Gestation period of the project? | 2 months |
| 9. | Minimum Economic Unit Size? | 500 units/day |
| 10. | Indicative Investment | ₹ 2-4 Lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw material and machinery are easily procurable and are available in all parts of the country. |
| 12. | Can it be part of Circular economy? | It can be a part of circular economy to some extent. |
| 13. | What will be the Chain of Value addition? | Variety products and value added products can be produced by utilizing the locally grown agricultural produce with the existing manufacturing set up. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes the complete value chain can be made locally irrespective of the location. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Initial setting up of the plant with the required machinery from the nearest suppliers.<br>Raw materials required for the production of the products can be locally procured. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 15 -20 days |
| 17. | How to be implemented form the root to tip | Interested member of the family can get trained and involve other family members for different aspects involved in processing and marketing of the product. |
| 18. | If it can be implemented at Family level or external manpower is required? | Can be managed with the family members (4) without the external manpower. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 3-4 persons |
| 20. | What is the Status of Commercialization | The technology is ready for commercialization and has been already given to the entrepreneurs. |
| 21. | Scale of Funding required all total? | The process has been claimed and certified by CFTRI, hence the source of funding can be easily available. |

| | | |
|---|---|---|
| 22. | Budget with breakage? | Breakeven point (percent capacity utilization) around 70%; simple return on investment @ 21%; payback period – 2 to 3 years. |
| 23. | What type of Certification Required for the product? (If required) | Not required if marketed in a small scale on daily basis, but FSSAI certification is required if commercialized and transported to distant places with brand name. |
| 24. | Risk involved? | The product shelf life is poor with high water activity, hygiene and sanitation aspects have to be taken care during the production. Raw material quality need to be checked for best quality product. |

# A process for Gluten Free Baked Products

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | A process for Gluten Free Baked Products |
| 2. | About technology (in short) | The gluten free cookies have bright crust colour, creamish white crumb colour, crispy texture and typical taste of cookies. The shelf life of the product (cookies) is about three months.<br>The Gluten Free muffin has good volume, medium fine crumb grain and soft texture. The shelf life of the product(muffins) is about 5 days. |
| 3. | What is the scientific approach to choose the particular technology? | The technology has been developed Scientifically so as to produce a safe and hygiene product. |
| 4. | After what duration the first output can be seen? | Immediately after the manufacturing plant has been established , the products can be seen on a day to day basis |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | For cookies: Rice Flour, sugar powder, fat, salt, soya protein isolate, glycerol monostearate, sodium bicarbonate, ammonium bicarbonate, skimmed milk powder.<br>For muffins: Millet flour, Sugar, salt, margarine, soya protein isolate, water, sodium stearoyl -2- lactylate (SSL), calcium propionate and glacial acetic acid.<br>All raw materials are easily available and can be procured locally. |
| 6. | What is the area foot print of the Process? | Approximately 500 sq. feet (min) |
| 7. | What kind of Climatic and Geographical location is required? | Suitable for all the Climatic and Geographical locations in our country. |
| 8. | Gestation period of the project? | 2 months |
| 9. | Minimum Economic Unit Size? | 20 kg cookie/day; 500 /day |
| 10. | Indicative Investment | 2-4 Lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw material and machinery are easily procurable. |
| 12. | Can it be part of Circular economy? | It can be a part of circular economy to some extent. |

| | | |
|---|---|---|
| 13. | What will be the Chain of Value addition? | Variety products and value added products can be produced utilizing the locally grown agricultural produce with the existing manufacturing unit for further diversification. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes the complete value chain can be made locally irrespective of the location. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Initial setting up of the plant with machinery from the nearest suppliers.<br>Raw materials required for the production of the products can be locally procured. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 15 days |
| 17. | How to be implemented form the root to tip | Interested member of the family can get trained and involve other family members for different aspects of the production and marketing of the product. |
| 18. | If it can be implemented at Family level or external manpower is required? | Can be managed with the family members without the external manpower. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 3-4 persons |
| 20. | What is the Status of Commercialization | The technology is ready for commercialization. |
| 21. | Scale of Funding required all total? | The process has been claimed and certified by CFTRI, the source of funding can be easily available. |
| 22. | Budget with breakage? | Breakeven point (percent capacity utilization) around 70%; simple return on investment @ 21% and payback period is 2-3 years. |
| 23. | What type of Certification Required for the product? (If required) | Certification not required if locally marketed on day to day basis but FSSAI certification is required if commercialized with brand name. |
| 24. | Risk involved? | The product shelf life is poor with high water activity for gluten free muffins, hygiene and sanitation aspects have to be taken care during the production. Raw material quality to be assessed before the production. |

# NUTRITIOUS RUSK: Process for making composite ragi rusk and high protein rusk

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | NUTRITIOUS RUSK<br>Process for Making Composite Ragi Rusk and High Protein Rusk. |
| 2. | About technology (in short)<br><br>Ragi rusk and High protein rusk<br><br>  <br>  | Rusk in general is a ready-to-eat snack with a long shelf life is liked by children and all others. Ragi is a rich source of calcium and hence it is good for growing children, pregnant women and lactating mothers. Ragi is also rich in dietary fibre and it is specially advised for patients suffering from diabetes. Rusk prepared from suitably processed ragi flour incorporated in wheat flour gives touch of the local taste, contributes to the variety and adds to nutrition.<br><br>High protein rusks has improved taste, texture and nutritional quality.<br><br>High protein rusks have great potential in rural areas in view of the increased protein content of about 6 % than ordinary rusks and long shelf life. |
| 3. | What is the scientific approach to choose the particular technology? | The technology has been developed scientifically so as to produce a safe and hygiene product. |
| 4. | After what duration the first output can be seen? | Immediately after the manufacturing plant has been established , the product can be seen on a day to day basis. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw materials required for the production of nutritious rusk are wheat flour/maida, ragi flour, defatted soya flour sugar, vegetable fat, skimmed milk powder, yeast, salt, improvers and preservatives. The packaging material is usually poly propylene. All the raw materials used for the processing can be procurred locally. |
| 6. | What is the area foot print of the Process? | Approximately 500 sq. feet (min) |
| 7. | What kind of Climatic and Geographical location is required? | Suitable for all Climatic and Geographical locations in our country. |

| | | |
|---|---|---|
| 8. | Gestation period of the project? | 2 months |
| 9. | Minimum Economic Unit Size? | 50 units (kg) /day |
| 10. | Indicative Investment | ₹ 4 Lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Raw material and machinery are easily procurable and are available in all parts of the country. |
| 12. | Can it be part of Circular economy? | It can be a part of circular economy to some extent. |
| 13. | What will be the Chain of Value addition? | Variety products and value added products can be produced by utilizing the locally grown agricultural produce with the existing manufacturing set up. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes the complete value chain can be made locally irrespective of the location. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Initial setting up of the plant with the required machinery from the nearest suppliers.<br>Raw materials required for the production of the products can be locally procured. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 15 -20 days |
| 17. | How to be implemented form the root to tip | Interested member of the family can get trained and involve other family members for different aspects involved in processing and marketing of the product. |
| 18. | If it can be implemented at Family level or external manpower is required? | Can be managed with the family members (4) without the external manpower. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 3-4 persons |
| 20. | What is the Status of Commercialization | The technology is ready for commercialization and has been already given to the entrepreneurs. |
| 21. | Scale of Funding required all total? | The process has been claimed and certified by CFTRI, hence the source of funding can be easily available. |
| 22. | Budget with breakage? | Breakeven point (percent capacity utilization) around 71%; simple return on investment @ 23%; payback period – 2 to 3 years. |
| 23. | What type of Certification Required for the product? (If required) | Not required if marketed in a small scale on daily basis, but FSSAI certification is required if commercialized and transported to distant places with brand name. |
| 24. | Risk involved? | Raw material quality need to be checked for best quality product. |

# Eggless Cake Premix

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Eggless Cake Premix |
| 2. | About technology (in short) | Eggless cake premix is the technology to develop a cake without egg. Egg being one of the main ingredient in cake production, removing the egg from the formulation ends in poor quality cake. Therefore, this technology is developed to prepare an eggless cake premix containing all the ingredients for cake development and egg replacers along with food additives to mimic the role of egg. |
| 3. | What is the scientific approach to choose the particular technology)? | The egg protein plays an important role in cake as a foaming and structure building agent. Replacing the egg protein in the cake development involves scientific approach to replace the egg protein. |
| 4. | After what duration the first output can be seen? | 2 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | General raw materials, Power connection of 3 phase for blender, water for regular cleaning of the area. |
| 6. | What is the area foot print of the Process? | May be started in a 10x10 ft area |
| 7. | What kind of Climatic and Geographical location is required? | Applicable through wide climatic conditions. |
| 8. | Gestation period of the project? | 6-12 months |
| 9. | Minimum Economic Unit Size? | 300-500 kg per day |
| 10. | Indicative Investment | ₹ 10-12 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Easily available in local market |
| 12. | Can it be part of Circular economy? | Yes |

| | | |
|---|---|---|
| 13. | What will be the Chain of Value addition? | The technology helps to fulfil the increasing market demand for eggless products especially cake. The advantage of this technology is it just requires adding a required quantity of water, mixing and baking in oven. The cake can be prepared by layman without any baking knowledge at household level. Apart from household level preparation, it can find extensive use in restaurants, bakeries, industrial canteens due to its easy processing methods. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Locally available raw materials, and food additives. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1 day |
| 17. | How to be implemented form the root to tip | Easy for implementation with 1-2 manpower |
| 18. | If it can be implemented at Family level or external manpower is required? | Family level as a home scale business, even at small scale industry level. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 2 |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 10-12 lakhs |
| 22. | Budget with breakage? | Fixed Capital – 10 lalkhs<br>Working Capital- 2 lakhs |
| 23. | What type of Certification Required for the product? (If required) | FSSAI certification |
| 24. | Risk involved? | Very low |

# INSTANT Cake Premix

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | INSTANT CAKE MIX |
| 2. | About technology (in short) | Instant cake mix is a premix containing all the ingredients normally used for the preparation of cake. Cake could be easily prepared by just adding required quantity of water to the premix and mixing for a specific period of time and baking the batter in an oven. |
| 3. | What is the scientific approach to choose the particular technology)? | Developing a good quality cake is cumbersome procedures and it requires expertise. The knowledge of ingredients and the quantity place a very key role in the formulation. Apart from that, processing methods such as weighing of individual ingredients, creaming, mixing requires subject knowledge. In this technology, a formulation was prepared to develop a cake by just adding water to the premix and mixing followed by baking. |
| 4. | After what duration the first output can be seen? | 2-3 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | General raw materials, Power connection of 3 phase for blender, water for regular cleaning of the area |
| 6. | What is the area foot print of the Process? | May be started in a 10x10 ft area |
| 7. | What kind of Climatic and Geographical location is required? | Applicable through wide climatic conditions. |
| 8. | Gestation period of the project? | 6-12 months |
| 9. | Minimum Economic Unit Size? | 300-500 kg per day |
| 10. | Indicative Investment | ₹ 10-12 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Easily available in local market |
| 12. | Can it be part of Circular economy? | Yes |

| | | |
|---|---|---|
| 13. | What will be the Chain of Value addition? | The technology adds variety snack foods in the household. The advantage of use of such mix is convenience as it eliminates the drudgery of purchasing ingredients in small quantities, weighing them, creaming them separately for a longer duration during the preparation of batter which is a very cumbersome procedure. This will find extensive use in household level, restaurants, bakeries, industrial canteens etc. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Locally available raw materials, and food additives. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 1 day |
| 17. | How to be implemented form the root to tip | Easy for implementation with 1-2 manpower |
| 18. | If it can be implemented at Family level or external manpower is required? | Family level as a home scale business, even at small scale industry level. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 2 |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | ₹ 10-12 lakhs |
| 22. | Budget with breakage? | Fixed Capital – 10 lalkhs<br>Working Capital- 2 lakhs |
| 23. | What type of Certification Required for the product? (If required) | FSSAI certification |
| 24. | Risk involved? | Very low |

# POTATO PRODUCTS (POTATO FLOUR, DRIED SLICES/ DICED AND CHIPS)

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | POTATO PRODUCTS (POTATO FLOUR, DRIED SLICES/ DICED AND CHIPS) |
| 2. | About technology (in short) | The potatoes are washed peeled, sliced/diced and soaked overnight in a solution of salt and KMS. Sliced/ Diced potatoes are granulated, pressed and dried. The dry granules are ground to get the flour. Even Sliced/Diced potatoes after blanching can be dried as such and then pulverized to get flour of desired particle size or dried slices can be fried to get ready to eat potato chips. It has good color and nutrients so it can provide good calorific values to human diet. The end product has minimum of 10 months shelf life, if packed in an appropriate packaging material and storage at ambient temperature. |
| 3. | What is the scientific approach to choose the particular technology)? | Blanching of sliced/diced potatoes are utmost important to inactivate enzymes and get end product free from browning and good color retention (creamy white depending on the variety). The blanched sliced/diced potatoes are dried either by adopting solar drier or by electric mechanical drier using appropriate thickness and per tray loading capacity. The dried sliced/diced potatoes becomes easy to pulverized and get potato flour of desired particle size. The drying reduces the moisture (within 7%) and water activity (0.4) in the dried sliced/ diced potatoes so end products will be microbiological safe for consumption and product will have more shelf life at ambient temperature. The dried sliced/diced potatoes can be fried to get chips of less oil uptake. The potato flour has wide applications like it can be utilized for making alootikki, chops, pakora, stuffed parantha, sewain, kofta etc. |
| 4. | After what duration the first output can be seen? | After installation of machineries within a year. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw materials like potatoes, salt, water, firmness regulator, acidity regulator, preservative, packaging material including hybrid energy resources like solar, steam and electricity. |
| 6. | What is the area foot print of the Process? | Pretreatment, blanching and drying |

| | | |
|---|---|---|
| 7. | What kind of Climatic and Geographical location is required? | Diverse agro climatic conditions more preferably subtropical climate is required for potatoes with full sunlight to thrive better. |
| 8. | Gestation period of the project? | 1 Year |
| 9. | Minimum Economic Unit Size? | 50 Kg/day |
| 10. | Indicative Investment | ₹ 6 Lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | First, licensee need to identify the orchard (nearby processing unit) for the purchase of good quality raw materials for processing.<br><br>Second, licensee need to obtain suitable quotation for machinery purchase from the list of suitable machinery suppliers provided to them through online. Even it is possible to obtain subsidy on machinery purchase through government agencies. The machinery required for aforementioned technology are abrasion peeler, mechanical cabinet dryer or solar drier, slicer, mincer or grater, hydraulic press, blanching tank, frying unit and paddle operated heat sealing unit for packaging etc. |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | The farmers provides input for agriculture production so it becomes easy to go for processing like fresh food processing and manufacturing to look for internal market (wholesale, retail and catering). Thereafter, it is possible to go for export demand to outreach product to the consumers. The innovative product can make more money in comparison to fresh commodity because an added value agricultural product has more market value than a commodity. It can meet changing tastes and preferences of consumers such as convenience, quality, safety, health, variety, price, and social and environmental consciousness. The aforementioned innovative technology can compete by differentiating a product in a highly competitive market. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | It is possible to make complete value chain locally through shelf-help groups actively working in and around the vicinity of that particular village. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | It is possible to make complete value chain locally through shelf-help groups actively working in and around the vicinity of that particular village. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 3 days |

| | | |
|---|---|---|
| 17. | How to be implemented form the root to tip | First choose technology, Make payment towards technology purchase along with MOU with the CSIR-CFTRI, Licensee can undergo for training at CSIR-CFTRI (FVT Pilot plant) for 3 days, Select appropriate land size depending on the per day production, Apply for bank loan to meet your expenditure, Do construction of unit through external agency, Procurement of machinery and installation of machineries at appropriate places within the unit and check functioning of unit, hire manpower with proper training to them, Apply FSSAI license for product marketing, Select marketing channels and start manufacturing products within the unit and store in warehouses till marketing of end product. |
| 18. | If it can be implemented at Family level or external manpower is required? | Yes, it can be implemented at family level, if per day production is within 50Kg but if per day production is more than 50Kg external manpower is very much required to run the unit in a proper way. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 7 members are required |
| 20. | What is the Status of Commercialization | It has already been commercialized. |
| 21. | Scale of Funding required all total? | ₹ 6 Lakhs |
| 22. | Budget with breakage? | ₹ 10 Lakhs |
| 23. | What type of Certification Required for the product? (If required) | The certificates like training certificate for product development and nutritional profile of the product are required and can be obtained from CSIR-CFTRI, Mysore. The license for commercial marketing of the end product in packed form can be obtained from FSSAI. |
| 24. | Risk involved? | As such there is no risk involvement with the aforementioned technology but few points to be looked into in a fruitful manner.<br><br>Is there a technological improvement that is needed for the Agro-product?<br><br>i) Does the product need a specific packaging that will appeal the consumer?<br>ii) Does the product have a particular quality due to its geographical origin? A particular ingredient?<br>iii) Is there a special plant variety that will improve the product?<br>iv) Does the product have specific competitive advantages? |

# READY TO EAT (RTE) OSMO-DRIED FRUITS

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | READY TO EAT (RTE) OSMO-DRIED FRUITS |
| 2. | About technology (in short) | It is a ready to eat (RTE) kind of product and retains good characteristics color and flavor in the end product. It has nutrients in concentrated form so it can provide good calorific values to human diet. The end product has minimum of 6 months shelf life, if packed in an appropriate packaging material and storage at ambient temperature. |
| 3. | What is the scientific approach to choose the particular technology)? | It is a combination of two different technologies: i) osmosis of fruit slices in hypertonic sugar syrup to remove moisture partially and ii) drying of osmosed slices at optimum temperature to bring down further moisture within 15 % and vis-à-vis reduction in drying time due osmosis process to save energy and make end product microbiological safe for consumption and better storage stability in packed form. |
| 4. | After what duration the first output can be seen? | After installation of machineries within a year. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw materials like fruits (mango, pineapple, amla and jackfruit), sugar, water, firmness regulator, acidity regulator, preservative, packaging material including hybrid energy resources like solar, steam and electricity. |
| 6. | What is the area foot print of the Process? | Osmosis and drying |
| 7. | What kind of Climatic and Geographical location is required? | Diverse agro climatic conditions more preferably tropical climate and subtropical climate are required for fruits with full sunlight to thrive better. |
| 8. | Gestation period of the project? | 1 Year |
| 9. | Minimum Economic Unit Size? | 50 Kg/day |
| 10. | Indicative Investment | ₹ 6 Lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | First, licensee need to identify the orchard (nearby processing unit) for the purchase of good quality raw materials for processing. |

| | | |
|---|---|---|
| | | Second, licensee need to obtain suitable quotation for machinery purchase from the list of suitable machinery suppliers provided to them through online. Even it is possible to obtain subsidy on machinery purchase through government agencies. The machinery required for aforementioned technology are peeler, mechanical cabinet dryer or solar drier, slicer, blanching tank and syruping tank and paddle operated heat sealing unit for packaging etc. |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | The farmers provides input for agriculture production so it becomes easy to go for processing like fresh food processing and manufacturing to look for internal market (wholesale, retail and catering). Thereafter, it is possible to go for export demand to outreach end product to the consumers. The innovative product can make more money in comparison to fresh commodity because an added value agricultural product has more market value than a commodity. It can meet changing tastes and preferences of consumers such as convenience, quality, safety, health, variety, price, and social and environmental consciousness. The aforementioned innovative technology can compete by differentiating a product in a highly competitive market. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | It is possible to make complete value chain locally through shelf-help groups actively working in and around the vicinity of that particular village. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | The shelf-help groups actively working in and around the vicinity of any particular village may be useful to establish processing unit in the village itself through CSIR-CFTRI involvement. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 3 days |
| 17. | How to be implemented form the root to tip | First choose technology, Make payment towards technology purchase along with MOU with the CSIR-CFTRI, Licensee can undergo for training at CSIR-CFTRI (FVT Pilot plant) for 3 days, Select appropriate land size depending on the per day production, Apply for bank loan to meet your expenditure, Do construction of unit through external agency, Procurement of machinery and installation of machineries at appropriate places within the unit and check functioning of unit, hire manpower with proper training to them, Apply FSSAI license for product marketing, Select marketing channels and start manufacturing products within the unit and store in warehouses till marketing of end product. |

| | | |
|---|---|---|
| 18. | If it can be implemented at Family level or external manpower is required? | Yes, it can be implemented at family level, if per day production is within 50Kg but if per day production is more than 50Kg external manpower is very much required to run the unit a proper way. |
| **Additional Information** | | |
| 19. | How many Manpower required? | 7 members are required |
| 20. | What is the Status of Commercialization | It has already been commercialized. |
| 21. | Scale of Funding required all total? | ₹ 6 Lakhs |
| 22. | Budget with breakage? | ₹ 10 Lakhs |
| 23. | What type of Certification Required for the product? (If required) | The certificates like training certificate for product development and nutritional profile of the product are required and can be obtained from CSIR-CFTRI, Mysore. The license for commercial marketing of the end product in packed form can be obtained from FSSAI. |
| 24. | Risk involved? | As such there is no risk involvement with the aforementioned technology but few points to be looked into in a fruitful manner.<br><br>Is there a technological improvement that is needed for the Agro-product?<br><br>i) Does the product need a specific packaging that will appeal the consumer?<br>ii) Does the product have a particular quality due to its geographical origin? A particular ingredient?<br>iii) Is there a special plant variety that will improve the product?<br>iv) Does the product have specific competitive advantages? |

# PRODUCTION OF GREEN CHILLI SAUCE

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | PRODUCTION OF GREEN CHILLI SAUCE |
| 2. | About technology (in short) | With convenience being the buzz word in the fast changing scenario in food consumption pattern, sauce fall under this category. Sauces are not only important accompaniments but of late have been used for garnishing many dishes.<br>Chilli sauce can be used for many recipes due to its pungent, sweetish and sourish taste. Chilli sauce can be used in snack foods like *Gobi Manchurian*, noodles, fried rice, pasta and as an adjunct for *Samosa*, Cutlet, Bread etc. |
| 3. | What is the scientific approach to choose the particular technology)? | Convenience food product which has varied uses. |
| 4. | After what duration the first output can be seen? | 3 months |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Fresh green chillies potato, onion, garlic, Ginger, Sugar, Pectin, Spice mix, Salt, Acetic acid, Sodium benzoate, Steam jacketed kettle, boiler, Bottling unit. |
| 6. | What is the area foot print of the Process? | |
| 7. | What kind of Climatic and Geographical location is required? | Tropical |
| 8. | Gestation period of the project? | |
| 9. | Minimum Economic Unit Size? | 50 kg /day OR 250 bottles |
| 10. | Indicative Investment | ₹ 2 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Locally available raw materials and packaging material to be sourced from outside. |
| 12. | Can it be part of Circular economy? | No |
| 13. | What will be the Chain of Value addition? | Farmers/ Processors<br>Rural processing industry<br>Rural marketing centre<br>Consumers |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | NA |
| 15. | How everything from top to bottom to be made in the village itself<br>(Circular and local)? | |
| 16. | How many Training Days or months required for the technology to be learned properly? | 7 days |
| 17. | How to be implemented form the root to tip | Explore the market for the requirement of product.<br>Initiation at a rural area were raw material for the technology are locally available.<br>Installation of required machinery.<br>Production and packaging<br>Marketing |
| 18. | If it can be implemented at Family level or external manpower is required? | Can be implemented at family level too. if comprising of at least 4 working members |
| **Additional Information** | | |
| 19. | How many Manpower required? | Six in number including an analyst/ chemist |
| 20. | What is the Status of Commercialization | Commercialised |
| 21. | Scale of Funding required all total? | ₹ 8 lakhs |
| 22 | Budget with breakage? | Plant and machinery – ₹ 5 lakhs<br>Auxiliary equipment ₹ 0.5 lakhs<br>Raw material Packaging material |
| 23 | What type of Certification Required for the product?<br>(If required) | FSSAI |
| 24 | Risk involved? | |

# FRUIT SYRUPS & SQUASHES

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | FRUIT SYRUPS & SQUASHES |
| 2. | About technology (in short) | Fruit Syrups and Squashes can be manufactured from different varieties of mature, ripe fruits.<br><br>In India, a variety of tropical, sub tropical and temperate fruits are grown. Fruit beverages are relished very much when served in chilled condition especially during summer, which are nutritious and healthy. Fruit squashes, crushes, cordials and syrups are popular class of fruit products, which are convenient to use. Squashes like orange squash, mango squash, lime squash, Pineapple squash, grape squash, etc., are very popular. Among syrups, sarasaparilla syrup, ginger-amla, roovaafsa" are well known. Lemon juice cordial is also popular. The demand for squashes and syrups goes up in summer and in winter it will be very less. Orange squash, mango squash, etc., will find a reasonably good market all-round the year for their nutritional quality. |
| 3. | What is the scientific approach to choose the particular technology? | |
| 4. | After what duration the first output can be seen? | |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Mature ripe fruits, electric power for operation of equipment, potable water, packaging materials |
| 6. | What is the area foot print of the Process? | Agri Horticulture |
| 7. | What kind of Climatic and Geographical location is required? | The unit can be located at place where the above mentioned resources are available with road and rail transportation |
| 8. | Gestation period of the project? | Can be set up immediately |
| 9. | Minimum Economic Unit Size? | 200 kg per day |
| 10. | Indicative Investment | Minimum ₹ 25 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Indigenous |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | |
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | both |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends up on the production quantity. 2-6 persons |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | Minimum 25 lakhs for equipment and 2000 square feet shed |
| 22. | Budget with breakage? | 25 lakhs<br>5 lakhs working capital |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Marketing |
| | | Answers |

# RTS FRUIT JUICE AND BEVERAGES

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | RTS FRUIT JUICE AND BEVERAGES |
| 2. | About technology (in short) | RTS fruit juice and beverages can be manufactured from different varieties of mature, ripe fruits.<br><br>A variety off soft drinks are being presently produced in the country such as sweetened carbonated (aerated) soft drinks, still beveragescontaining fruit juice/pulp and soda water falling under the category of RTS (ready-to-serve) beverages. Among these the share of fruit juice based beverages are very small compared to synthetic carbonated drinks/soda waters. However, the trend is slowly changing for the obvious advantages of nutritious beverages over the synthetic aerated waters. The present volume of the soft drinks business is of the order of Rs. 800 crores per annum.Manufacture of RTS fruit beverages based on fruit juices/pulps are only considered here, as they are nutritious. |
| 3. | What is the scientific approach to choose the particular technology? | . |
| 4. | After what duration the first output can be seen? | |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Mature ripe fruits, electric power for operation of equipment, potable water, packaging materials. |
| 6. | What is the area foot print of the Process? | Agri Horticulture |
| 7. | What kind of Climatic and Geographical location is required? | The unit can be located at place where the above mentioned resources are available with road and rail transportation. |
| 8. | Gestation period of the project? | Can be set up immediately |
| 9. | Minimum Economic Unit Size? | 5000 bottles per day |
| 10. | Indicative Investment | Minimum ₹ 25 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Indigenous |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | |
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | both |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends up on the production quantity. 2-6 persons |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | Minimum ₹ 25 lakhs for equipment and 2000 square feet shed |
| 22. | Budget with breakage? | ₹ 25 lakhs<br>₹ 5 lakhs working capital |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Marketing |

# FRUIT JAMS AND JELLIES

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | FRUIT JAMS AND JELLIES |
| 2. | About technology (in short) | Fruit jams and jellies can be manufactured from different varieties of mature, ripe fruits.<br><br>Among preserved fruits, jams, jellies, and marmalades form an important class of products. The popular varieties of jams are pineapple, Mango, Mixed fruit, Strawberry, Grape, Apricot and among jellies guava and papaya, and orange marmalades. The product is used as a spread on bread for sandwiching. It is very popular now-a-days to eat bread with jams/jellies or marmalades. Can also consumed along with chapathi, dosa or similar breakfast foods to make them more palatable. The packing ranges from 25g (single serve) to 4 Kg or even 7 Kg. |
| 3. | What is the scientific approach to choose the particular technology? | |
| 4. | After what duration the first output can be seen? | |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Mature ripe fruits, electric power for operation of equipment, potable water, packaging materials. |
| 6. | What is the area foot print of the Process? | Agri Horticulture |
| 7. | What kind of Climatic and Geographical location is required? | The unit can be located at place where the above mentioned resources are available with road and rail transportation. |
| 8. | Gestation period of the project? | Can be set up immediately |
| 9. | Minimum Economic Unit Size? | 200 kg per day |
| 10. | Indicative Investment | Minimum ₹ 25 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Indigenous |
| 12. | Can it be part of Circular economy? | |

| | | |
|---|---|---|
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | both |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends up on the production quantity. 2-6 persons |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | Minimum ₹ 25 lakhs for equipment and 2000 square feet shed |
| 22. | Budget with breakage? | ₹ 20 lakhs<br>₹ 5 lakhs working capital |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Marketing |

# TOMATO PRODUCTS KETCHUP, SAUCE

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | TOMATO PRODUCTS KETCHUP, SAUCE |
| 2. | About technology (in short) | Tomato ketchup, sauce and chutney can be manufactured from mature, ripe tomatoes with deep red color.<br>Tomato is produced in large quantities throughout the year in different parts of the country. Tomato with its unique flavor and red color imparts characteristic flavor to the different food preparations. Tomato production increases during the months of winter and early summer seasons. The excess production results in glut there by resulting in price drop and less returns to the farmers. Fresh tomatoes are perishable with a short shelf life at ambient temperature and need to be transported from fields to marketing yards immediately after the harvest. Tomatoes are used in various traditional food preparations. |
| 3. | What is the scientific approach to choose the particular technology)? | The technology for the tomato instant products facilitates the production of tomato crush, tomato rasam mix and tomato rice bath mix. These products are ready to use mixes for the preparation of different culinary products. |
| 4. | After what duration the first output can be seen? | |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Mature ripe tomatoes, electric power for equipment, potable water, packaging materials. |
| 6. | What is the area foot print of the Process? | Agri Horticulture |
| 7. | What kind of Climatic and Geographical location is required? | The unit can be located at place where the above mentioned resources are available with road and rail transportation. |
| 8. | Gestation period of the project? | Can be set up immediately |
| 9. | Minimum Economic Unit Size? | 200 kg per day |
| 10. | Indicative Investment | Minimum ₹ 25 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Indigenous |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | |
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | both |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends up on the production quantity. 2-6 persons |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | Minimum ₹ 25 lakhs for equipment and 2000 square feet shed |
| 22. | Budget with breakage? | ₹ 25 lakhs<br>₹ 5 lakhs working capital |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Marketing |

# JAMUN FRUIT PRODUCTS

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | JAMUN FRUIT PRODUCTS |
| 2. | About technology (in short) | Jamun juice, syrup, jelly can be manufactured from mature, ripe jamun fruits<br>Jamun(*SyzygiumCuminii. L),* a fruit of great antiquity is highly liked for its pleasing flavour. The juicy fruit pulp contains resin, gallic acid and tannin; it tastes usually from acid to fairly sweet. It is also valued for its several medicinal properties. The sweetened Jamun juice is a delicious fruit beverage. Jamun RTS beverage alone or as blended beverage with other fruit juices can also find good acceptability. Jamun squash/syrup are the other products that can be made commercially. |
| 3. | What is the scientific approach to choose the particular technology? | The product has excellent market potential considering the increase in its production, availability and growing popularity; there is considerable interest in processing the fruit into value added products. |
| 4. | After what duration the first output can be seen? | |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Mature ripe jamun fruits, electric power for operation of equipment, potable water, packaging materials |
| 6. | What is the area foot print of the Process? | Agri Horticulture |
| 7. | What kind of Climatic and Geographical location is required? | The unit can be located at place where the above mentioned resources are available with road and rail transportation |
| 8. | Gestation period of the project? | Can be set up immediately |
| 9. | Minimum Economic Unit Size? | 200 kg per day |
| 10. | Indicative Investment | Minimum ₹ 25 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Indigenous |
| 12. | Can it be part of Circular economy? | |

| | | |
|---|---|---|
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | both |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends up on the production quantity.<br>2-6 persons |
| 20. | What is the Status of Commercialization | Commerciallized |
| 21. | Scale of Funding required all total? | Minimum ₹ 25 lakhs for equipment and 2000 square feet shed |
| 22. | Budget with breakage? | ₹ 25 lakhs<br>₹ 5 lakhs working capital |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Marketing |

# AMLA SPREAD

# [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | AMLA SPREAD |
| 2. | About technology (in short) | Amla spread is a jam type of product, can be manufactured from mature amla fruits. The product can be consumed with chapathy, bread etc.,<br><br>The important varieties of Amla are: Banarsi, Bansi red, Chkiya, Desi, Hathi fool and Pink-tinged. The variety chakiya is noted for its heavy and regular bearing habits while banarsi is reported for its fairly large sized fruits, though it is slightly shy. Amla gets ready for harvesting by November. In the Northern plains, the peak harvesting period is from mid December to January end. Bacterial or fungal spoilage may occur during post harvest handling of Amla fruits. Processing of Amla not only results in curtailing the spoilage of fresh fruits but also results in value addition through new products with better nutritional properties. Product characteristics are,<br><br>ι) Product packed in glass jar.<br>ιι) Product can be stored under ambient temperature.<br>ιιι) The product is microbiologically stable.<br>ιϖ) Product can be consumed as jam for bread spread. |
| 3. | What is the scientific approach to choose the particular technology? | |
| 4. | After what duration the first output can be seen? | |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Mature ripe fruits, electric power for operation of equipment, potable water, packaging materials. |
| 6. | What is the area foot print of the Process? | Agri Horticulture |
| 7. | What kind of Climatic and Geographical location is required? | The unit can be located at place where the above mentioned resources are available with road and rail transportation. |
| 8. | Gestation period of the project? | Can be set up immediately |
| 9. | Minimum Economic Unit Size? | 200 kg per day |
| 10. | Indicative Investment | Minimum ₹ 25 lakhs |

| Salient Feature of Process/Technology Information | | |
|---|---|---|
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Indigenous |
| 12. | Can it be part of Circular economy? | |
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17 | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | both |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends up on the production quantity. 2-6 persons |
| 20. | What is the Status of Commercialization | Commerciallized |
| 21. | Scale of Funding required all total? | Minimum ₹ 25 lakhs for equipment and 2000 square feet shed |
| 22. | Budget with breakage? | ₹ 25 lakhs<br>₹ 5 lakhs working capital |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Marketing |

# AMLA PASTE

# [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | AMLA PASTE |
| 2. | About technology (in short) | *Emblicaofficinalis* or Indian Goose-berry is highly valued for its medicinal properties. Amla paste is a rich source of vitamin including ascorbic acid, minerals, organic acids, polyphenols, crude fibre etc.<br>Amla paste is the pulp extracted from mature amla fruits, the pulp can be used for the preparation of Chavyanpras and jam. |
| 3. | What is the scientific approach to choose the particular technology? | |
| 4. | After what duration the first output can be seen? | |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Mature ripe amla fruits, electric power for operation of equipment, potable water, packaging materials. |
| 6. | What is the area foot print of the Process? | Agri Horticulture |
| 7. | What kind of Climatic and Geographical location is required? | The unit can be located at place where the above mentioned resources are available with road and rail transportation. |
| 8. | Gestation period of the project? | Can be set up immediately |
| 9. | Minimum Economic Unit Size? | 200 kg per day |
| 10. | Indicative Investment | Minimum ₹ 25 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Indigenous |
| 12. | Can it be part of Circular economy? | |
| 13. | What will be the Chain of Value addition? | |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | both |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends up on the production quantity. 2-6 persons |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | Minimum ₹ 25 lakhs for equipment and 2000 square feet shed |
| 22. | Budget with breakage? | ₹ 25 lakhs<br>₹ 5 lakhs working capital |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Marketing |

# VALUE ADDED PRODUCTS FROM FIGS
# (*FICUS CARICA L*)

## [CSIR-CFTRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | VALUE ADDED PRODUCTS FROM FIGS (*FICUS CARICA L*) |
| 2. | About technology (in short) | Fig jam, beverages are prepared from mature fig fruits. Mature fig fruits with bright colour and characteristic flavour will be used for the preparation of different processed products. |
| 3. | What is the scientific approach to choose the particular technology? | |
| 4. | After what duration the first output can be seen? | |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Mature ripe fig fruits, electric power for operation of equipment, potable water, packaging materials. |
| 6. | What is the area foot print of the Process? | Agri Horticulture |
| 7. | What kind of Climatic and Geographical location is required? | The unit can be located at place where the above mentioned resources are available with road and rail transportation. |
| 8. | Gestation period of the project? | Can be set up immediately |
| 9. | Minimum Economic Unit Size? | 200 kg per day |
| 10. | Indicative Investment | Minimum ₹ 25 lakhs |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Indigenous |
| 12. | Can it be part of Circular economy? | |
| 13. | What will be the Chain of Value addition? | |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | yes |

| | | |
|---|---|---|
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | |
| 18. | If it can be implemented at Family level or external manpower is required? | both |
| **Additional Information** | | |
| 19. | How many Manpower required? | Depends up on the production quantity. 2-6 persons |
| 20. | What is the Status of Commercialization | Commercialized |
| 21. | Scale of Funding required all total? | Minimum ₹ 25 lakhs for equipment and 2000 square feet shed |
| 22. | Budget with breakage? | ₹ 25 lakhs<br>₹ 5 lakhs working capital |
| 23. | What type of Certification Required for the product? (If required) | FSSAI |
| 24. | Risk involved? | Marketing |

# Demonstration of decentralized solar thermal energy applications for sustainability and livelihood expansion

## [CSIR-CSMCRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Demonstration of decentralized solar thermal energy applications for sustainability and livelihood expansion |
| 2. | About technology (in short) | Solar energy can be converted to thermal energy with the help of solar collectors. With the increasing demand of thermal energy in different sectors, the solar thermal energy can be utilized in applications like water desalination, drying of food materials and crops, cooking, water heating, process heat generation, etc. The broad objective aims at harnessing solar thermal energy in an efficient manner utilizing research elements and is targeted at the indigenous development of solar thermal units to meet some of the requirements of remote and rural sector in a decentralized manner. The focussed objective include, development and implementation of integrated solar heating device, which can meet different food preparation and processing needs of a rural household like cooking, heating, baking, dehydration in a cost effective manner, instead of having to go for different single-purpose solar thermal devices for different applications.<br>In addition to domestic usage, the entity can also serve as a foundation for setting up of small enterprise for income generation of rural womenfolk and hence help in livelihood expansion. |
| 3. | What is the scientific approach to choose the particular technology? | The conventional solar devices such as solar dryer, solar cooker, solar oven and solar water heater are mostly single purpose devices, even if they have some common features such as mirrors for reflecting and re-directing additional solar radiation into a heating chamber through glass window and thermally insulated bottom and sides of the heating chamber. Individually they cannot meet different needs for different heating temperatures or different heating chamber sizes appropriate for different heating applications. The proposed design will be of two parts: a preheater and main heating chamber in which foodstuffs to be cooked/baked/dried are spread on trays in a multi-deck pattern. The preheater will be tilted and oriented in such a way that it receives maximum |

| | | |
|---|---|---|
| | | solar radiation during the desired season of use. Due to absorption of solar radiation, the inside temperature will be enhanced and long wave radiation emitted will not be allowed to escape the atmosphere due to the presence of double float glass cover. The float glass cover will also reduce direct convective losses to the ambient. Heated air would be able to circulate between the horizontal and slant heating chamber freely through a slit cut at the place where both the sections are joined. The scientific principle involved will be that the solar radiation incident on an aperture can be intensified by reflecting and redirecting additional solar radiation using appropriately inclined mirrors and this model will make use of mirrors on two sides of both preheater and heating chamber to augment the direct solar radiation entering the system. The geometric concentration ratio (A/B) for the V-trough alignment for the preheater will be kept at 2, the acceptance angle (α) being $0^o$ and trough angle (ψ) $30^o$. The preheater will be tilted at an optimum angle (β) of $18.9^o$ to the horizontal (0.9 of latitude). The continuous accumulation of heat will raise the temperature inside to a level where ultimately the rate of heating will be equal to the rate of heat loss through insulation and glass cover. The slanted pre-heating chamber similar in construction to the main horizontal heating chamber except for its slant orientation will deliver pre-heated air to the heating chamber during early forenoon or late afternoon when the sun is at a low altitude.During cooking and baking, the entire unit will be made fully air-sealed. In this case of application, temperature inside the unit can be made to rise above $150^o$C.During household dehydration operation, the moisture (vapour formed due to evaporation) from the foodstuff will be taken away by the air entering the preheater through a vent and going out of the unit through appropriate vents at the horizontal heater section by natural circulation. These vents will remain closed during cooking/baking operation. Temperature of drying can be varied from $50^o$C to $70^o$C depending on location and time of day.The solar food preparation unit will be mounted on a trolley and should be manually and periodically, oriented so as to make the slant preheating chamber to face the sun. Proper orientation can be checked visually by noticing the symmetry of the shadows of the booster mirrors which is cast on the ground due to sunlight. |
| 4. | After what duration the first output can be seen? | By the end of 3rd year, the first output produced using the technology will be demonstrated in an adopted village. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw material: raw unprocessed food items, fruits and vegetables , as required,<br>Energy : Solar Energy<br>Others : Low cost indigenous hardware<br>Food items etc. |
| 6. | What is the area foot print of the Process? | Solar thermal energy will be required for implementation of the mentioned technology. Unshaded area will be the requirement depending on the capacity of implementation. |

| | | |
|---|---|---|
| 7. | What kind of Climatic and Geographical location is required? | Preferably sunny parts of India (4.5-6.0 kWh/$m^2$/day DNI) |
| 8. | Gestation period of the project? | 3 years |
| 9. | Minimum Economic Unit Size? | |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Source of Raw material : Locally available materials<br>Machinery to Possible Market : Indigenously available machinery |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | The newly emerging solar food processing technology is an important socio-economic activity in the country especially in rural areas. The versatile solar thermal food preparation unit for households can not only serve as a green cooking mode and save conventional fuel, but also has wide application base like baking, dehydration of fruits, vegetables, forest produce, medicinal and herbal products etc. Since the unit operate at zero energy cost, the cost economics will also be very favourable for setting up of a small industry from home/select village. Likewise, since the unit is modular in nature, the capacity of system can be varied depending on the market demand and capacity of capital investment. Thus a large number of entrepreneurs from the villages, semi urban and urban areas can participate and involve in starting a small scale venture. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Locally available. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | 1. Creation of a small workshop in a hamlet of the adopted village or amending existing.<br>2. Training to the skilled workforce (fabricator/welder//carpenter) (6-10 in a batch) in the village regarding fabrication of the units.<br>3. Training to womenfolk (6-10 in a batch) regarding use and maintenance of the units for their daily food preparation needs as well as dehydration, drying/baking activities.<br>4. Creating women groups for enterprise venture generation.<br>5. Local market identification for sale of product, mostly the baked products or the dehydrated ones.<br>6. Thus serve as a foundation for income generation of rural womenfolk and hence help in livelihood expansion, through CSIR technology.<br>The circular and local aspect can be best brought forward if an NGO working in the village is taken in the loop during the project term and also afterwards. |

<table>
<tr><td>16.</td><td>How many Training Days or months required for the technology to be learned properly?</td><td>1 month of handholding</td></tr>
<tr><td>17.</td><td>How to be implemented form the root to tip</td><td>Demonstration of process and training to the end-users on field scale. Awareness creation for proliferation preferably through workshops and/or involvement of NGO.</td></tr>
<tr><td>18.</td><td>If it can be implemented at Family level or external manpower is required?</td><td>Mostly at family level however, skilled/ high skilled personnel will be required as external work force if sufficient cumber(s) of work force is not available.</td></tr>
<tr><td colspan="3">Additional Information</td></tr>
<tr><td>19.</td><td>How many Manpower required?</td><td>On an average 2 Highly skilled/ Skilled personnel, 2 Project Associate Level II Qualifications:<br>Un-skilled / Skilled personnel : Matric<br>High Skilled personnel: 12th Pass, ITI<br>Project Associate Level II : Bachelors in Engineering/ Masters</td></tr>
<tr><td>20.</td><td>What is the Status of Commercialization</td><td></td></tr>
<tr><td>21.</td><td>Scale of Funding required all total?</td><td>₹ 100.74 lakhs</td></tr>
<tr><td>22.</td><td>Budget with breakage?</td><td>
<table>
<tr><td colspan="5">Estimated Project Cost Requirement for the Tenure Proposed</td></tr>
<tr><td></td><td>Year 1</td><td>Year 2</td><td>Year 3</td><td>Total</td></tr>
<tr><td>A. Recurring</td><td></td><td></td><td></td><td></td></tr>
<tr><td>a) T.A. (In India)</td><td>1.2</td><td>1.2</td><td>1.2</td><td>3.6</td></tr>
<tr><td>T.A. (Abroad)</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>b) Contingencies</td><td>1</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>c) Maintenance</td><td>0.5</td><td>1.5</td><td>1</td><td>3</td></tr>
<tr><td>d) Chemicals / Consumables</td><td>1.5</td><td>1.5</td><td>1.5</td><td>4.5</td></tr>
<tr><td>e) ORE</td><td>12</td><td>12</td><td>12</td><td>24</td></tr>
<tr><td>f) Tech HR</td><td>8.88</td><td>8.88</td><td>8.88</td><td>26.64</td></tr>
<tr><td>Total (A)</td><td>25.08</td><td>26.08</td><td>25.58</td><td>76.74</td></tr>
<tr><td>B. Capital</td><td></td><td></td><td></td><td></td></tr>
<tr><td>a) Works & Services</td><td>1</td><td>1.5</td><td>1.5</td><td>4</td></tr>
<tr><td>b) Apparatus & Equipments</td><td>10</td><td>5</td><td>5</td><td>15</td></tr>
<tr><td>Total (B)</td><td>11</td><td>6.5</td><td>6.5</td><td>24</td></tr>
<tr><td>Grand Total (A+B)</td><td>36.08</td><td>32.58</td><td>32.08</td><td>100.74</td></tr>
</table>
</td></tr>
<tr><td>23.</td><td>What type of Certification Required for the product? (If required)</td><td>None</td></tr>
<tr><td>24.</td><td>Risk involved?</td><td>Inclement weather</td></tr>
</table>

# Utilization of Salicornia for economic growth of coastal rural population

## [CSIR-CSMCRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Utilization of Salicornia for economic growth of coastal rural population |
| 2. | About technology (in short) | The halophytes have enormous potential for industrial applications in the form of herbal salt production, nutraceuticals, essential oils, biofuels, alcohol, latex, cosmetics, fibres, etc. The halophytes can become an important source of herbal salt and other high-value products and can be easily incorporated into saltwater-based agriculture. Cultivation of halophytes is both economically and ecologically beneficial: it encourages the extension of technologies to improve a country's economy by providing employment opportunities to rural population, and also helps to protect coastal wastelands and promotes ecosystem restoration. Edible salt is also picking up momentum and looking to this scenario there is every need for increasing good quality salt production in the country. The Herbal Salt has been appropriately named as Saloni K (Patent no. European Patent EP1487283 date 12/14/2005; US Patent no. 6,929,809 August 16, 2005; US Patent No: 7208 189 dated 24/4/07; Italian Patent No: 54973 dated 21/2/2006; Australian Patent No: 2002/2, 44,907 dated 6/10/2006.). The vegetable salt contains several important nutrients besides sodium chloride not normally found in sea salt hence promising as a health salt. Due to presence of low sodium, it is considered to be beneficial for heart patients. |
| 3. | What is the scientific approach to choose the particular technology? | In the absence of the usage of technical input, the herbal salt produced from Salicornia from wild collection is not meeting the required herbal salt production. Which in turn gives less economic return. They are also not able to adapt to the new technology in the absence of the knowhow of the technical input.<br><br>The herbal salt extraction from the halophytic plant species such as *Salicornia brachiata* has been carried out by our group at Laboratory scale. The herbal salt (Saloni-K) discovered earlier by CSIR-CSMCRI. |

| | | |
|---|---|---|
| | | Thus under this project, Large scale cultivation of the identified halophyte *Salicornia brachiata* for the production of herbal salt will be carriedout. Demonstration of cultivation practices and economic utility of *Salicornia brachiata* to rural coastal people of Gujarat.. |
| 4. | After what duration the first output can be seen? | 3 years |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw material / Water : saline water<br>Energy : Electricity<br>Others : Low cost indigenous equipment required for salt production |
| 6. | What is the area foot print of the Process? | Mainly saline water will be required for generating high biomass production and herbal salt production. |
| 7. | What kind of Climatic and Geographical location is required? | Coastal Belt of Gujarat. |
| 8. | Gestation period of the project? | 3 Years |
| 9. | Minimum Economic Unit Size? | |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Source of Raw material : Locally available saline water<br>Machinery to Possible Market : Indigenously available machinery |
| 12. | Can it be part of Circular economy? | Yes |
| 13 | What will be the Chain of Value addition? | Awareness among the coastal people about cultivation practices and value addition of non-traditional crops and enhancing incomes and improvement in quality of lives of coastal rural communities. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Locally available |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Under this project, a mechanism will be developed where available/developed technological options will be introduced to the coastal belt farmers by CSIR-CSMCRI, which has wide capabilities in the area of high biomass production and herbal salt production.<br>• Total input time will be reduced, thereby decreasing the input cost. Sale of herbal salt will yield more income from the same herbal salt unit<br>• Enhancement of livelihood options by ensuring better returns by increase in good quality herbal salt<br>• Through sale of the good quality of herbal salt, the marginal herbal salt producers will become self-reliant and competent enough to sale their herbal salt at a much higher price improving their livelihood |

| | | |
|---|---|---|
| | | • Increase in income will ensure that the producers will utilize the fund for their basic needs and will certainly reduce the drudgery in work<br>• Focused on enhancing incomes and improvement in quality of lives of rural communities thus catalyzing and bringing socio-economic development through CSIR offerings technologies. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 8 months each year. Total 3 years have been estimated for implementation of technology targeting 20-25 small-scale farmers nearby coastal belt. |
| 17. | How to be implemented form the root to tip | Demonstration of cultivation practices and economic utility of various halophytes to rural coastal people of Gujarat and awareness among the coastal people about value addition of non-traditional crops and enhancing incomes and improvement in quality of lives of coastal rural communities. |
| 18. | If it can be implemented at Family level or external manpower is required? | Mostly at family level however, skilled/ high skilled personnel will be required as external work for herbal salt production. |
| **Additional Information** | | |
| 19. | How many Manpower required? | On an average 2 Un-skilled / Skilled personnel, 1 Project Associate Level I and One technical advisor will be required for each activity mentioned in point no. 4 above.<br><br>Qualifications:<br><br>Un-skilled / Skilled personnel : Matric<br>Technical advisor : PhD in Agriculture (Agronomy)<br>Project Associate Level I : M.Sc. in Agriculture (Agronomy/ Agricultural Chemistry and Soil Science) |
| 20. | What is the Status of Commercialization | Technology has been transferred to one client in Bhavnagar. He is producing and selling herbal salt in the market. |
| 21. | Scale of Funding required all total? | ₹ 71.9848 lakhs |
| 22. | Budget with breakage? | |

| | Year 1 | Year 2 | Year 3 | Total |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| A. Recurring | | | | |
| a) T.A. (In India) | 2.50 | 2.50 | 2.50 | 7.50 |
| T.A. (Abroad) | 0.00 | 0.00 | 0.00 | 0.00 |
| b) Contingencies | 1.00 | 1.00 | 1.00 | 3.00 |
| c) Maintenance | 0.00 | 0.00 | 0.00 | 0.00 |
| d) Chemicals / Consumables | 5.00 | 3.00 | 3.00 | 11.00 |

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>e) ORE</td><td>6.00</td><td>6.00</td><td>6.00</td><td>18.00</td></tr>
<tr><td>f) Tech HR</td><td>10.16160</td><td>10.16160</td><td>10.16160</td><td>30.48480</td></tr>
<tr><td>Total (A)</td><td>24.6616</td><td>22.6616</td><td>22.6616</td><td>69.9848</td></tr>
<tr><td>B. Capital</td><td></td><td></td><td></td><td></td></tr>
<tr><td>a) Works & Services</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>b) Apparatus & Equipments</td><td>2.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Total (B)</td><td>2.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Grand Total (A+B)</td><td>26.6616</td><td>22.6616</td><td>22.6616</td><td>71.9848</td></tr>
</table>
</td></tr>
<tr><td>23.</td><td>What type of Certification Required for the product? (If required)</td><td>Not applicable</td></tr>
<tr><td>24.</td><td>Risk involved?</td><td>Climatic factors such as excessive rainfall</td></tr>
</table>

# Seaweed bio-fertiliser

## [CSIR-CSMCRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Seaweed bio-fertiliser |
| 2. | About technology (in short) | Although seaweeds are well known for phycocollid, since few decades seaweeds are being used as fertilizer for agricultural crops. The broad classifications of seaweeds are Chlorophyta, Rhodophyta and Phaeophyta. However, the seaweed fertilizers were processed only from brown algae such as *Ascophyllum nodosum, Fucus* spp and *Sargassum* species (Hong and others 2007). The researchers from CSIR-CSMCRI developed an innovative product from red seaweed *Kappaphycus alvarezii* due to its characteristics of having succulent thallus. The product is sap (liquid plant biostimulant) which is 65-70 percent of the total plant biomass besides the other co-products, viz., carrageenan. The benefits of seaweeds as sources of organic matter and fertilizer nutrients have led to their use as soil conditioners for centuries. Some 15 million metric tonnes of seaweed products are produced annually (FAO 2006), a considerable portion of which is used for nutrient supplements and as bio-stimulants or bio-fertilizers to increase plant growth and yield. A number of commercial seaweed extract products are available for use in agriculture and horticulture. Numerous studies have revealed a wide range of beneficial effects of seaweed extract applications on plants, such as early seed germination and establishment, improved crop performance and yield, elevated resistance to biotic and abiotic stress, and enhanced postharvest shelf-life of perishable products. The technology developed allows production of two products (biostimulant and carrageenan) from freshly harvested *Kappaphycus alvarezii* seaweed growing under Indian condition. Another technology pertains to development of biostimulant from naturally harvested Sargassum seaweed. |
| 3. | What is the scientific approach to choose the particular technology? | CSIR-CSMCRI invented a unique processing (US Patent No 6, 893, 479, 2005) of the fresh seaweed for deriving two products in an integrated manner, one being a granular residue rich in gelling polysaccharide and the other being the sap rich in plant growth stimulants including potash |

| | | |
|---|---|---|
| | | and micronutrients with proven efficacy. The field trials of sap as a foliar spray in a variety of crops such as sugarcane, paddy, wheat, maize, potato, pulses, oilseeds, potato and several fruits and vegetables has shown an improved growth and yields ranging from 11 - 37% in different geo-climatic conditions in the country |
| 4. | After what duration the first output can be seen? | 60-90 days |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Seaweed biomass, Sap expeller machine, electricity supply, and preservatives |
| 6. | What is the area foot print of the Process? | Sap processing from fresh seaweed basically needs a small building with the area of 25 sq.m for erection of sap expeller , storing the products, the sap and residue and it must be easily approachable for smooth transportation of the products. During the operation, nearby area of 10 sq.m is utilized for drying the fresh residue |
| 7. | What kind of Climatic and Geographical location is required? | Preferred in coastal areas |
| 8. | Gestation period of the project? | 6-8 months |
| 9. | Minimum Economic Unit Size? | |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Seaweed cultivation Harvested Seaweed biomass Sap extraction Seaweed bio- stimulant Marketing |
| 12. | Can it be part of Circular economy? | Source of bio stimulant is fresh biomass of seaweed. The seaweeds are cultivated by engaging a coastal community. The young tip of the biomass harvested is reused as seed for next cycle. Matured basal part is utilized simultaneously for sap extraction and carrageenan production. There is no wastage is obtained or harmful effluent is discharged starting from cultivation of source seaweed. Therefore the technology can be a part of circular economy. |
| 13. | What will be the Chain of Value addition? | Further S&T efforts led to secure IPRs for diverse processes for production of *biodegradable films from carrageenan* (US Patent No. 7, 067, 568), *health drink from sap* (US Patent No. 8, 252, 359), *low sodium salt of botanic origin* (US Patent No. 7, 208, 189), agricultural intermediates along with HMF (PCT Publ. No. WO2014027368). Most recent studies on biomass conversion technology has led to an advanced process that help realizing a spectrum of bio-products (plant growth stimulant, crude pigment, crude lipid, polysaccharide (agar/carrageenan) and cellulose) in integrated manner from fresh seaweeds (PCT Publ. No. WO2015/102021) |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes all required raw material and machinery to final packed product available locally |

<table>
<tr><td>15.</td><td>How everything from top to bottom to be made in the village itself (Circular and local)?</td><td>Yes, everything can be made in village itself by the coastal villagers. The villagers produce their own seaweed and can be imparted the technology to process it to get sap and carrageenan by forming local self help groups.</td></tr>
<tr><td>16.</td><td>How many Training Days or months required for the technology to be learned properly?</td><td>Five training programme for seaweed farming and two days training for sap processing and packaging</td></tr>
<tr><td>17.</td><td>How to be implemented form the root to tip</td><td>By arranging Buy back linkage between industry and trainees</td></tr>
<tr><td>18.</td><td>If it can be implemented at Family level or external manpower is required?</td><td>It can be implemented at family level</td></tr>
<tr><td colspan="3">Additional Information</td></tr>
<tr><td>19.</td><td>How many Manpower required?</td><td>2 skilled man power for Sap expelling and 2 skilled manpower for adding preservatives and packing for the process of one ton sap per day scale</td></tr>
<tr><td>20.</td><td>What is the Status of Commercialization</td><td>Technology has been successfully licenced and product is available in market.</td></tr>
<tr><td>21.</td><td>Scale of Funding required all total?</td><td>₹ 12.87 lakhs</td></tr>
<tr><td>22.</td><td>Budget with breakage?</td><td>
<table>
<tr><td>Capital/non-recurring</td><td></td><td>Rate</td><td>Cost in lakhs</td></tr>
<tr><td>Sap expeller*</td><td>2</td><td>1.5 lakhs</td><td>3.00</td></tr>
<tr><td>Recurringw</td><td></td><td></td><td></td></tr>
<tr><td>Fresh seaweed biomass (2 tons@Rs.5000/ton)</td><td></td><td>0.05</td><td>0.10</td></tr>
<tr><td>Skilled Manpower **</td><td>4</td><td>0.20/month</td><td>9.60</td></tr>
<tr><td>Preservatives, consumables* & Energy charges</td><td></td><td></td><td>0.10</td></tr>
<tr><td>Packing materials (cans , 5 litres capacity etc.,)</td><td>200</td><td>35</td><td>0.07</td></tr>
<tr><td>Total</td><td></td><td></td><td>12.87</td></tr>
</table>
</td></tr>
<tr><td>23.</td><td>What type of Certification Required for the product? (If required)</td><td>The certification is required in some part of the country while launching the product sales in the market. The certificate may contain the following statement “The product- seaweed fertilizer ( Bio-stimulant) contain no chemical fertilizer or pesticide additives and are pure. bio-nutrients derived from fresh seaweed accordingly be considered harmless and safe for humans”. New proposal has been there to bring the biostimulants under Fertilizer Control Order (FCO).</td></tr>
<tr><td>24.</td><td>Risk involved?</td><td>Seaweed biomass is the basic requirement for seaweed fertilizer production. The following risks are involved in seaweed farming Season, grazing, epiphytes and physio-chemical factors</td></tr>
</table>

# Seaweed farming

## [CSIR-CSMCRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Seaweed farming |
| 2. | About technology (in short) | Seaweed farming is most willingly expected practice among the coastal community in each Maritime states in India besides the production of phycocolloids. As the practice is evident for the best livelihood opportunity in the coastal region of Tamil Nadu state, it is being disseminated to other maritime states. Short duration of farming cycle and no heavy infrastructure requirements are the merits that quite suitable to carry out in the coastal rural area. Following the reason, seaweed farming is easily established in Tamil Nadu coast since the past two decades. Seaweed farming is a supplementary activity to existing fishing and its ancillary activities. It can provide a regular and sustainable income source by leveraging local entrepreneurial talent and has translated into an additional annual income of upto ₹ 80,000 per person. A successful potent formulation from seaweeds will attract entrepreuners and lead to self-employment or employment in existing industries.<br><br>Although seaweeds are best source of nutrition and fertilizer, globally seaweeds are known mainly for phycolloids like agar, alginate and carrageenan production which applications are wide in several industries such as food, confectionary, pharmaceutical dairy production, textile paint and paper making industries etc.<br>In India, seaweeds are utilized as raw material for the production of agar, alginate and liquid seaweed fertilizer (LSF). There are few agar, algin industries and LSF industries distributed at different places in the Tamil Nadu, Karnataka, Andhra Pradesh and Gujarat.<br><br>The red algae such as *Gelidiella acerosa*, *Gracilaria edulis*, *G. crassa*, *G. foliifera* and *G. verrucosa* are used for agar production and brown algae *Sargassum* spp., *Turbinaria* spp. for the production of alginates and liquid seaweed fertilizer. In Tamil Nadu most of the seaweeds are sourced from natural habitat excluding *Kappaphycus* which is being cultivated. |

| | | |
|---|---|---|
| | | The quantity of seaweeds exploited is inadequate to meet the raw materia requirement of Indian seaweed industries. Seaweeds such as *Gracilaria edulis*, *Hypnea musciformis*, *Kappaphycus alvarezii*, *Enteromorpha flexuosa* and *Acanthophora spicifera* can be successfully cultivated in long-line ropes and nets by vegetative propagation method. This activity has a potential to provide income and employment to about 200,000 families. |
| 3. | What is the scientific approach to choose the particular technology? | Indian subcontinent has long coastal line that falls in the tropical region where the seawater temperature has been recorded in the range between 25-32°C. The seaweeds which are identified for cultivation is tropical species and natural occurrence. The vegetative part of the seaweed thallus is proliferating nature and thus the healthy and young vegetative part can be selected as a seed, fixed firmly in the water adopting suitable cultivation method, the vegetative part can grow well in three or four time over a short period of time. Considering the growth of the vegetative part in a short duration seaweed farming technology has been developed. |
| 4. | After what duration the first output can be seen? | 45 - 90 days (depending on the species used) |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | a) Bamboo poles ( 3-4" dia)<br>b) Five toothed Iron anchor or anchor stones<br>c) Nylon thread for seeding<br>d) Polypropylene rope : 3mm (for tying the seeded stone), 6mm (for raft linking), 10mm (for anchoring)<br>e) Used fishnet<br>f) Seed material |
| 6. | What is the area foot print of the Process? | Farming of seaweed basically needs an area along the coastal region of the sea which is ideally a shallow, sandy bottom with good accessibility for transportation. During the operation, seafront is engaged for cultivating the seaweeds and the beach area is utilized for drying purposes. |
| 7. | What kind of Climatic and Geographical location is required? | Climate required for seaweed cultivation is warm seawater with temperature ranged from 25-32 degree centigrade. The maritime states in India located in varied geographical locations which starting from 8° North latitude to 20° North latitude. The particular range temperature (25°-32°C) may not occur in a same period. It may vary to various location. Thus the particular season with temperature range of 25°-32 °C is needed to be capitalized and operating cultivation farm with this range is crucial vision of the activity. |
| 8. | Gestation period of the project? | Six months to 12 months are the developmental stage because, survey and site identification, participant's identification needed during this period. |
| 9. | Minimum Economic Unit Size? | |
| 10. | Indicative Investment | |

| Salient Feature of Process/Technology Information | | |
|---|---|---|
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Seaweed biomass is a source, which is the harvestable product of the farming. The harvested biomass is supplied to the industries processing for phycocollid and fertilizer (SAP). Seaweed based industries are function more than three decades. There will not be a problem marketing the seaweed biomass produced by the farming. |
| 12. | Can it be part of Circular economy? | There is a huge demand for the seaweed-based products in India. The farming can generate sustainably the biomass that supports not only the livelihood, it also supplies the raw material for processing and thus the industrial growth is ensured. During farming no waste products and effluent discharge are formed rather it enrich the marine ecosystem. Seaweed biomass that produced in the cultivation is used to produce more than one product simultaneously. Therefore the farming and its products can be an ideal example for circular economy. |
| 13. | What will be the Chain of Value addition? | Phycocollid (agar-agar, and carrageenan), seaweed fertilizer |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Farming activity is more appropriate to people residing at village. Therefore motivating and entertain the villager is not an issue. |
| 16. | How many Training Days or months required for the technology to be learned properly? | Training period is short Three to Five days duration is sufficient for learning the basics of seaweeds and methods of cultivation including field demonstration. |
| 17. | How to be implemented form the root to tip | Objective of the activity is basically societal interest. Therefore identifying the eligible candidate is most important. The effective strategy is survey for candidate selection, training and infrastructure assistance to eligible candidate. The successful implementation of first phase of commercial cultivation can be disseminated to reach the people at the tip. |
| 18. | If it can be implemented at Family level or external manpower is required? | The practice is quite suitable for family level implementation. However, the lifestyle habit of coastal community is slightly changed due to educational development. Therefore, it may not possible fully at family level implementation. However, the cultivator can themselves arrange the external members if needed. |
| **Additional Information** | | |
| 19. | How many Manpower required? | It has been proposed to have 0.25 ha demonstration / seed production farm in all the coastal state including union territory. Coastal fisher populace, especially fisherwomen (12 /ha. For Kappaphycus & 45/ha for agarophytes). There no special skill & qualification require for seaweed farming |

| | | |
|---|---|---|
| 20. | What is the Status of Commercialization | |
| 21. | Scale of Funding required all total? | a. Training ₹ 6000/- for three person<br>b. Farming ₹ 225000/- for three person for procuring 150 rafts in 0.25 ha.<br>c. Total fund need ₹ 2,31,000/-.<br>This is for single state and can be multiplied to each state. |
| 22. | Budget with breakage? | a. Training - ₹ 6000<br>1. Food and refreshment ₹ 1000 per person<br>2. Training material purchase ₹ 1000 per person<br>a. Farming - ₹ 2,25,000<br>1. Area to be covered under cultivation – 0.25 ha<br>2. No.of rafts required for farming - 150<br>3. Cost of raft@ ₹.1500/raft - ₹ 2,25,000<br>Total expenditure – ₹ 2,31,000 |
| 23. | What type of Certification Required for the product? (If required) | Not applicable |
| 24. | Risk involved? | There are issues are monsoon and seed plant availability after monsoon, and disease infestation |

# Improving quality and yield of salt, implementation of low cost equipment in small scale solar salt works in rural areas

## [CSIR-CSMCRI]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Improving quality and yield of salt, implementation of low cost equipment in small scale solar salt works in rural areas |
| 2. | About technology (in short) | Indian salt production has crossed over to 28 million ton and the country stands 3rd among the salt producing countries of the world.<br>The current small-scale solar salt producers are producing poor quality of salt, having lower economic value. Because of increase in such impurity in the salt unit, the unit continues to remain in the poor category, which in turn gives less profit in compared to the quality salt. Under lack of knowledge of the available scientific technology of the salt production, lack of bank linkages, de motivated salt owners is forced to shut down their salt units. At the same time, the local people who used to consume the locally available salt (impure non-edible salt), put them into serious health problems.<br>Requirement of edible grade salt is picking up momentum and looking to this scenario there is every need for increasing good quality salt production in the country.<br>Similarly, harvesting of solar salt is carried out in different stages. A number of mechanical approaches developed by producers are being used depending on the historical evolution of the systems and local conditions. In modern times, several systems have been employed which involve high-power machines. However, most of the machines are useful only for large salt works having pucca crystallizers. On the other hand, solutions are being sought which are adaptable to small units where one can work with light machinery. These are important in making small solar salt works competitive, especially in our country. It is essential to introduce competitive and low cost indigenous systems. The modernization of traditional salt harvesting methods is favoured because their adaptation to modern techniques of salt manufacturing would require use of equipment of low investment. The proposal is to introduce various semi-mechanization equipment keeping in mind |

| | | |
|---|---|---|
| | | the Indian conditions as well as small solar salt works. Semi mechanization process can considerably reduce the drudgery of labour involved in the harvesting of salt. |
| 3. | What is the scientific approach to choose the particular technology? | In the absence of the usage of technical input, the salt producers are forced to produce below standard salt, which in turn gives less economic return. They are also not able to adapt to the new technology in the absence of the knowhow of the technical input.<br>CSIR-CSMCRI, Bhavnagar having a record of accomplishment in the development of technologies in the area of salt and marine chemicals can help the salt producers with the practical demonstration of the innovative technologies developed by the institute.<br>Thus under this project, a mechanism has been developed where available/developed technological options as well as low cost indigenous equipment will be demonstrated to the small scale solar salt producers by CSIR-CSMCRI which has wide capabilities in the area of salt and other downstream chemicals. |
| 4. | After what duration the first output can be seen? | 5 years |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Raw material / Water: saline water (sub soil brine, lake brine)<br>Energy : Solar Energy, Electricity<br>Others : Low cost indigenous equipment required in solar salt production |
| 6. | What is the area foot print of the Process? | Mainly solar energy will be required for solar salt production. |
| 7. | What kind of Climatic and Geographical location is required? | Solar salt production areas of India. |
| 8. | Gestation period of the project? | 5 years |
| 9. | Minimum Economic Unit Size? | |
| 10. | Indicative Investment | |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Source of Raw material : Locally available saline water (sub soil brine, lake brine)<br>Machinery to Possible Market : Indigenously available machinery |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | High purity edible grade salt production with reduced drudgery of labour / manpower employed |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |

| | | |
|---|---|---|
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Under this project, a mechanism is developed where available/developed technological options will be introduced to the salt owners by CSIR-CSMCRI, which has wide capabilities in the area of salt. Various cost effective technologies have been developed for solar salt production of high purity from different kind of brines.<br>• Total input time will be reduced, thereby decreasing the input cost. Sale of salt will yield more income from the same salt unit.<br>• Enhancement of livelihood options by ensuring better returns by increase in good quality solar salt.<br>• Through sale of the good quality salt, the small scale / marginal salt producers will become self-reliant and competent enough to sale their salt at a much higher price improving their livelihood.<br>• Increase in income will ensure that the producers will utilize the fund for their basic needs and will certainly reduce the drudgery in work.<br>Focused on enhancing incomes and improvement in quality of lives of rural communities, thus catalyzing and bringing socio-economic development through CSIR offerings/ technologies. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 8 months each year. Total 5 years have been estimated for implementation of technology targeting 50-100 small-scale solar salt producers. |
| 17. | How to be implemented form the root to tip | Demonstration of processes and training to salt workers on field scale.<br>Introduction of low cost semi mechanization equipment will be demonstrated to small solar salt works which will help them in reduction of reduce drudgery of labourers. |
| 18. | If it can be implemented at Family level or external manpower is required? | Mostly at family level however, skilled / high skilled personnel will be required as external work force if sufficient cumber(s) of work force is not available. |
| **Additional Information** | | |
| 19. | How many Manpower required? | On an average 8 Un-skilled / Skilled personnel, 2 Project Associate Level II and One technical advisor will be required for each activity mentioned in point no. 4 above.<br>Qualifications:<br>Un-skilled / Skilled personnel : Matric<br>High Skilled personnel : 12$^{th}$ Pass, ITI<br>Technical advisor : PhD in Chemical Science<br>Project Associate Level II : M.Sc. Chemistry |
| 20. | What is the Status of Commercialization | |
| 21. | Scale of Funding required all total? | ₹ 257.52 lakhs |

<table>
<tr><td>22.</td><td>Budget with breakage?</td><td>
<table>
<tr><td colspan="7">Estimated Project Cost Requirement for the Tenure Proposed</td></tr>
<tr><td></td><td>Year 1</td><td>Year 2</td><td>Year 3</td><td>Year 4</td><td>Year 5</td><td>Total</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>8</td></tr>
<tr><td>A. Recurring</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>a) T.A. (In India)</td><td>2.50</td><td>2.50</td><td>2.50</td><td>2.50</td><td>2.45</td><td>12.45</td></tr>
<tr><td>b) T.A. (Abroad)</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>c) Contingencies</td><td>2.00</td><td>2.00</td><td>2.00</td><td>2.00</td><td>2.00</td><td>10.00</td></tr>
<tr><td>d) Maintenance</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>e) Chemicals / Consumables</td><td>1.00</td><td>1.00</td><td>1.00</td><td>1.00</td><td>1.00</td><td>5.00</td></tr>
<tr><td>f) ORE</td><td>18.25</td><td>19.01</td><td>19.81</td><td>20.65</td><td>21.53</td><td>99.25</td></tr>
<tr><td>g) Tech HR</td><td>8.63</td><td>8.89</td><td>9.16</td><td>9.43</td><td>9.71</td><td>45.82</td></tr>
<tr><td>Total (A)</td><td>32.38</td><td>33.40</td><td>34.47</td><td>35.58</td><td>36.70</td><td>172.52</td></tr>
<tr><td>B. Capital</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>a) Works & Services</td><td>10.00</td><td>10.00</td><td>10.00</td><td>10.00</td><td>10.00</td><td>50.00</td></tr>
<tr><td>b) Apparatus & Equipment</td><td>15.00</td><td>5.00</td><td>10.00</td><td>5.00</td><td>0.00</td><td>35.00</td></tr>
<tr><td>Total (B)</td><td>25.00</td><td>15.00</td><td>20.00</td><td>15.00</td><td>10.00</td><td>85.00</td></tr>
<tr><td>Grand Total (A+B)</td><td>57.38</td><td>48.40</td><td>54.47</td><td>50.58</td><td>46.70</td><td>257.52</td></tr>
</table>
</td></tr>
<tr><td>23.</td><td>What type of Certification Required for the product? (If required)</td><td>Not Applicable</td></tr>
<tr><td>24.</td><td>Risk involved?</td><td>Climatic factors such as rains</td></tr>
</table>

# Edible Mushroom Cultivation

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Edible Mushroom Cultivation |
| 2. | About technology (in short) | CSIR-North East Institute of Science & Technology (CSIR-NEIST) took upon itself the onerous task of developing a few simple technologies suitable for the micro-scale sector of the industry. Development of these micro-scale technologies were intended to benefit entrepreneurs as well as the consumers from the rural and urban poor's of the unreached section of our society. While developing the technologies special attention was paid to the facts that these technologies ought to be simple, easy to operate with low skill and minimum land, labour and capital, and at the same time having ready market. The mushroom technology is one of such successful technology of CSIR-NEIST. Under the guidance of CSIR-NEIST mushroom cultivation has come up in various places in Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Tripura and Nagaland. CSIR-NEIST has developed the agro-practice for cultivation of edible mushroom varieties and also the knowledge base for commercial mushroom spawn production. CSIR-NEIST has transferred this agro-practice as well as the spawn production technology to 20 entrepreneurs/NGOs and generated employment to over 10,000 people. |
| 3. | What is the scientific approach to choose the particular technology? | Although mushroom is very much popular food item among most of the rural population, cultivation of mushroom in an organized manner has not been done till date. The local people are very much interested in mushroom hunting from jungle, which some time create confusion as regards edibility, taste, nutritive value etc. On the other hand jungle collections sometimes lead to fatal cases also. Due to this reason, it is expected that introduction of organized cultivation at grass root level will generate extra source of income and at the same time it will also provide protein rich food for the weaker section of populations. A gainful engagement towards alleviating poverty is also envised through implementation of this rural development activity. |
| 4. | After what duration the first 5output can be seen? | 3 months |

| | | |
|---|---|---|
| 5. | hat kind of Resources Required (Raw material, Energy, water, others)? | Although Oyster mushrooms are generally found in the wild on deciduous woods, they grow well on many other materials besides hardwoods, including cereal straws, corn cobs, seed hulls, coffee wastes, sugar cane bagasse, paper and pulp by-products, and numerous other materials. Success increases if the base material is modified to create an optimal structure and moisture—and heat-treated—before inoculation. Here is a short list of the materials that can be recycled into mushroom production: Cereal straws & grain hulls, Corncobs, Coffee plants & waste, Tea leaves, Sugar cane bagasse, Banana fronds, Seed hulls (cottonseed and oil-rich, seeds), Hulls of almonds, walnuts, sunflower, pecans, and peanuts, Soybean meal and soy waste.<br>The following supplements can be added at various percentages of total dry mass of the bulk substrate to enhance yields:<br>Corn meal, cottonseed meal or flour, oat bran, oat meal, rice bran, rye grain, soybean meal & oil, vegetable oils, wheat grain etc. |
| 6. | What is the area foot print of the Process? | 250 sq.ft. |
| 7. | What kind of Climatic and Geographical location is required? | Paddy straw mushroom can be grown around 35°C. Temperature should not go below 30°C or above 40°C for more than 4-8 hours during growing period. Oyster mushroom grows best between 22-28°C. It is grown in North East India from September to April. |
| 8. | Gestation period of the project? | 3 months |
| 9. | Minimum Economic Unit Size? | 250 sq.ft. |
| 10. | Indicative Investment | Land requirement 250 sq.ft.<br>One Unit of Semi-Permanent Mushroom Growing House made with treated bamboo: Rs. 11,000/- |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Agricultural wastes, rich in cellulose and lignin are the basic raw materials needed for undertaking the activity. Since enormous quality of waste matter in the form of straw, leaves produced in the country remains unused, therefore, there is a great scope for utilization of such agricultural wastes for production of edible mushroom, which can be collected locally. Necessary inputs such as pure culture, mother spawn etc. will be made available from the germplasm bank of CSIR-NEIST for undertaking the work smoothly. |
| 12. | Can it be part of Circular economy? | Yes. |
| 13. | What will be the Chain of Value addition? | Subsidiary small industries development for value addition e.g. Preserved Mushroom, Pickling, Mushroom powder, Mushroom papar, Mushroom flavoured drinks etc. |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes. |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | The activity will evolve immense opportunity for engagement of manpower at grass root level and it is expected to provide employment opportunity for the rural uneducated as well as educated youth. Introduction of mushroom cultivation in remote rural areas involving weaker section of population will create employment potential to thousand of targeted group of population. This will create an environment for commercial cultivation of edible mushroom and will help for entrepreneurship development among the unemployed educated youth of this region. |
| 16. | How many Training Days or months required for the technology to be learned properly? | 5 training days. |
| 17. | How to be implemented form the root to tip | The activity would be done in rural areas to promote cultivation and value addition of edible mushroom among the unemployed educated and uneducated youth, weaker group of rural population in certain villages of targeted areas. It is expected that introduction of organized cultivation at grass root level will generate extra source of income. Value added products from mushroom is a promising enterprise especially for the unemployed educated and uneducated man and woman because it is basically an indoor activity and can be effectively managed by woman. The value added products will not only cater to the protein and micronutrient requirement but at the same time will enable the population to live a healthy life. This shows the importance of the activity for the socio economic development of rural population of the target villages through cultivation and value addition of edible mushroom. |
| 18. | If it can be implemented at Family level or external manpower is required? | Can be implemented at family level. |
| | **Additional Information** | |
| 19. | How many Manpower required? | One (1) |
| 20. | What is the Status of Commercialization | Wild mushroom has the potential to become a high end export under the right conditions. Equally important is the cultivation of newly developed varieties based on wild stock, as mushroom are recognized to be nutritionally important. This activity will address three concurrent benefits – employment to rural youth, a ready protein source for local consumption, and preservation of wild stock until the markets are right for them. |
| 21. | Scale of Funding required all total? | ₹ 20,000/- |

<table>
<tr><td>22.</td><td>Budget with breakage?</td><td>Semi-Permanent Mushroom Growing House made with treated bamboo (life span 4-7 years):<br><br><table><tr><th>Sl. No.</th><th>Particulars</th><th>Quantity</th><th>Rate in Rs.</th><th>Amount in Rs.</th></tr><tr><td>1.</td><td>Bamboo</td><td>60 nos.</td><td>110 per piece</td><td>6600</td></tr><tr><td>2.</td><td>Rope</td><td>5 kg</td><td>90 per kg</td><td>450</td></tr><tr><td>3.</td><td>Wages</td><td>8 man-days</td><td>450 per man-day</td><td>3600</td></tr><tr><td>4.</td><td>Misc. Cost</td><td>Per house</td><td>approximation</td><td>350</td></tr><tr><td></td><td></td><td></td><td></td><td>11,000</td></tr></table></td></tr>
<tr><td>23.</td><td>What type of Certification Required for the product? (If required)</td><td>No certification required.<br>CSIR-NEIST has already developed several protocols for mushroom production that have been successfully implemented in northeast.</td></tr>
<tr><td>24.</td><td>Risk involved?</td><td>No risk involved as the chances of failure are negligible.</td></tr>
</table>

# Scented Decorative Candle

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Scented Decorative Candle |
| 2. | About technology (in short) | Candles are extensively used in different festivals and functions. Decorative candles have special markets in various functions, parties and in hotel. The colour and different shape of such candles increase the aesthetic values of the parties. Scented decorative candles are much valuable for such gathering. Like incense stick, scented decorative candles have special market in society. |
| 3. | What is the scientific approach to choose the particular technology? | Decorative candle may be of hand crafted candle. There is no limit of its improvement for using creativity with scientific inputs. Mixing different combination of bee wax & paraffin wax, adding combination of pleasant natural fragrance for mood recreation, adding herbal extracts, dried flower etc. need scientific basis for this technology. |
| 4. | After what duration the first output can be seen? | After 2-3 months of production and used by people, the visibility of market could be seen. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Wax (paraffin or bee wax), decorative candle mould, plant extracts, utensils, energy source (gas or firewood) |
| 6. | What is the area foot print of the Process? | A room of 6M x 5M size is sufficient to start the venture. |
| 7. | What kind of Climatic and Geographical location is required? | Not applicable |
| 8. | Gestation period of the project? | 3 Months |
| 9. | Minimum Economic Unit Size? | 750 candles/day |
| 10. | Indicative Investment | ₹ 3-5 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | All the raw materials including wax, plant extracts can be procured from market. The machineries like moulds, containers are also available in market. Scented decorative candle have good market due to their special use and hence can be marketed. |
| 12. | Can it be part of Circular economy? | Yes |

<table>
<tr><td>13.</td><td>What will be the Chain of Value addition?</td><td>Wax + Plant extracts+ hand craft</td></tr>
<tr><td>14.</td><td>Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally</td><td>Locally available raw materials can be used in the value chain. High quality bee wax can be obtained from local bee keeping entrepreneurs, Plant extracts can also be made by using simple techniques. Selling of candle may also locally arranged.</td></tr>
<tr><td>15.</td><td>How everything from top to bottom to be made in the village itself (Circular and local)?</td><td>Plant extracts can be made available in local environment. Bee wax can be processed from local bee keeper. Mould and other machinery may also be fabricated locally.</td></tr>
<tr><td>16.</td><td>How many Training Days or months required for the technology to be learned properly?</td><td>10-15 Days</td></tr>
<tr><td>17.</td><td>How to be implemented form the root to tip</td><td>Creating awareness among people about the technology, providing training of manufacturing the candles and others, preparing business plan.</td></tr>
<tr><td>18.</td><td>If it can be implemented at Family level or external manpower is required?</td><td>Can be implemented at family level.</td></tr>
<tr><td colspan="3">Additional Information</td></tr>
<tr><td>19.</td><td>How many Manpower required?</td><td>3-5</td></tr>
<tr><td>20.</td><td>What is the Status of Commercialization</td><td>Ready for commercialization</td></tr>
<tr><td>21.</td><td>Scale of Funding required all total?</td><td>₹ 3-5 lakh depending on the plant size</td></tr>
<tr><td>22.</td><td>Budget with breakage?</td><td>The yearly expenditure will be
<table>
<tr><th>Sl. No.</th><th>Particulars</th><th>Amount in Rupees</th></tr>
<tr><td>A</td><td>FIXED COST</td><td></td></tr>
<tr><td>1</td><td>Utility</td><td>1500.00</td></tr>
<tr><td>2</td><td>Interest on fixed capital</td><td>36275.00</td></tr>
<tr><td>3</td><td>Depreciation</td><td>4100.00</td></tr>
<tr><td>4</td><td>Maintenance & Repair</td><td>1500.00</td></tr>
<tr><td>5</td><td>Miscellaneous Expenditure</td><td>1000.00</td></tr>
<tr><td>6</td><td>Room rent</td><td>60000.00</td></tr>
<tr><td>7</td><td>Manpower Cost</td><td>300000</td></tr>
<tr><td colspan="2">TOTAL OF (A)</td><td>404375.00</td></tr>
</table></td></tr>
</table>

| | | |
|---|---|---|
| | | <table><tr><td>**B**</td><td>**VARIABLE COST**</td><td></td></tr><tr><td>1</td><td>Total Raw Material Cost</td><td>681600.00</td></tr><tr><td>2</td><td>Manpower Cost</td><td>270000.00</td></tr><tr><td>3</td><td>Utility</td><td>9600.00</td></tr><tr><td>4</td><td>Packaging Cost</td><td>160750.00</td></tr><tr><td>5</td><td>Maintenance & Repair</td><td>6150.00</td></tr><tr><td>6</td><td>Miscellaneous Expenditure</td><td>9000.00</td></tr><tr><td colspan="2">TOTAL OF (B)</td><td>1137100.00</td></tr><tr><td>**C**</td><td>**TOTAL COST (A + B)**</td><td>1541475.00</td></tr></table> Capacity : 750 candle per day |
| 23. | What type of Certification Required for the product? (If required) | MSME |
| 24. | Risk involved? | No risk involved as the chances of failure are negligible |

# Process for extraction of Fibres from Banana Pseudo stem

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Process for extraction of Fibres from Banana Pseudo stem |
| 2. | About technology (in short) | This technology deals with the utilization of banana plants which remains as a waste after harvesting the fruits for production of fibre and useful products of higher commercial value for day to day use. The fibres are suitable for manufacturing fabrics, decorative handicraft items, twines and ropes, bristles for brushes, cushions etc. |
| 3. | What is the scientific approach to choose the particular technology? | Banana Fibre is extracted by adopting chemical, mechanical and manual process. |
| 4. | After what duration the first output can be seen? | 3 month |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Banana Plants, Chemicals, Fibre Respoder Machine, Water, Electricity, etc. |
| 6. | What is the area foot print of the Process? | Waste utilization without environmental pollution |
| 7. | What kind of Climatic and Geographical location is required? | Tropical condition in which banana plant abundantly grow. |
| 8. | Gestation period of the project? | 3 month |
| 9. | Minimum Economic Unit Size? | 500 kg/day |
| 10. | Indicative Investment | ₹ 7.2 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Nearby local market |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Fibre can be converted to fabrics |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 4 days |
| 17. | How to be implemented form the root to tip | It will be implemented by giving demonstration in selected rural areas time to time. |
| 18. | If it can be implemented at Family level or external manpower is required? | Optional, can be carried out at family level |
| **Additional Information** | | |
| 19. | How many Manpower required? | 5 |
| 20. | What is the Status of Commercialization | Total 3 nos. of technologies are commercialised till date. |
| 21. | Scale of Funding required all total? | MSME scale |
| 22. | Budget with breakage? | Plant Capacity= Fibre production 500 kg/day<br>A) Capital Investment : ₹ 7,16,000.00<br>B) Production Cost : ₹ 3,500.00<br>Total : ₹ 7,19,500.00 |
| 23. | What type of Certification Required for the product? (If required) | N/A |
| 24. | Risk involved? | Yes |

# Process for making Handmade Paper

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | Items | **Answers** |
| 1. | Title of the technology | Process for making Handmade Paper |
| 2. | About technology (in short) | This technology deals with the conversion of waste materials like office paper waste, banana fibre, straw fibre etc. into handmade paper of good commercial value for day to day use. The handmade papers are used in office stationary as file covers & file boards, printing & packaging industries as greetings, invitation and visiting cards, folders and albums, lamp shades and a wide range of decorative items. |
| 3. | What is the scientific approach to choose the particular technology? | Handmade paper is manufactured by wet process. |
| 4. | After what duration the first output can be seen? | 3 month |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Waste paper/banana fibre/straw fibre, water, electricity, Beater, Vat machine, screw press, calendaring machine etc. |
| 6. | What is the area foot print of the Process? | Waste utilization without environmental pollution |
| 7. | What kind of Climatic and Geographical location is required? | It is used in all types of climatic and geographical location. |
| 8. | Gestation period of the project? | 3 month |
| 9. | Minimum Economic Unit Size? | 200kg/day production |
| 10. | Indicative Investment | ₹ 15.25 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Kolkata, West Bengal |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Handmade paper to speciality paper |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |

| | | |
|---|---|---|
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | No |
| 16. | How many Training Days or months required for the technology to be learned properly? | 4 days |
| 17. | How to be implemented form the root to tip | Proper strategy is required |
| 18. | If it can be implemented at Family level or external manpower is required? | External manpower is required |
| **Additional Information** | | |
| 19. | How many Manpower required? | 10 |
| 20. | What is the Status of Commercialization | Total 1 technology is commercialised till date. |
| 21. | Scale of Funding required all total? | MSME scale |
| 22. | Budget with breakage? | Plant Capacity= 200kg/day production<br>A) Capital Investment : ₹ 14,40,000.00<br>B) Production Cost : ₹ 85,000.00<br>Total : ₹ 15,25,000.00 |
| 23. | What type of Certification Required for the product? (If required) | N/A |
| 24. | Risk involved? | Yes |

# Liquid Deodorant & Cleaner

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Liquid Deodorant & Cleaner |
| 2. | About technology (in short) | Liquid Deodorant & Cleaner is a product of CPP Group, CSIR-NEIST, Jorhat, which is used for variety of purposes such as cleaning of floors & tiles, bathrooms & toilets, polishing glass & ceramic articles etc. They are extensively used in nursing homes and hospitals, hotels and restaurants, business and private houses, seminar halls, auditorium etc. |
| 3. | What is the scientific approach to choose the particular technology? | Liquid Deodorant & Cleaner is an emulsion based product used as disinfectant and cleaning agent manufactured from green raw materials. |
| 4. | After what duration the first output can be seen? | 3 month |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Green chemicals, essential oil, water and heat. |
| 6. | What is the area foot print of the Process? | Herbal aromatic oil to household product |
| 7. | What kind of Climatic and Geographical location is required? | It is used in all types of climatic and geographical location. |
| 8. | Gestation period of the project? | 3 month |
| 9. | Minimum Economic Unit Size? | 100 L/day |
| 10. | Indicative Investment | ₹ 6.15 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Nearby local market, hospitals, restaurant & Hotels etc |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Different household product |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |

| | | |
|---|---|---|
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | It will be implemented by giving demonstration in selected rural areas time to time. |
| 18. | If it can be implemented at Family level or external manpower is required? | Optional, can be carried out at family level |
| **Additional Information** | | |
| 19. | How many Manpower required? | 5 |
| 20. | What is the Status of Commercialization | Total 18 nos of technology are commercialised till date throughout the country. |
| 21. | Scale of Funding required all total? | MSME scale |
| 22. | Budget with breakage? | Plant Capacity= 100 L/day production<br>A) Capital Investment : ₹ 4,55,000.00<br>B) Production Cost : ₹ 1,60,000.00<br>Total : ₹ 6,15,000.00 |
| 23. | What type of Certification Required for the product? (If required) | N/A |
| 24. | Risk involved? | Yes |

# Low Dust Chalk Pencil

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Low Dust Chalk Pencil |
| 2. | About technology (in short) | Chalk pencils are commonly used for writing on black boards in educational institutions and other demonstration houses. It is an essential educational aid and there is a substantial demand for this product. Presently the demand is met by conventional quality chalk pencils, which release lots of dust during writing coupled with breakage during transportation. Low dust chalk pencils generate minimum dust during writing and are not easily breakable like conventional ones. |
| 3. | What is the scientific approach to choose the particular technology? | Low Dust Chalk Pencil is a product which release very less amount of dust to the environment. |
| 4. | After what duration the first output can be seen? | 3 month |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Commercial Chemical, water and Chalk pencil mould. |
| 6. | What is the area foot print of the Process? | Environment pollution reduction |
| 7. | What kind of Climatic and Geographical location is required? | It is used in all types of climatic and geographical location. |
| 8. | Gestation period of the project? | 3 month |
| 9. | Minimum Economic Unit Size? | 250 box/day |
| 10. | Indicative Investment | ₹ 2.87 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Nearby local market, school, college or other educational institute |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | |

| | | |
|---|---|---|
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | It will be implemented by giving demonstration in selected rural areas time to time. |
| 18. | If it can be implemented at Family level or external manpower is required? | Optional, can be carried out at family level |
| **Additional Information** | | |
| 19. | How many Manpower required? | 5 |
| 20. | What is the Status of Commercialization | Total 25 nos of technology are commercialised till date. |
| 21. | Scale of Funding required all total? | MSME scale |
| 22. | Budget with breakage? | Plant Capacity= 250 Box/day production<br>A) Capital Investment : ₹ 1,00,000.00<br>B) Production Cost : ₹ 1,87,000.00<br>Total : ₹ 2,87,000.00 |
| 23. | What type of Certification Required for the product? (If required) | N/A |
| 24. | Risk involved? | Yes |

# Mosquito Repellent Candle

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Mosquito Repellent Candle |
| 2. | About technology (in short) | Wax candle is commonly used by rural people as alternate light sources. The candle has already an established market. Therefore, attempt is made to prepare wax candle having mosquito repellent properties. Easily available non-toxic herbal sources are used as ingredients of mosquito repellent. On burning, the candle emits pleasant fragrance along with the light and the fragrance keep mosquito out from the room. So the new candle will give light along with pleasant fragrance and mosquito repellent properties. It was found that the candle could provide considerable protection from mosquitoes. |
| 3. | What is the scientific approach to choose the particular technology)? | Mosquito is a persistent problems and little options are available for their eco-friendly management. To overcome these issues, the technology is selected. |
| 4. | After what duration the first output can be seen? | After 2-3 months of production and used by people, the visibility of market could be seen. |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Wax (paraffin or bee wax), candle mould, plant extracts, utensils, energy source (gas or firewood) |
| 6. | What is the area foot print of the Process? | A room of 6M x 5M size is sufficient to start the venture. |
| 7. | What kind of Climatic and Geographical location is required? | Not applicable |
| 8. | Gestation period of the project? | 3 Months |
| 9. | Minimum Economic Unit Size? | 5000 candles/day |
| 10. | Indicative Investment | ₹ 2-4 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | All the raw materials including wax, plant extracts can be procured from market. The machineries like moulds, containers are also available in market. As demand of candle as well as mosquito repellent products are already in the market, so after production, through proper strategy the product can be sold. |
| 12. | Can it be part of Circular economy? | Yes |

<table>
<tr><td>13.</td><td>What will be the Chain of Value addition?</td><td>Wax + Plant extracts to mosquito repellent candle.</td></tr>
<tr><td>14.</td><td>Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally</td><td>Locally available raw materials can be used in the value chain. High quality bee wax can be obtained from local bee keeping entrepreneurs, Plant extracts can also be made by using simple techniques. Selling of candle may also locally arranged.</td></tr>
<tr><td>15.</td><td>How everything from top to bottom to be made in the village itself (Circular and local)?</td><td>Plant extracts can be made available in local environment. Bee wax can be processed from local bee keeper. Mould and other machinery may also be fabricated locally.</td></tr>
<tr><td>16.</td><td>How many Training Days or months required for the technology to be learned properly?</td><td>4-5 Days</td></tr>
<tr><td>17.</td><td>How to be implemented form the root to tip</td><td>Creating awareness among people about the technology, providing training of manufacturing the candles and others, preparing business plan.</td></tr>
<tr><td>18.</td><td>If it can be implemented at Family level or external manpower is required?</td><td>Can be implemented at family level.</td></tr>
<tr><td colspan="3">Additional Information</td></tr>
<tr><td>19.</td><td>How many Manpower required?</td><td>3-5</td></tr>
<tr><td>20.</td><td>What is the Status of Commercialization</td><td>Ready for commercialization</td></tr>
<tr><td>21.</td><td>Scale of Funding required all total?</td><td>₹ 3-5 lakh depending on the plant size</td></tr>
<tr><td>22.</td><td>Budget with breakage?</td><td>The budget expenditure for one year is as follows
<table>
<tr><th>Sl. No.</th><th>Particulars</th><th>Amount in Rupees</th></tr>
<tr><td>A</td><td>FIXED COST</td><td></td></tr>
<tr><td>1</td><td>Utility</td><td>1390.00</td></tr>
<tr><td>2</td><td>Interest on fixed capital</td><td>51703.00</td></tr>
<tr><td>3</td><td>Depreciation</td><td>4000.00</td></tr>
<tr><td>4</td><td>Maintenance & Repair</td><td>1875.00</td></tr>
<tr><td>5</td><td>Miscellaneous Expenditure</td><td>5000.00</td></tr>
<tr><td colspan="2">TOTAL OF (A)</td><td>63969.00</td></tr>
<tr><td>B</td><td>VARIABLE COST</td><td></td></tr>
<tr><td>1</td><td>Raw Material Cost</td><td>2101500.00</td></tr>
<tr><td>2</td><td>Manpower Cost</td><td>375000.00</td></tr>
<tr><td>3</td><td>Utility</td><td>7879.00</td></tr>
<tr><td>4</td><td>Packaging Cost</td><td>255000.00</td></tr>
<tr><td>5</td><td>Maintenance & Repair</td><td>5625.00</td></tr>
<tr><td>6</td><td>Miscellaneous Expenditure</td><td>5000.00</td></tr>
<tr><td colspan="2">TOTAL OF (B)</td><td>2750004.00</td></tr>
<tr><td>C</td><td>TOTAL COST (A + B)</td><td>2813973.00</td></tr>
</table>
Plant Capacity =3,00,000 Candle/annum</td></tr>
</table>

| | | |
|---|---|---|
| 23. | What type of Certification Required for the product? (If required) | MSME, Department of Health |
| 24. | Risk involved? | No risk involved as the chances of failure are negligible |

# Solid Deodorant & Cleaner

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Solid Deodorant & Cleaner |
| 2. | About technology (in short) | Solid Deodorant & Cleaner is a product of CPP Group, CSIR-NEIST, Jorhat, which is An eco friendly product for cleaning the floor, tiles, mosquito repellent and deodorant & freshener. They are widely used in nursing homes and hospitals, hotels and restaurants, business and private houses, seminar halls, auditorium etc. |
| 3. | What is the scientific approach to choose the particular technology? | Solid Deodorant & Cleaner is a surfactant based dispersible tablet product used as disinfectant and mopping agent manufactured from green raw materials. |
| 4. | After what duration the first output can be seen? | 3 month |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | Green chemicals, essential oil, water, grinding and mixing machine |
| 6. | What is the area foot print of the Process? | |
| 7. | What kind of Climatic and Geographical location is required? | It is used in all types of climatic and geographical location. |
| 8. | Gestation period of the project? | 3 month |
| 9. | Minimum Economic Unit Size? | 1200 tablets/day |
| 10. | Indicative Investment | ₹ 5.89 lakh |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | Nearby local market**,** hospitals, hotels and restaurants, business and private houses, seminar halls, auditorium etc. |
| 12. | Can it be part of Circular economy? | Yes |
| 13. | What will be the Chain of Value addition? | Household products |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |

| | | |
|---|---|---|
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Local |
| 16. | How many Training Days or months required for the technology to be learned properly? | 2 days |
| 17. | How to be implemented form the root to tip | It will be implemented by giving demonstration in selected rural areas time to time. |
| 18. | If it can be implemented at Family level or external manpower is required? | Optional, can be carried out at family level |
| **Additional Information** | | |
| 19. | How many Manpower required? | 5 |
| 20. | What is the Status of Commercialization | Total 2 nos of technology are commercialised till date. |
| 21. | Scale of Funding required all total? | MSME scale |
| 22. | Budget with breakage? | Plant Capacity= 1200 Tablet/day production<br>A) Capital Investment : ₹ 5,00,000.00<br>B) Production Cost : ₹ 89,000.00<br>Total : ₹ 5,89,000.00 |
| 23. | What type of Certification Required for the product? (If required) | N/A |
| 24. | Risk involved? | Yes |

# Vermicompost production technology

## [CSIR-NEIST]

| Basic Information | | |
|---|---|---|
| | **Items** | Answers |
| 1. | **Title of the technology** | Vermicompost production technology |
| 2. | About technology (in short) | Vermicompos is purely organic fertilizer. Its technology is very simple and no need to engage high skilled manpower, investment, huge land and raw materials. The demands of vermicompost is increasing day by day. As most of the common people has now also awarded about the effect of inorganic fertilizers used in different crops and now they becomes preferring for organic based products in their day to day life. Due to severe health hazard concerned the Central and most of the State Govt. emphasized on organic farming products.<br>It low cost/ one time investment and can be achieved continuous returned. |
| 3. | What is the scientific approach to choose the particular technology)? | Purely organic, eco-friendly, waste management and livelihood generation. |
| 4. | After what duration the first output can be seen? | After 60 days |
| 5. | What kind of Resources Required (Raw material, Energy, water, others)? | A good quality vermiculture (E. foetida), a production unit (pit) with shed, weed (excluding any aromatic and spicy plant, flesh , plastic and lather) and cow dung and watering arrangement |
| 6. | What is the area foot print of the Process? | 12 feet x 3 feet x 3 feet (LxBxH) feet |
| 7. | What kind of Climatic and Geographical location is required? | High Humid 80-90 %) with moderate temperature 22-38°C is highly favourable condition |
| 8. | Gestation period of the project? | 45-60 days |
| 9. | Minimum Economic Unit Size? | 1000 kg / month= ₹.15,000-20,000/- per month |
| 10. | Indicative Investment | ₹ 20,000/- for temporary Low cost / rural vermipi (Bamboo make)<br>₹ 75,000/- (Cemented / permanent structure vermipit) |
| **Salient Feature of Process/Technology Information** | | |
| 11. | Tentative Supply Chain (Source of Raw material, Machinery to Possible Market) | 1. High demand by local farmers for organic farming<br>2. High demand by tea planters<br>3. High demand by the plants nursery<br>4. High demand by the kitchen gardener<br>5. High demand by the flower gardener<br>6. High demand by Horticultural crops grower (Kiwi farmers in Arunachal Pradesh) |

| | | |
|---|---|---|
| 12. | Can it be part of Circular economy? | If it is permanent structure pit there is no need to replace or shift earthworm. Only feeding materials have to provide. The pit will remains for at least 10-15 years without any renovation. |
| 13. | What will be the Chain of Value addition? | Depends upon the supplement of feeding materials and optimum nos. of earth worm in the pit. Eight to ten thousand earth worm can recycle a fully filled up feeding materials of a 1 sq m pit in one month. |
| 14. | Can the complete value chain be made local like if bee keeping is the activity what is the possibility of making bee boxes locally | Yes |
| 15. | How everything from top to bottom to be made in the village itself (Circular and local)? | Low cost |
| 16. | How many Training Days or months required for the technology to be learned properly? | 3-4 days |
| 17. | How to be implemented form the root to tip | It's very low cost high return and need not required huge land like other farming crops. Everybody can setup in their own kitchen garden and even top of the RCC roof. No investment for electricity, other raw material required. |
| 18. | If it can be implemented at Family level or external manpower is required? | Only half an hour to one hour is required to look after (sprinkle watering) the pit per day. |
| **Additional Information** | | |
| 19. | How many Manpower required? | During harvesting of vermicompost at least two manpower will be required for 2-4 days (harvesting and collection of waste materials, weeds, cow dung etc.). One manpower will be regularly required for monitoring and watering, collection of bio-waste etc |
| 20. | What is the Status of Commercialization | It can be commercialized.<br>Depends upon the awareness of organic benefit.<br>In Itanagar locality of Arunachal Pradesh its cost ₹ 35-40/- per kg of vermicompost. |
| 21. | Scale of Funding required all total? | Depends upon the income expectation per month (for commercial big vermin pits) |
| 22. | Budget with breakage? | Not exceeds than ₹ 100000/- (one lakh) |
| 23. | What type of Certification Required for the product? (If required) | It depends upon the NPK ratio. Optimum NPK ratio will always be maintained if varieties of small and broad plant leaves are added along with cow dung as feeding supplement in the pit. |
| 24. | Risk involved? | Nothing. Eco-friendly forever. |