विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF
SCIENCE & TECHNOLOGY

TECHNOLOGIES IMPLEMENTED BY

WOMEN TECHNOLOGY PARKS (WTPs)

Catalyzed and Supported by

Science for Equity Empowerment and Development (SEED) Division

Department of Science & Technology
Government of India

Vigyan Prasar
An Autonomous Organisation of
Department of Science and Technology
Government of India

Contents

Preface

Introduction

Simple technologies that are easy to operate and are a source of livelihood generation for rural women lie at the core of Women Technology Parks (WTPs). The basic philosophy is ensuring the empowerment of women through their engagement with a simple technological setup and its operation that leads to income generation besides skill enhancement. The technologies that lie at the pivot of WTPs are plain technologies that are easy to learn and train and give women the confidence that can also be the architect of their own destinies, can earn for themselves and their families like the male members and have a sense of worth.

Thus, WTPs ensure greater participation of women in the socio-economic realm. These tend to develop into microenterprises and strive for making women entrepreneurs. The technologies utilised by WTPs use local resources that are available in plenty as raw materials. Easy to procure, available in abundance, and the nominal cost are some of the peculiarities that make any local resource fit to qualify as a raw material for a WTP. Sustainable use of natural resources as raw material is an environment-friendly approach that ensures optimum utilization, longevity, and productivity.

The technologies deployed at WTPs are need-based and cater to one or more requirements or necessities of the local population. Their processes are simple and plain while the end products/outputs are cost-effective and have their worth in fulfilling the needs of locals. Sincere attempts have been made by WTPs to make their products part of the value chain and create demand in the market. Market access for the products generated by WTPs is essential to make these entities run as microenterprises, as it would help create a demand-supply chain for the WTP products and yield profits that eventually lands up in the hands of rural women. Though simple, these technologies have brought positive changes to the lives of rural women bringing them into the mainstream of socio-economic life.

When it comes to the sustainability of these Parks and their long-term operations, the upgradation of technology and its modulation is a must. It saves the WTP technology from obsoletion, helps it cater to emerging needs, and comes up with more refined and demand-oriented products. As a result of the operation of technology, by-products are also generated which comes as an additional advantage both in terms of livelihood generation and fulfilling local needs. Parks have been established as common facility centres for trained women to manufacture the products.

For the purpose of the study of WTPs, the technologies have been mainly demarcated under seven categories – Agriculture and Allied, Waste to Wealth, Healthcare, Energy, Information Technology, traditional technology and Assisted Technologies—based on the resources that these Parks utilise and technology modulation and customisation they have adopted. The compendium describes in detail the local problem that has been identified, the introduction of the technology as a solution, training that has been imparted and how micro-enterprises have been developed in some cases. Also described thoroughly are how WTPs have brought changes in the lives of communities in general and womenfolk in particular by creating livelihood opportunities. Further, the role of the Institutions involved and that of other stakeholders have also been stressed.

Agriculture and Allied

Arecanut De-husker

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About Technology

A 200-kg weighing machine that can de-husk 200-250 kg of areca nuts per hour, operating on a 1 Horsepower (HP) motor. It peels the husk instead of cutting the nuts and reduces drudgery, processing time, and cost.

Focus Area

Agriculture and Allied

Problem Addressed

Arecanut husking was a hectic task that required a lot of labor and time. The machines that have been developed were not much productive as they ended up damaging the areca nuts.

S&T Component

Easy to maintain and operate. The de-husked areca nuts come out through side paths while the husk is collected on the other side.

Impacts

- The use of technology saves time and effort on the part of women.
- It helps increase income by improving the quality of the product.
- Provided employment to women from families that are victims of Endosulfan.
- Skill development in trainees. They learn to operate the de-husker, maintain it, and pack and store the products.

Low-Cost Egg Incubator

About Technology
The solar-powered incubator is a fully automated insulated box that provides a conducive environment for hatching fertilized eggs. The incubator can incubate 100 eggs at a time and optimizes the incubation duration.

Focus Area
Agriculture and Allied

Problem Addressed
In Meghalaya, the artificial incubators in use were solely dependent on the electricity supply and were faced with intermittent power cuts that adversely affected the hatching of eggs. To solve this problem, the incubator was connected to solar panels to ensure the power supply was uninterrupted.

S&T Component
Connected to the solar panel to ensure an uninterrupted power supply, the incubator provides the perfect environment— the temperature at 37 °C, humidity at 60 percent – for incubation and hatching of eggs. The eggs placed inside can also be turned regularly to ensure proper incubation.

Impacts
- Low operational cost, high efficiency, and more production lead to women poultry farmers' economic empowerment. It adds to the annual income of farming households, thereby enhancing the quality of life.
- It reduces the workload and drudgery among womenfolk.
- It leads to skill development among poultry farmers.
- A high production rate and better-quality lead to more demand in the market.

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Local Agriculture and Horticultural Products

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About Technology

Value-addition of local agriculture and horticulture products.

Focus Area

Agriculture and Allied

Problem Addressed

The primary source of livelihood for the majority of the population is agriculture. Almost every household grew seasonal vegetables and spices in summer and winter vegetable gardening, but there was no custom of adding value to the local food crops.

S&T Component

To enhance the income opportunities amongst the rural communities, a micro food processing, and value addition unit was established to add value to local fruits and vegetables. Seven women's SHGs established themselves as small-scale food crop processors after capacity building. The SHGs procure the major raw materials from the village households and undertake food processing activity at a shared facility. The SHGs utilise locally available vegetables and fruits, such as starfruit, chilli, bamboo shoot, lemon, king chilli, gooseberry, ginger, coconut, etc., and manufacture value-added products such as pickle, jelly, jam, biscuits, fruit juice, coconut oil, chips, cookies, and chocolates.

Impacts

- The initiative has effectively demonstrated rural potential based on the value addition of regional food crops, producing a variety of food products that support the home and local community's economy.
- The value-added products produced by the SHGs are marketed in the village shops, weekly markets, and nearby townships.
- There was an improvement in general knowledge of potential choices for livelihood enhancement as a result of raising awareness of the possibilities for adding value to food crops in the villages.

Production of Virgin Coconut Oil (VCO) and Minimal Processing of Fresh-cut Vegetables

About Technology

Virgin Coconut Oil is produced by wet milling and centrifuge method instead of using the traditional Refined, Bleached, and Deodorized (RBD) method. The VCO, thus obtained, contains all the natural constituents, aroma, and other antioxidants. Minimally processed vegetables are hundred percent usable products that are packaged to offer consumers high nutrition, convenience, and flavor while still maintaining their freshness.

Focus Area

Agriculture and Allied.

Problem Addressed

Earlier, the raw coconut was used for converting to sun-dried copra for extraction of ordinary coconut oil using an expeller which is then refined using chemical methods. On the other hand, Virgin Coconut Oil (VCO) is extracted by centrifugation of coconut milk, and the VCO thus obtained contains all the natural constituents, aroma, and other antioxidants. The VCO has become one of the iconic products of the health and wellness trend at the national and international levels. VCO has become popular in mainstream supermarkets, and its industrial application is growing.

Minimally processed vegetables are hundred percent usable products that are packaged to offer consumers high nutrition, convenience, and flavor while still maintaining their freshness. This will be highly beneficial to the trainees as it saves time while maintaining the nutrition and freshness of the vegetables. Minimally processed vegetables, also called ready-to-cook products, offer the following advantages: (i) value-added alternative products to fresh vegetables for the local and export market, (ii) lower transport costs, (iii) No waste at the point of consumption.

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S&T Component

The production of Virgin Coconut Oil from coconut milk involves the following operations— coconut de-husking, splitting, grating, pressing, coconut milk clarification, mechanical agitation, centrifugation, microfiltration, and bottling. Minimal processing of fresh-cut vegetables involves manual trimming and washing, peeling and slicing, washing and disinfection, moisture removal (centrifugal drying), packaging, and storage at refrigerated temperature.

Impacts

- The VCO has great appeal in the national and international markets. The VCO does not contain trans-fatty acids; it has a high level of Lauric acid and is not refined. The VCO has become one of the iconic products of the health and wellness trend at the national and international levels.
- Virgin coconut oil and natural coconut vinegar have good demand in the market, giving them an additional income source.
- Additional employment opportunities and improved livelihood.
- FSSAI certification was obtained for the products; virgin coconut oil and natural coconut vinegar.
- The economic viability of the virgin coconut oil producing plant having the capacity to process 1000 coconuts per day and producing 50 litres of virgin coconut oil daily - Annual Profit: Rs.17,28,000/-
- The economic viability of minimally processed fresh-cut vegetable plant with a capacity of processing 300 kg of vegetables per day - Annual Profit: Rs.12,80,000/-

Grain Puffing cum Roasting Machine

About Technology
The motorized and efficient grain puffing cum roasting machine produces puffed rice, popcorn, roasted gram, and roasted peanut.

Focus Area
Agriculture and Allied

Problem Addressed
Puffed grains are in high demand in the market, but the traditional method is expensive, and the process is time-consuming. The modification of the Grain puffing cum roasting machine to a new mixer grain puffing cum roasting machine saves time and effort on the part of women workers.

S&T Component
The traditional machine has been modified so as to have less processing time, minimum fuel input, and maximum output. The container containing sand is heated for 20 -25 minutes with fuel wood. Once the sand is heated, the raw materials are added to get the products. The machine can produce 500 kg per day, working 5 hours a day.

Impacts
- Less processing time.
- More output.
- Reduces efforts on the part of women.
- Income generation for women.
- Skill Development and Entrepreneurship for women.

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Oyster Mushroom Production and Drying Process

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About Technology

Development of value-added, Vitamin D enriched, dried mushroom powder-based health drink.

Focus Area

Agriculture and Allied.

Problem Addressed

Provide an opportunity for better utilization of natural resources for livelihood generation.

S&T Component

The cultivation of Oyster mushrooms on paddy straw and spawn. The biological yield of one oyster mushroom bed prepared using 3 kg (wet weight) of paddy straw and 150 g of bed spawn was 25 – 35%.

Selection of effective drying methods (sunlight, artificial drying, and UV treatment). The mushrooms were equally divided for each condition, such as sun drying, artificial drying, and UV treatment. Sun drying - The sliced oyster mushroom samples were exposed to sunlight over a period of 6 hours for two consecutive days. The dry weight of the mushroom samples was calculated before and after drying for further analysis. UV treatment - Oyster mushroom samples were irradiated using UV-B light (306 nm) and placed at a distance of 1.25 inches from the Quartz window. The sliced mushrooms were exposed to UV-B light for 60 minutes, followed by drying in a hot air oven for 3 hours @ 65°C.

Quantification of vitamin D in freshly sliced mushrooms was taken as a control.

Impacts

- Enhanced Vitamin D level in food.
- The food industry to take up the production of vitamin D-enriched dried mushrooms as a novel food formulation and value addition of mushrooms developed as soup powder.
- Hands-on training is required on producing oyster mushrooms and drying methods like sun drying, UV treatment, etc.

Growth of oyster mushroom | Dried Mushroom | Powdered Mushroom

Nursery Techniques and Homestead Cultivation of Medicinal plants

About Technology
Homestead cultivation of medicinal plants and plants having nutritional with semi-processing.

Focus Area
Agriculture and Allied

Problem Addressed
Many rural households are engaged in diverse unskilled or semi-skilled vocations in the non-farm sector. Further, due to the lack of access to S&T infrastructure and facilities, they cannot earn sufficient income to sustain their livelihood. A significant women population in the target villages of Bengaluru rural District belong to economically and socially disadvantaged households. Due to difficulties experienced by these households, on account of monsoon failures, increasing costs of agricultural inputs, etc., a large number of rural households are engaged in diverse unskilled or semi-skilled vocations in the non-farm sector.

S&T Component
Vermicomposting techniques; Nursery techniques for medicinal plants; Homestead cultivation of medicinal and nutritional plants; Semi-processing and value addition of Medicinal plants.
Technology Develop/Facilitator: Foundation for Revitalisation of Local Health Traditions (FRLHT), Bengaluru

Impacts
- Income generation
- Environment-friendly approach as the use of chemical fertilizers and pesticides is
- reduced.
- Skill development among women.
- Entrepreneurship development among 200 women in Rural Bengaluru.
- Enhanced awareness, knowledge, and skill set on medicinal plants and traditional
- healthcare of humans and livestock.
- Women take care of the primary healthcare needs of their families, through the use of
- medicinal & nutritional plants.

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Cultivation of Medicinal & Aromatic Plants (MAPs)

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About Technology
Medicinal and Aromatic Plants (MAPs) are high-value natural resources providing additional income to a large section of deprived and underprivileged populations, particularly forest dwellers and a number of tribes whose livelihood depends on MAPs found in the forest.

Focus Area
Agriculture and Allied

Problem Addressed
The medicinal plants of Uttarakhand have been used since ages to cure various chronic ailments. Currently, their existence is jeopardised for several reasons, including habitat alteration, overexploitation, and climate change. The decrease in the supply of MAPs and their recognition as an essential ecosystem service that has a direct positive bearing on human well-being has sparked interest in examining and exploring ways for their sustainability.

S&T Component
Natural forests are under tremendous strain in nations with a large populations, like India. Since MAPs can be grown in extreme (saline/alkaline/acidic) soil conditions, degraded and eroded soil, and intercropped with plantation crops and fruit orchards, they are ideal for small farm holders. They are also

resistant to insect pests and diseases. Polyhouse and nurseries were developed at the Bidholi campus of the University of Petroleum and Energy Studies (UPES), Dehradun, for cultivating MAPs such as Stevia, Chamomile (tea), Tulsi, Ashwagandha, Sarpagandha, Lemon Grass, Aloe Vera, and Kaliyari. A lab and an extraction unit were established for carrying out research work and extracting essential oil from different MAP species. A training programme was also conducted on the identification and cultivation of MAPs. Multiple institutes provided technical backup and linkages for research, training, and marketing.

Impacts

- Essential oil of aromatic species was extracted, and herbal medicinal oil was prepared using 32 herbs.
- Cultivation of MAPs benefitted the farmers monetarily.
- The initiative empowered women; An SHG comprising 11 women farmers in Birsaini village of Sahaspur is working on aloe vera cultivation.
- Market linkages were established with Baagwan NGO, Himalayan Women Cooperative Society, and UPES.
- The cultivation of MAPs can significantly improve poor people's livelihood, reduce the pressure on natural forests, enhance biological diversity, and promote sustainable development.

Technology Developer/ Facilitator

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3. Bagwaan Gramoudyog Samiti, Premnagar
4. Forest Research Institute, Dehradun
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6. Aushadhigarbha Himalaya Pvt. Ltd.

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Vermicomposting Techniques

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Technology Developer/ Facilitator

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About Technology

Imparting skills of vermicomposting technique

Focus Area

Agriculture and Allied

Problem Addressed

Significant women population in the target villages belonged to economically and socially disadvantaged households and experienced difficulties on account of monsoon failures, lack of access to S&T in farming, increasing costs of agricultural inputs, etc. A large number of rural households were engaged in diverse unskilled or semi-skilled vocations in the non-farm sector but could not earn sufficient income to cope with the increasing cost of living.

S&T Component

The problems were tackled by imparting simple skills of vermicomposting technique and promoting entrepreneurship among the women. The technology requires materials like agricultural waste, soil, and earthworms, minimal capital investment, and can be implemented at the village and household levels. The facility of vermicompost pit was provided through the Panchayat and the Institute of Horticultural Research.

Impacts

- Five vermicomposting units have been established by women entrepreneurs, while two more units are under establishment.
- Enhanced their awareness, knowledge, skills, and economic well-being.
- Income generation and improved quality of life.
- Promoted entrepreneurship among women from economically and socially disadvantaged rural households through technology transfer.
- Promotion of environment-friendly green technologies and cost saving by the reduction in the usage of chemical fertilisers and pesticides.

Urea Molasses Mineral Block (UMMB)

About Technology
The Urea Molasses Mineral Block (UMMB) caters to the nutritional requirements of dairy animals and helps resolve their nutrient deficiencies, thus, improving milk production.

Focus Area
Agriculture and Allied

Problem Addressed
Diet of Ruminants is based on fibrous feeds, mainly mature pastures, and crop residues (e.g., wheat and rice straw, maize, and sorghum stover). These feeds are imbalanced as they are deficient in protein, minerals, and vitamins. Also, being highly lignified, their digestibility is low. Mineral deficiency is the primary cause of poor milking and animal health-related issues. UMMB has solved these problems and improved milk production.

S&T Component
UMMB is a perfect blend of Molasses, Urea, Mineral mixture, $CaCO_3$, DCP, Common salt, DORB, Malt sprout, Rice polish, and dry Azolla. Microbial protein can contribute 30–40 % of the crude protein requirement of an animal. Therefore, Azolla is added in the UMMB as one of the crucial ingredients due to the high content of proteins, essential amino acids, vitamins (vitamin A, vitamin B12, Beta Carotene), growth promoter intermediaries, and minerals material.
Molasses 25 kg + Urea 12 kg + Mineral mixture 8 kg + $CaCO_3$ (Calcium Carbonate) 10 kg + DCP (Digestible crude protein) 10 kg + Common salt 8 kg + DORB (De oiled Rice Bran) 12 kg + malt sprout 6 kg + Rice polish 4 kg + Dry Azolla 5 kg.

Impacts
- Improves animal health.
- Improves average milk production by 10 to 12 percent.
- More income to dairy farmers.

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Urea Molasses Mineral Block (UMMB)- Goat Special

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About Technology

Development of a quality goat feed mineral block using Azolla and moringa leaves.

Focus Area

Agriculture and Allied.

Problem Addressed

Mineral deficiency in goats leads to poor health and low milk and meat production. The use of dry Azolla and Moringa in goat feed proved beneficial for their health and has increased their milk production capacity.

S&T Component

Moringa leaves contain a good amount of beta-carotene, vitamin C, calcium, magnesium, and iron. Moreover, Moringa leaves are a great source of protein, and about 92% of the protein found in Moringa is digestible and thus can be used as fodder for animals like goats.

The urea molasses mineral block is prepared by adding Jaggery 40 kg + Mineral mixture 10 kg + $CaCO_3$ 10 kg + Common salt 8 kg + DORB 10 kg + Wheat Bran 15 kg + Dry Azolla 4 kg + Dry Moringa leaves 3 kg.

Impacts

- Improved health of goats and increase in their body weight.
- Increased Milk production.
- Livelihood generation for livestock farmers.

Azolla Cultivation for Poultry Feed

About Technology
Development of dry Azolla-based poultry and fish feed.

Focus Area
Agriculture and Allied.

Problem Addressed
There were nutritional deficiencies in fish and poultry birds, adversely affecting the production and thus having a bearing on the income of farmers.
Azolla-based poultry feed is beneficial to poultry farmers in terms of feed cost reduction and quality and yield improvement. Azolla has a high protein content, essential amino acids, vitamins (Vitamin A, Vitamin B12, Beta Carotene), growth promoter intermediaries, and minerals like calcium, phosphorous, potassium, ferrous, copper, and magnesium. It caters to the nutritional deficiencies in livestock, makes them healthy, and increases yield.

S&T Component
Azolla is an aquatic fern that cannot be stored for a long time after harvest because of excess moisture. Hence, excess moisture must be removed to increase its storage. Azolla cultivated in plastic tubs were dried in the shade, and only 10 percent was obtained as dried Azolla. The dried Azolla, groundnut cake and fish meal were powdered using a mixer. The Wheat flour


Azolla cultivated in tub


Dried Azolla


Formulated Fish Feed

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and the powdered contents in calculated ration were mixed with enough water to be made into fine dough, making it feasible for extrusion. Extrusion is a technique that is used for making small pellets. The pellets were extruded using a kitchen extruder of pore size 2mm. The pellets are then dried and used as feed for fish.

Impacts

- Have the potential to replace 20 percent of the regular poultry and fishery diet available in the market.
- The Azolla supplementation is cost-effective and improves the quality and yield of poultry and fishery.
- Increases income of poultry farmers and fish farmers

Dired Azolla

Treatment Birds

Collected eggs

Waste to Wealth

Banana Fibre Extraction Technology

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About Technology

Banana fibre extraction technology comprises various tools and techniques for blending the banana fibre with cotton. These are a group of proprietary technologies that provides an innovative solution to banana fibre extraction and blending it with textile materials. The technology involves producing banana fibre from stems and winding of fibre on pirns for the direct use of power looms or handlooms. This technology is mainly used by the cottage industry. However, it also finds use in cloth packaging for agricultural produce, door mats, decorative articles, handbags, etc.

Focus Area

Waste to Wealth

Problem Addressed

Earlier, the banana stem was not utilized and was usually discarded as waste. However, with the introduction of technology, the worth of the Banana stem has been realised. Banana fibre is a natural fibre with high strength, which can be blended easily with cotton fibre or other synthetic fibres to produce blended fabric & textiles. Banana fibre extraction has received a lot of attention from women in the region.

The use of banana fibre as a textile material is a new concept. The Government of India has identified Warangal district as the main cluster for the development and promotion of banana fibre extraction.

S&T Component

The technology comprises a group of developed proprietary technologies blending the banana fibre with cotton. The technology involves producing banana fibre from stems through a machinery set-up and winding fibres on pirns for direct use in handlooms.

Impacts

- It led to skill development among the women folks.
- Increased financial literacy among women and has brought market awareness and technology adoption.
- Severalfold increase in annual income of women.
- Blended fabric and textile of high quality.
- Optimum utilization of naturally available raw material.

Women working on Banana Stem Cutter

Women extracting banana fibre at Atmakur village

Palletisation Technology

About Technology
Production of biomass-based fuel pellets by an improved method that utilises biomass from agriculture, horticulture, and forest as well as food processing waste to produce energy-rich fuel pellets for meeting local energy requirements.

Focus Area
Waste to Wealth

Problem Addressed
Unemployment is high in the Hoshiarpur district of Punjab, and people struggle to meet their fuel energy requirements. However, the region is rich in natural bioresources. The available biomass has the potential to cater to energy needs, especially in rural areas. Biomass-based fuel pellets cater to energy requirements and are also a way for the proper utilization of agricultural waste and other forest-based resources.

S&T Component
The Biomass Pellet Machine for the production of fuel briquettes utilizing paddy straw produces fuel pellets using different biomass combinations like Lantana camara, Amla processing waste, Sugarcane bagasse, forest leaves, wheat straw, etc. The trails runs have proved the enhancement of the operational efficiency and fine-tuning of the machine. Analytical testing of Pellets for qualitative parameters, viz. moisture, ash content, volatile matter, proximate & ultimate analysis, gross calorific value, etc., have also provided similar positive results. It has the capacity of producing 75 kg/hour of fuel pellets. The Gross Calorific Values of the fuel pellets prepared were found in the range of 3700 – 4000 Kcal/Kg.

Impacts
- Alternative and substitute sources of energy in place of wood in domestic stoves, hotels, and community kitchens.
- They can also be utilized in industrial boilers for heating purposes as a substitute for coal.
- Biomass pellets as fuel are reasonably better than that of using firewood as the main fuel. The amount of PM10, SO2, NH3, and CO in biomass pellet-heated households is the lowest.
- Biomass pellet stoves are very effective in improving the indoor air quality of rural households, reducing indoor pollution and respiratory outbreaks.
- Source of Income Generation for women.

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Wastepaper Recycling Unit

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About Technology

Innovative technology for recycling waste papers and manufacturing paper products from recycled papers.

Focus Area

Waste to Wealth

Problem Addressed

In the rural areas of Salem district, Tamil Nadu, the majority of the population is involved in farming or as daily wage labourers living below the poverty line. A detailed field visit was conducted to connect with the rural women and provide them with knowledge of the latest technologies so that they could secure a decent livelihood. One such method is the recycling of waste paper. A large amount of paper waste is generated daily, but only a small fraction gets recycled, while a large fraction is dumped or disposed of, causing environmental repercussions. This machine recycles waste paper and produces various products from recycled paper.

S&T Component

The women received both theoretical and practical training. The theoretical classes comprised information about raw materials, the basis of technology, basic necessities, and marketing methods. In the practical sessions, the candidates learned about the chemical mixing ratios and received hands-on training on paper recycling, product manufacturing, and machinery operation and maintenance.

Impacts

- Recycling waste paper is an eco-friendly process since it utilizes waste paper and produces a variety of paper products, thus reducing deforestation.
- The trainees can increase their income and livelihood by making and selling various paper products. The increase in income also translates into awareness about safe and hygienic livelihood and empowerment.
- In the long run, the trainees can also become entrepreneurs in the paper product-making industries.
- The recycling and product development from 500 kgs of waste papers resulted in a net profit of Rs. 50000.

Making Handmade Paper

About Technology
It is a simple eco-friendly process for producing recycled handmade paper. Handmade paper and boards find multiple uses in office stationery in the form of file covers and file boards, as well as in printing and packaging industries as invitation cards, visiting cards, lampshades, carry bags, and a wide range of decorative items.

Focus Area
Waste to Wealth

Problem Addressed
This technique utilises locally available waste papers and bio-waste to produce recycled paper.

S&T Component
Handmade paper and boards are manufactured from various materials, such as waste paper and natural fibres. Apart from the conventional raw materials like rags, a few other raw materials like water hyacinth, banana fibres, etc., can be used depending on their availability in the locality. The raw materials required for the process are waste papers, rags, other cellulosic materials, and chemicals. However, the parameters of the process will vary with the type of raw material.
Technology Developer: Council of Scientific and Industrial Research, North-Eastern Institute of Science and Technology (CSIR-NEIST), Jorhat, Assam.

Impacts:
- The products are biodegradable and environment-friendly.
- Implementation requires low capital investment.
- Unskilled youths are imparted the training necessary for manufacturing handmade paper, thus leading to skill development and capacity building.
- Entrepreneurship among unemployed youth from NE.
- Transfer of Technology by CSIR-NEIST to two companies.
- Quite fair profit margin worth Rs. 55,563 per month by a unit producing 200 kg of handmade papers and boards daily.
- According to the Khadi & Village Industries Commission, the handmade paper industry has a vast potential to cater to the growing demand for paper products.

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Cow Dung Pots Making Machine

Details of WTP

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About Technology

This simple Machine produces eco-friendly cow dung pots made primarily of cow dung, sawdust, and guar gum, which help reduce the harmful environmental impact of polythene bags.

Focus Area

Waste to Wealth

Problem Addressed

Nurseries generally sell plant saplings in plastic bags. Once the plant is transferred to mud or cement pots, the plastic bags are discarded and disposed of, ending up either in landfills or incinerated, resulting in environmental pollution. The wind can also carry these bags away to nearby water sources or green patches, where they are consumed by marine organisms or grazing animals which consequently die from stomach ailments. A simple, innovative machine was introduced to replace plastic pots with cow-dung pots, which may help reduce the environmental menace caused by plastic bags.

S&T Component

The value of the pots is much higher than that of raw cow dung. The machine used to produce the cow dung pots is simple to operate and improves production efficiency. The pots are eco-friendly since they reduce the menace of plastic bags and promote the utilization of waste.

Impacts

- The machine reduces drudgery, helps utilize local resources, and increases productivity and efficiency.
- The women were trained in the manufacturing and marketing of the pots and received handholding until they could work independently.
- The cow dung pots can be used for planting saplings and sold in nurseries and markets.
- The sale of 250 cow dung pots brings a net profit of Rs. 4870.

Bio-Plates and Leaf Cup Machine

About Technology
A machine to modify the locally available Sal leaves and fabricate strong, elegant, and uniform bio-plates and leaf cups.

Focus Area
Waste to Wealth

Problem Addressed
The raw materials used for making the bio-plates and leaf cups are Sal leaves which are abundantly available in Tripura. The leaves did not find any use, and hence a technical solution was identified based on the gap areas identified and the interest level of the local population to manufacture bio-plates and leaf cups using a simple machine.

S&T Component
The Machine helped prepare more robust, elegant, and uniform cups and plates of different sizes from the Sal leaves, and these eco-friendly products are now being used as an alternative to paper plates/other plates made up of plastics. The technical solution was identified, adopted, and disseminated based on factors like the availability of raw materials in the vicinity and infrastructural support like building, electricity, etc. Skill development training was provided by the resource persons of IIT, Kharagpur, and CFTRI, Mysore.

Impacts
- It is an eco-friendly product and can be used regularly to replace paper/ plastic and thermocol waste.
- The trainees already sell the product in the local market.
- Women are getting empowered in terms of income enhancement and upgradation of the standard of living.

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Technology Developer/ Facilitator
Central Food Technological Research Institute, Mysore

Biomass Dryer

Details of WTP

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About Technology

Design and development of biomass dryer with drying protocols, resulting in an increase in shelf life and value addition of fruits and vegetables.

Focus Area

Waste to Wealth

Problem Addressed

India ranks second in the world for the production of fruits and vegetables. However, a 2013 study found that 18% of the produce worth Rs. 13,300 is wasted yearly. When dried, fruits and vegetables lose 70-90% of their water content but retain all their nutritional value. With a moisture content of less than 8%, the dried products have a shelf life of more than six months, and the value addition is also 2-3 times.

S&T Component

Since both electric and solar dryers have disadvantages such as high cost, access issues in remote areas, and difficulty in controlling the rate of drying and end point of moisture, thus a thermal biomass dryer was designed and developed. The dryer uses biomass for thermal energy and is designed to ensure maximum heat transfer, efficient burning, and controlled emissions. A tray dryer housed in a cabinet with a drying capacity of 25-1000 kg was fabricated along with

the development of protocols for drying fruits and vegetables, including preparation steps on cutting, loading, batch time, moisture percentage, and end time. The technology was commercialised through entrepreneurs, Self Help Groups (SHGs), and other Civil Society Organizations (CSOs).

Impacts

- Introduced biomass drying as a source of income for rural women, founded the self-help group MANINI and developed a scalable institutional model for women's drying enterprises.
- Subsequently trained five other organizations across the country that are now producing commercial products through drying.
- Actively promoted the drying of turmeric and areca nuts in Northeast India.
- Popularised thermal biomass dryers in agricultural drying processes for produce like vegetables, medicinal plants, turmeric, cardamom, and areca.
- Entrepreneurs can earn up to Rs. 25000 per dryer. Farmers/SHGs can add up to 200% to the value of their produce by drying it and increasing its shelf life.
- When the markets for raw fruits and vegetables are shut down, biomass drying is necessary. It reduces wastage and drudgery and can act as an additional livelihood source.

Technology Developer/ Facilitator

Technology Informatics Design Endeavour (TIDE)

TIDE 25 @ 2018

Lac-coated Dung Diyas

Details of WTP

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About Technology

Eco-friendly diyas made of cow dung. These are chemical-free diyas, and the ash residue can be used for plants as compost and as a natural fungicide.

Focus Area

Waste to Wealth.

Problem Addressed

Cow dung is mostly used as fuel in rural areas. Due to the lack of proper use of animal dung, animal husbandry is not profitable. It was also found that farmers are also reducing the use of dung in manure preparation.

To mitigate this, rural women in livestock farming use cow dung for their livelihood by making cow dung Diyas. Thus, it has emerged as a good source of income for rural women.

S&T Component

The value of these Diyas made from cow dung was enhanced by coating them with Lac. It is a mixture that is produced Diyas in a Die machine by mixing Multani mitti (Fuller's earth), Guar gum, Mustard oil, Gobar (Cow dung), Gypsum

Impacts

- Livelihood generation for rural women.
- Eco-friendly, chemical-free Diyas.
- The ash residue is utilised as compost and natural fungicide.

Animal Dung Pot/Lac Coated

About Technology
Utilisation of cow dung and agriculture waste to make an eco-friendly biodegradable pot.

Focus Area
Waste to Wealth

Problem Addressed
Animal husbandry was not lucrative due to improper usage of stray and domestic animal dung. A survey revealed that farmers used a lower quantity of dung in manure preparation, further contributing to the wastage. In such a situation, eco-friendly pots made from dung were employed to pique the interest of women farmers.

S&T Component
Fresh cow dung, wheat atta, Chlorpyriphos, Carbendazim, and a die machine is required to make biodegradable pots. The pots can be made strong and pest resistant by mixing cow dung and other natural binders in the correct proportions. The shelf-life of the cow dung pot is extended by the addition of Chlorpyriphos 25% Emulsifiable Concentrate (EC) (2ml/kg) and Carbendazim 50% Wettable Powder (WP) (2g/kg). Lac coating on the pots added further value to the pots. The machine is manually operated, easy to use, and requires no ongoing maintenance. Pots of different sizes can be produced on the same machine. A capital investment of Rs. 1000-1200 is needed to prepare 100 pots, which are sold for Rs. 12 each. One woman can produce roughly 10-12 pots per hour and attractively amplify their income.

Impacts
- The pots are eco-friendly and biodegradable since they are made of cow dung and agricultural waste.
- Animal dung pots are better suited for seed germination and transplanting flowers/ornamental plants.
- Lac coating on animal dung pots adds value to the pots, and such lac-coated pots are suitable for offices.
- The sale of these value-added products helps farmers amplify their income. The income gained was utilized by updating their skills in farming activities, thereby improving their quality of life.
- During the training program, women farmers, people in the village, and school dropouts showed an interest in innovation and value addition.

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Agro-waste Usage for Mushroom Cultivation

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About Technology

The technology uses wheat/paddy straw as a substrate for spawning in mushroom cultivation. Spawn is the living fungal culture, called mycelium, grown onto a substrate. It provides the backbone to any mushroom-growing operation. It is the equivalent of seeds for a mushroom farm. In this technology, Pleurotus sajor-caju, a high-value mushroom variety, is cultivated over the substrate (various agricultural and forest wastes) without composting.

Focus Area

Agriculture and Allied

Problem Addressed

Stubble burning and burning of farm waste leading to environmental pollution is a significant problem in Punjab. The utilisation of agro-waste as a substrate in mushroom cultivation is a positive step towards solving the problem of stubble burning up to some extent.

S&T Component

The cultivation of mushrooms on a substrate that is agriculture and forest waste without the method of composting. Also, the dried product has a greater shelf-life.

Impacts

- Pleurotus is a unique variety of high-value fungi used in food, especially as a flavouring agent.
- Skill development among women.
- It is one of the most suitable fungal organisms for producing protein-rich food from various agro-wastes or forest wastes without composting.
- The average price of 1 kg of dried Pleurotus is approximately Rs. 1200-1400.
- Cultivating this fungus commercially is quite profitable as capital costs are low.
- It helps solve the problem of stubble burning up to some extent.

HealthCare

Bio-Sand Filter (Plastic Barrel)

Details of WTP

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About Technology

Manufacture of user-friendly bio-sand filters using plastic barrels.

Focus Area

Healthcare

Problem Addressed

In India, approximately 82 percent of households rely on private hand pumps for drinking water and consume untreated water, resulting in the prevalence of water-borne diseases. As a result, the women were trained in water quality monitoring and management, and bio-sand filters were introduced.

S&T Component

The barrel bio-sand filters were crafted from reused plastic barrels, PVC pipe, perforated intake candle (20 cm), GI Tank nipple, plastic socket, elbows, plumbing tape roll, plastic washbasin, accessory fittings, strainer net, and mosquito mesh. Other raw materials included coarse sand, gravel, charcoal, stone chips, and charcoal retaining bag. The purity of the filtered water was demonstrated with various portable water testing kits for parameters such as pH, Total Dissolved Solids (TDS), iron, fluorides, chlorides, nitrates, turbidity, and hydrogen sulfide (H_2S).

Impacts

- Awareness generation among the women on safe domestic water quality management and water-related health issues.
- Ten women self-help groups (SHGs) trained as water managers and possessing detailed knowledge of water quality monitoring operate as micro-enterprise units promoting bio-sand filters.
- The technology provided 20 percent of households with safe drinking water leading to improved human health, reduced water-borne diseases, and improved food quality. The enterprises also offer maintenance services for additional income generation.
- The women SHGs disseminated 150 bio-sand filters at the local level, with the price of each filter set at Rs.1800, which is collected in monthly installments (EMI).

Bio-Sand Filter (BSF)

About Technology
The bio-sand filter (BSF) is a simple household water treatment device that is an advancement over the traditional slow sand filters specifically designed for intermittent use.

Focus Area
Health Care

Problem Addressed
A number of villages reported difficulty accessing clean drinking water due to the contamination of streams (siltation and bacteria) and drying up of borewells. The water from the borewells contains a high concentration of metals, making its consumption difficult. A slew of new health problems emerged, and as a result, families began boiling the water for drinking. Boiling water for drinking purposes led to the demand for a large amount of firewood in an already depleted forest region.

S&T Component
BSF is a point-of-use water treatment system adapted from the traditional slow sand filters. It consists of a concrete container filled with varying measures and layers of sand and gravel. As water flows through the filter, physical straining removes the drinking water's pathogens, iron, turbidity, and metallic taste. The BSF removes pathogens and suspended solids from water. A shallow layer of water sits atop the sand leading to the development of a biofilm that contributes to the removal of pathogens due to predation and competition for food between non-harmful microorganisms contained in the biofilm and harmful organisms in the water.

Impacts
- The BSF is a proven technology for removing pathogens like bacteria, viruses, and protozoa. The BSF also effectively eliminates physical parameters from water, such as turbidity and iron.
- Compared to other filters, the main advantage of the bio-sand filter is that it does not require regular replacement of the medium (clay and ceramic).
- The BSF has a viable market for providing long-term access to potable drinking water in remote areas, particularly where E. coli contamination is a concern.
- The main advantage of BSF is that it does not require regular replacement of the medium compared to other filters (clay and ceramic). Further, with regular use, the filter grows in efficacy.
- It also qualifies as a community-based carbon project as it off-sets the use of wood for boiling water (one filter can save as much as 2.3 CO_2 tonnes annually).

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Liquid Deodorant Cleaner

Details of WTP

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About Technology

Herbal-based formulation is used as a liquid deodorant cleaner.

Focus Area

Health Care

Problem Addressed

The floor cleaner that is in the market uses harmful chemicals, and the by-products are also harmful to the environment contrarily, the liquid deodorant cleaner is made of an herbal formulation, and no sophisticated machinery or processes are involved.

S&T Component

Made of herbal formulation, it is an improved liquid deodorant. The manufacturing requires no sophisticated machinery or skilled manpower. It uses eco-friendly raw materials like wax, fatty acids, emulsifying agent, fragrance oil, etc.

Impacts

- CSIR-NEIST has licensed the technology to twenty companies and more than two thousand entrepreneurs across the country.
- The technology has massive potential for developing small and medium entrepreneurs due to its low capital investment.
- The quality of products was tested at the Analytical and Quality Control Laboratory, CSIR-NEIST, Jorhat.
- No harmful by-products
- Low-cost investment.

Mosquito Repellent Incense Stick

About Technology
A herbal-based formulation is used for making mosquito-repellent incense sticks which is quite effective in repelling mosquitoes.

Focus Area
Health Care

Problem Addressed
Mosquitoes are widespread and prefer warm, humid, tropical regions like India and are the cause of diseases like malaria and dengue. Herbal Incense sticks do not harm humans and keep mosquitoes away, besides giving a soothing fragrance.

S&T Component
Herbal formulations made from plant sources are used as the basic ingredient, while bamboo is used for the stick.

Impacts
- The technology is low capital intensive and hence easily adopted by small and medium entrepreneurs.
- Entrepreneurship Development
- Ward off Mosquitoes.
- The technology has been licensed and quality certified.
- Used for Incense in social and religious gatherings.

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Mosquito Repellent Candles

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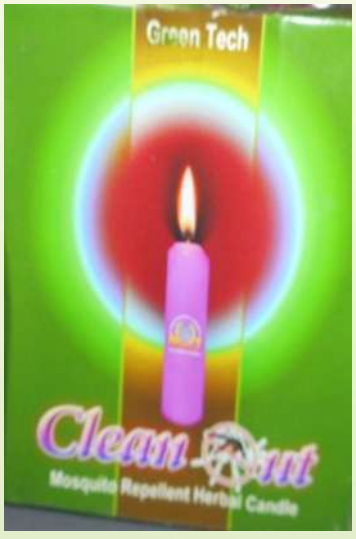

About Technology

Candles with mosquito-repellent properties will serve both as a light source as well as help repel mosquitoes.

Focus Area

Healthcare

Problem Addressed

Mosquitoes are widespread and prefer warm, humid, tropical climates. The incidence of mosquitoes transmitting disease is increasing around the world. Herbal mosquito liquid candle is an effective mosquito-repellent that keeps away mosquitoes and prevents diseases like malaria and dengue.

S&T Component

Herbal-based formulation is used for preparing candles. It is a low-cost technology which is environment-friendly.

Impacts

- Repel mosquitoes
- Emit light and soothing fragrance
- Low-cost technology
- Entrepreneurship development
- Development of strong market linkages.

Energy

Photovoltaic System (PV) Repair and Maintenance

Details of WTP

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About Technology

The technique is in the form of a kit to repair a photovoltaic system, which basically contains a voltmeter and digital mustimeter.

Focus Area

Energy

Problem Addressed

As per the baseline study conducted in Assam in the early 2010s, only 23.20% of households had a connection to grid electrification. But the majority, i.e., 61.32% of households, did not have any access to electricity attributed due to the poor or non-availability of the grid, and only 14.71% of households have solar lighting facilities. It was observed that with a lack of support services for maintaining solar lighting systems, the households utilising solar lighting were declining and adding to un-electrified households. This had called for enabling local capacity for maintaining and repairing photovoltaic (PV) systems as an essential for their continued operation in the identified villages and to improve energy services for essential lighting.

S&T Component

The technique is focussed on the maintenance and repair of photovoltaic (PV) systems through technical expertise.

Technology Developer/Facilitator

1. NB Institute of Rural Technology, Guwahati
2. Assam Energy Development Agency (AEDA), Government of Assam

Impacts

- Women have been capacitated on SPV service & repair.
- Catering to the rural energy requirements where the electricity cuts are intermittent and rampant.
- Skill development among women.
- Improved energy efficiency.

Charcoal-based Briquette

About Technology
The charcoal-based briquette-making utilises mainly agro-waste and other by-products to produce charcoal-based briquettes with the help of a portable charring kiln & briquette machine. It is a high combustion value fuel, lighter in weight, and is used in improved smokeless cooking stoves.

Focus Area
Energy

Problem Addressed
The agro-waste and stubble were mostly unutilised, and farmers burned these, causing environmental pollution. Further, charcoal or wood coal used as fuel in traditional 'stoves' emanates a lot of smoke and other suspended particles that cause harm to the health of women. On the contrary, charcoal-based briquettes are smokeless, tasteless, and have high combustion value. Longer burning time and a uniform and stable burning process ensure proper cooking. Further, the charcoal-based briquette is lighter in weight and thus easy to handle and transport.

S&T Component
Charcoal is the product of the pyrolysis of wood and other raw materials. Pyrolysis is the heating of organic material, such as biomass, in the absence of oxygen. The charcoal is mainly processed in the kiln and is called black wood charcoal. The white ash accounts for 2-3 percent of the charcoal briquette, while accelerants are a minor ingredient. Binder accounts for 5-7 percent. The charcoal produced by adding white ash plays a crucial role in the burning process of charcoal briquettes. The binder is added for plasticity. This has resulted in improving the properties of charcoal-based briquettes.

Impacts
- Utilization of agro-waste for meeting the energy needs of rural households.
- Employment and income generation for women.
- Waste to wealth generation.
- Skill development among rural women.
- Health benefits, as the smoke emission is less compared to ordinary charcoal.
- High combustion value (more than 80 percent of biomass), and hence more efficient fuel.
- Lighter in weight (only 1/5 to 1/3 of original weight) and hence easy to transport and handle.

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Improved Cook Stove Models

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Technology Developer/ Facilitator

Assam Energy Development Agency (AEDA), Government of Assam.

About Technology

Improved cooking stove models that reduce the emission of smoke and fumes.

Focus Area

Energy

Problem Addressed

Firewood is the primary source of fuel for most rural households. However, there was too much emission of smoke and fumes containing harmful gases in traditional cooking stoves that have an adverse effect on the health of women. Energy-efficient mud cookstoves are effective in reducing smoke and fumes and thus improve indoor air quality and don't take a toll on women's health.

S&T Component

Basic raw materials used for the construction of a fixed-type stove are soil, sand, cow dung, and rice husk. For the community stove, the materials required are bricks, loamy soil, sand, cow dung, iron rod, AC pipe and rice husk, hacksaw, hammer, straight-edged knife, etc. Improvements in cook stove design models developed were Sukhad (two pots with Chimney), Pubali and Bhagya Lakshmi Solar box cooker, Solar Parabolic cooker, and Agni Sun star Gasifier (top feed).

Impacts

- Less smoke and fumes
- High efficiency
- Improves Indoor air quality
- Improves the health of women.
- Reduced fuel consumption.

Cow Dung Log-Making Machine

About Technique
An improved technique for the preparation of cow dung logs that reduces drudgery and improves the calorific value compared to traditional log-making.

Focus Area
Energy

Problem Addressed
Rural women have been traditionally using cow dung to make patties which are used in stoves as fuel, however, it involves drudgery. The calorific value of these traditional cow dung logs is low, and requires a lot of wood as additional fuel for burning. Introduction of the high calories cow dung logs yield more output in terms of heat generation and do away with the requirement of wood.

S&T Component
Cow dung log is a combination of dung and straw (or any agro-waste/harvested crop residue) fed into the machine's hopper. The machine mixes raw materials thoroughly, compresses them, and produces logs. By using different sizes of dye, logs of different shapes and sizes can be made. Logs are then dried under the sun to remove moisture.

Impacts
- The enhanced calorific value of cow dung logs and hence more efficient fuel.
- Cow dung logs can be produced in different shapes and sizes as per the requirement.
- Less use of wood and hence environment friendly.
- Used as fuel in Bhattis, Dhabas, and industrial boilers.
- Income generation for women

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Solar Food Processing

Details of WTP

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Technology Developer/ Facilitator

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2. District Industries Centre, Salem
3. KVK (Krishi Vigyan Kendra), Santhiyur, Tamil Nadu

About Technology

Solar food processing increases the shelf-life of seasonal fruits and vegetables so that these products can be stored and preserved for a longer duration and make their way to the market throughout the year. It is a value-addition to farm products, particularly vegetables like tomatoes.

Focus Area

Energy

Problem Addressed

Most farm products, like vegetables, fruits, etc., cannot be stored for long as they petrify, decompose and decay. If these cannot make their way to market or are not sold, it incurs huge losses to farmers. Solar food processing came as a solution as dehydrated vegetables and fruits can be stored for longer and marketed throughout the year, beyond their season. It has provided good income opportunities to the farmers of Salem district, Tamil Nadu, and helped many women farmers sail out of poverty and become entrepreneurs.

S&T Component

The solar tunnel dryer is parabolic in shape for focusing the sun rays from all directions at the center of the dryer. It absorbs heat energy and does not allow it to escape or re-radiate. Further, it does not allow Ultraviolet (UV) rays to enter. The vegetables & fruits are cut into the required shape and loaded in the drier, absorbing the heat and dehydrating these. After drying, they were stored in airtight containers & preserved for a long time. Unique airflow patterns in the drying chamber have been designed to have maximum efficiency and output. Kadappa stone floors are used for re-radiating the stored heat during less solar radiation or cloudy conditions.

Impacts:

- Solar food processing increases the shelf life of fruits and vegetables, thus ensuring that seasonal fruits and vegetables are available throughout the year.
- Skill development among the women farmers.
- Provides ample livelihood generation opportunities.
- Help women become entrepreneurs.
- Production of various

Information Technology

Hand-Block Printing with Computer-Aided Embroidery

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About Technology

This technology was used for value addition to the existing textile industry by coupling traditional hand block printing with computer-aided embroidery.

Focus Area

Information Technology

Problem Addressed

Embroidery on the clothes of both men and women was carried out manually or by the zigzag action of power-operated embroidery machines. But with changing industrial scenario, it was challenging to match the demand by the people for quality products, thus enhancing the need for computerised embroidery. The embroidery work on fabric coupled with traditional block printing provides an advantage in the sale of the fabric and meeting the demands of the public.

S&T Component

A compact unit equipped with a computerized embroidery machine enhances the impact of block design. Block printing and computerisation of embroidery augment the value of raw textile material by incorporating design elements. The computer embroidery machine designs one motif in 5-10 minutes, whereas it takes 1-2 days to design the same motif by hand. Computerised embroidery can be done easily, enhancing speed, improving quality, and increasing quantity. Hand block printing is done through traditional methods only using wooden blocks and dyes.

Technology Developer/Facilitator

Department of Fashion Designing, Kanya Mahavidyalaya, Jalandhar

Impacts

- Financial training and training on marketing were also provided, which helped the women in marketing and selling their block-printed and embroidered textile materials.
- An incubation facility was offered by the WTP, where the trainees could bring the raw materials and use the facilities of the WTP.
- The trained women make and sell traditionally block-printed and computerised embroidered textile materials at their neighbourhood and the village level.
- The designed textile materials are in great demand, especially among the fashionable clientele in Punjab and Northern India.
- The initiative made the women self-reliant and economically independent.

Information and Communication Technology (ICT)-Assisted Art and Craft Design

About Technology
Computer-assisted art and craft design training was provided to rural women to enable the development of innovative handicrafts/designer apparel possessing a unique identity in the local/global market.

Focus Area
Information Technology

Problem Addressed
The local population of the Sahaspur block, Uttarakhand, are primarily marginal farmers who rely on agriculture, animal husbandry, and the supply of fuel and fodder from nearby forested areas. The rural women are talented and hold considerable expertise in craft and design work. Their craft does not, however, reach the intended markets and only provides a meagre revenue due to their lack of knowledge and exposure. Other problems are a lack of know-how to develop innovative products/designs with high appeal, a poor understanding of aesthetics, and a lack of market connectivity to know the demand and link it to the sale of products. Other issues include a lack of expertise in creating novel items or designs with high appeal, weak aesthetics knowledge, and a lack of market connectedness to understand demand and connect it to product sales.

S&T Component
Information and Communication Technology (ICT) is a key enabler and a vital component of the new knowledge-based economy, having the potential to transform the country through increased productivity and economic growth. In Uttarakhand, locally available raw materials like bamboo, rambaans/ringaal, jute, date leaves, plant parts, wild non-edible seeds and fruits, fiber, natural thread, etc., are highly abundant. Basic computer skills were disseminated to the beneficiaries, where they were taught to fine-tune their designs and use the design software for artistic improvisation and color mixing. The ICT skills were also helpful in analysing the market requirement, price fixation, product display, promotion, and marketing of their products. With systematic training, the beneficiaries produced various eco-friendly products ranging from utility articles to office stationery and decorative apparel.

Details of WTP
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Technology Developer/ Facilitator

1. Uttarakhand Bamboo and Fiber Development Board
2. Indian Institute of Technology Roorkee, Architecture & Planning
3. Uttarakhand Handloom and Handicraft Development Council (UHHDC), Directorate of Industries
4. Sadhan Sahkari Samiti Limited Bhauwala, Cooperative Society Formation
5. Nav Jyoti Hastshilp Hathkargha Vikas Sansthan, Artisan Consultant (Handloom)

Impacts

- A total of approximately 415 hours of training was conducted over six sessions. Upon completion, the participants were certified and provided with raw materials (bamboo, ringaal, natural fabric jute), and artisan mentorship was given to support craft production.
- The training aimed to provide diversification in product design and material. The participants worked with different eco-friendly materials (bamboo, ringal, hessian cloth (type of jute), and date leaves) and new designs, developing products with high demand in the market like office stationery, pen holder, baskets, flowers, bags, file folders, and jewellery.
- ICT intervention favourably impacted learning and product creation; crafts retained their aesthetic identity, differentiation, character, and value and were better able to reach the market, producing better costs that were appropriate for the labour of designers.
- The provision of linkage with markets helped the product reach the global market. It resulted in collaborations with a locally famous handicraft general store (Harbans General Stores) and a voluntary group (Yuvayana Tech and Craft) and a tie-up with Uttrakhand Bamboo and Fiber Development Board (UBFDB).
- ICT-assisted art and craft design benefited minimally educated women involved in craft development in an unstructured manner by contributing to their economic independence and confidence.
- The beneficiaries were able to earn over Rs. 7000 per month and the project benefitted over 90 families.

Assisted Technologies

Sewing Machine for Differently-Abled Women

Details of WTP

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Dr D. Raja, HOD-FT
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Technology Developer/ Facilitator

1. Valliappa Textiles, Salem
2. District Industries Centre
3. Differently abled Welfare Department, Salem

About Technology

The technology was primarily designed and developed for differently-abled women lacking lower limbs. The sewing machine was upgraded by employing sensor operations for hand control.

Focus Area

Assisted Technologies

Problem Addressed

In the clothing industry, foot pedal sewing machines (single needle lock stitch-SNLS) are frequently used for manufacturing garments. These foot pedal sewing machines are inappropriate for differently-abled women with lower limb disabilities (feet).

S&T Component

The WTP designed and developed an instrument to operate the sewing machine by hand to assist and enable differently-abled women to sew garments. The differently-abled women were trained to use/operate the modified hand-operated sewing machine and to cut patterns of various garments and stitch them. The garment industry is labour-intensive; thus, by incorporating modifications in the existing sewing machines, differently-abled women can be employed in these industries.

Impacts

- The technology intervention led to an increase in the income level of differently-abled women. In addition, it led to skill development, and awareness about women empowerment, safety, and hygiene, thus improving their livelihood.
- The differently-abled women can either be employed in the garment industry or run their businesses with a single machine and achieve a good livelihood and economic status in society.
- The WTP set an example for society by playing a vital role in creating sewing machines for differently-abled women to improve their living standards and provide equal opportunities in the growth and development of the country.

Sewing garment using hand control

Traditional Technology

Pulse Plating for Silver Anklet

Details of WTP
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About Technology
The technology is pulse plating on silver anklets that improves the lifetime of plating and reduces occupational hazards.

Focus Area
Traditional Technology

Problem Addressed
Women making silver anklets often lead deplorable lives due to lesser salaries and poor working conditions. Further, they are exposed to hazardous chemicals involved in plating, namely sodium cyanide and potassium cyanide salts.
In the Salem district of Tamil Nadu and the adjoining areas, there are many silver industries where many jewellers and artisans work with various hazardous chemicals. By using this novel pulse plating technology, the exposure to hazardous chemicals has been drastically reduced. This improved pulse plating technology uses the material in the nanomaterial range, and thus the amount of contact with chemicals is thereby reduced. Hence, it has drastically mitigated health hazards for jewelers and artisans in the silver industries.

S&T Component
The novel pulse plating technology comprises an electrolysis process, a chemical preparation method, and plating methodologies. In this method, a pulsed power supply was used for plating instead of a DC supply, which improves the lifetime of plating.

Impacts
- Mitigate occupational hazards by reducing exposure to hazardous chemicals.
- Enhanced life of plating on silver Anklets.
- Enhanced quality of the product.
- Increase in income.
- Women have opportunities to become entrepreneurs.

Construction and Habitat Technology

About Technology
Women were trained in various location-specific construction technologies to enable the production of good quality finished construction products such as bricks, tile grouting, cement blocks and rings, fencing poles, and water harvesting pits.

Focus Area
Traditional Technology

Problem Addressed
Women in the rural Warangal district have limited exposure to modern developments and technologies. The women masons, despite being proficient in their work, lack organizational skills and access to new technologies/skills, are illiterate and are unable to deliver good quality finished construction products. They also lack credit facilities and financial understanding, lead irregular livelihoods, and are vulnerable to getting indebted to moneylenders. In the process of identifying the needs of the local populace and the technologies required, the WTP found opportunities suitable for local conditions that can be solved through appropriate, cost-effective technologies.

S&T Component
Warangal district has abundant mineral resources such as laterite, dolomite, coal, clay, granite, limestone, and sand alongside vast deposits of granite and iron ore. Due to the richness of minerals in the district, the WTP trained the women in making cement and concrete dense bricks and blocks, cement mosaic tiles, fencing poles, cement rings, fly-ash bricks, hydrated lime, granite lime, granite tiles, coal fuel briquettes, and cement products, thus promoting mineral-based industries.

Impacts
- The WTP emphasised on reducing drudgery and empowering women through technology adoption, skill development, income generation, financial literacy, and market awareness, thereby improving the quality of life.
- It provided an opportunity for individuals to increase their annual income by about Rs. 60,000-90,000.

Training on Tiles Grouting

Details of WTP
Dr V. Mahesh
SR Engineering College,
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Telangana.
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Technology Developer/ Facilitator
Department of Civil Engineering, National Institute of Technology (NIT), Warangal.

Contact Details of WTPs and their Technologies

Sr. No	WTPs Contact Details	Technologies of WTPs
1.	Dr S Chitra, Principal & Professor, Er. Perumal Manimekalai College of Engineering, Near Koneripalli, Hosur, Krishnagiri, Tamil Nadu. E-mail: schitra3@gmail.com	1. Mechanical weeding unit for paddy / ragi fields 2. Granite saw waste transformation into bricks 3. Creating of micro enterprise for e-waste processing 4. Making designer chocolates and customised gifts through 3D printing 5. Neck rest pillow
2.	Dr Neelu J. Ahuja, UPES, Energy Acres, P.O. Bidholi, Via Premnagar, Dehradun-248 007, Uttarakhand, E-mail: neelu@ddn.upes.ac.in	1. Recycling of waste paper 2. Information and Communication Technology assisted art and craft design 3. Cultivation of Medicinal & Aromatic Plants (MAPs)
3.	Dr Mrutyunjay Suar, CEO, KIIT-TBI, Campus-11, KIIT-University, KIIT Road, Bhubaneswar-751 024, Odisha E-mail: msbiotek@yahoo.com , surekha@kiitincubator.in	1. Sanitary Napkin Unit 2. Mushroom farming & Food processing unit 3. Making of Millet noodles
4.	Dr Harvinder Kaur Sidhu, Desh Bhagat University, Mandigobindgarh, Punjab E-mail: sidhuinder6@gmail.com	1. Sanitary Napkin Unit 2. Leaf-plate making
5.	Dr (Mrs) N. Yesodha Devi, Secretary, PSGR Krishnammal College for Women, Peelamedu, Coimbatore, Tamil Nadu. E-mail: principal@psgrkc.com	1. Sanitary Napkin Unit 2. Value Added Products from Arecanut Leaves (Plates) 3. Post-Harvest Technology Based Value Added Products 4. Multi Millet Biscuits 5. Banana Fiber Extraction and Value-Added Products 6. Value Added Products (Coir Pot) from Coir Fibre
6.	Mr Satyavir Singh, Senior Research Scientist, Digital India Corporation, Varanasi, Uttar Pradesh. E-mail: satyavir@medialabasia.in , satyavir@digitalindia.gov.in	1. Digital art making Craft designing using CAD
7.	Sh. Sanjay Halder, Vivekananda Institute of Biotechnology, Sri Ramkrishna Ashram, Nimpith, Vill.: Nimpith, P.O.: Nimpith Ashram, Dist. South 24-Parganas, West Bengal-743 338 E-mail: bkdattasranvib@rediffmail.com ; vibsran@rediffmail.com	1. Fresh and Brackish Poly Culture
8.	Dr Manjita Mishra, Bhartiya Mahila Gramodyog Sansthan, Uttar Pradesh. E-mail: bmgsansthan291295@gmail.com	1. Terracotta craft 2. Moonj craft 3. Bamboo craft 4. Guava trade

Sr. No	WTPs Contact Details	Technologies of WTPs
9.	Dr Ekta Menghani, Professor, Department of Bio-technology, JECRC University, Jaipur E-mail: ekta.menghani@jecrcu.edu.in	1. Training on Gem and Jewellery design for women and girls 2. Handicraft item preparation 3. Preparation of designer diya preparations and Handicraft items 4. Paper bags from Newspapers 5. Handmade paper making from wastepaper 6. Natural colour and herbal dye from herbal waste 7. Rose and other flowers oil extractions from waste flowers of temples
10.	Dr V. Mahesh, SR Engineering College, Ananthasagar, Hasanparthy Warangal – 506 371, Telangana. E-mail: mahesh@srecwarangal.ac.in	1. Metal Craft Technologies 2. Construction and Habitat Technologies 3. Banana fibre extraction 4. Construction and habitat technology
11.	Dr E. Laxmi Narsaiah, Professor and Head of the Department, Basic Sciences and Humanities Department, B V Raju Institute of Technology (BVRIT), Narsapur, Telangana E-mail: laxminarsaiah.emmadi@bvrit.ac.in	1. Interventions in Handlooms and Handicrafts 2. NTFP (non-timber forest products) based livelihood interventions
12.	Shri. A. S. Suting, State Council of Science Technology and Environment (SCSTE), Meghalaya State Housing Financing Cooperative Society Ltd., Nongrim Hills, Behind Bethany Hospital, Shillong, Meghalaya- 733003 E-mail: stcouncilmegh@yahoo.com	1. Green building 2. Bamboo furniture and agarbatti sticks 3. Low-cost egg incubator
13.	Dr Modem Sai Leela, Department of Home Science, St. Joseph's College for Women (Autonomous), Gnanapuram, Visakhapatnam-530 004, E-mail: slmodem@gmail.com	1. Developing skills on video technology in young women 2. Value addition to NWFP process of adda leaf, tamarind, broom grass and wild tubers 3. Bio Sand Filter (BSF)
14.	Dr Jatin Kalita, Scientist, CSIR-North East Institute of Science and Technology, Jorhat-785 006, E-mail: kalitajk74@gmail.com	1. Extraction of banana fibre & product development 2. Herbal mosquito repellent incense stick and candle 3. Low dust chalk pencil and wax crayon coloured pencil 4. Solid deodorant freshener
15.	Smt. Nupar Nag, Scientist B, Tripura E-mail: nag.nupur@gmail.com	1. Mechanised dhenki and grain puffing cum roasting machine 2. Bio-plates and leaf cup machine 3. Mosquito replant candle
16.	Technology Informatics Design Endeavour (TIDE), FF1, Sapthagiri Apartments, No. 30, 10th Cross, 15th Main Road, RMV Extension, Sadashiva Nagar, Bangalore- 560 003 E-mail-k.sumathy@tide-india.org	1. Oyster mushroom cultivation and value addition 2. Organic farming & sustainable agriculture and Cultivation of Dry land Crops and Developing Value Added Products 3. Green bricks and firing in LCBK 4. Minor miller value addition 5. Biomass dryer

Contd.

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17.	Mr. Vishakh, Malabar Social Service Society (MASSS), Sreepuram, Pallikkunnu, Kannur, Kerala – 670 004, E-mail: info@masss.in	1. Medicinal oil unit & Virgin oil unit 2. Coir Pith Composting 3. Micro hatchery unit & Pearl culture unit 4. Coconut shell craft unit & Bamboo craft unit 5. Arecanut Dehusker
18.	Mr Binal Mani, Peermade Development Society (PDS), P B No 11, Peermade PO Idukki Dist, Kerala-685 531 E-mail: binalmaruthukunnel@gmail.com ; www.pdspeermade.com	1. Nursery Techniques and Seed Production and Community Nursery 2. Vetiver (Vetiveriazizanioides) cultivation and production of value-added products 3. Cassava – Value added products 4. Passion fruit - Value added products
19.	Dr Hari Shankar Jain, Vardhaman College of Engineering, Hyderabad, Telangana E-mail: deanrnd@vardhaman.org , jhshankar@vardhaman.org	1. Low volume high value (LVHV) from Quinoa and Chia
20.	Mr. Randhir Singha, Resources Centre for Sustainable Development # 20, Bye lane- 12 W, Rajgarh Road Guwahati-781007, Assam. E-mail: rsingha@rcsdin.org	1. Bamboo furniture and agarbatti sticks 2. Energy saving devices like Photovoltaic system (PV) repair and maintaining 3. Improved Cook Stove models 4. Biosand Filter (Plastic barrel) 5. Solar crop drier and value addition process of local agriculture and horticultural products
21.	Prof. A. Jyothi, Department of Home Science, Rural Women Technology Park, Sri Padmavati MahilaVisvavidyalayam, Tirupati, Andhra Pradesh-517502. E-mail: dstrwtp@gmail.com	1. Tulsi based products
22.	Dr Arvind Kumar, Division of Livestock Products Technology, Faculty of Veterinary Sciences and Animal Husbandry, Shere-e-Kashmir University of Agriculture Sciences and Technology, R.S Pura, Jammu – 181 102. E-mail: drarvindlpt@gmail.com	1. Value added Milk Products (Paneer, Value added Kaladhi, Value added Mozzarella Cheese, Khoa based value added sweets, Chhana based value added sweets, Milk beverages) 2. Value added Meat Products (Pickle, Nuggets, Patties, etc.)
23.	Sh. V. Manilal, Santhigram, Chappath, Kazhuvur, PO Pulluvia, Thiruvananthapuram, Kerala E-mail: manilal.v08@gmail.com	1. 33 Value added products from Jack fruit (jam, jelly, candy, cake, peda, halwa, squash, chips, jeggery and pickle)

Sr. No	WTPs Contact Details	Technologies of WTPs
24.	Dr Loveleen Kaur Brar, Pushpa Gujral science city, JalandharKapurthala Road, Punjab. E-mail: sciencecity@hotmail.com	1. Value addition to existing textile materials 2. Preparation of Cow Dung Logs 3. Mushroom Cultivation
25.	Dr R. Malathy, Vice Principal & Professor, Department of Civil Engineering, Sona College of Technology, Salem- 636 005, Tamil Nadu. E-mail: usha@sonatech.ac.in	1. Pulse Plating for Silver Anklet 2. Wastepaper Recycling 3. Sewing machine for differently abled women 4. Solar Food Processing
26.	Dr Daya Srivastava, Scientist, Krishi Vigyan Kendra-II, Village-Katiya, Post-Ulra (Manpur), Block & Tehsil- Biswan, District-Sitapur, Uttar Pradesh- 261145. E-mail: sitapurkvk2@gmail.com	1. Charcoal based Briquettes 2. Urea Molasses Mineral Block (UMMB) - Goat Special 3. Urea Molasses Mineral Block (UMMB) 4. Animal Dung Pot/Lac Coated 5. Lac coated Dung diya's
27.	Dr Jatinder Kaur Arora, Executive Director, Punjab State Council for Science & Technology, Sector 26, Chandigarh. E-mail: jkarora20@rediffmail.com	1. Palletisation Technology
28.	Dr S Ayyappan, Department of Mechanical Engineering, Dr Mahalingam College of Engineering and Technology, Pollachi, Tamil Nadu-642 003, E-mail- sayyappan2004@gmail.com	1. Production of Virgin Coconut Oil (VCO) 2. Minimal processing fresh-cut vegetables
29.	Dr Selvi Subramanian, Professor, Department of Biotechnology, PSG College of Technology, Coimbatore-641004, Tamil Nadu. E-mail: selvi.bio@psgtech.ac.in	1. Oyster mushroom production and Drying process 2. Azolla Cultivation for poultry feed
30.	Mr. Gurmeet Singh, Foundation for Revitalisation of Local Health Traditions (FRLHT), No.74/2, Jarakabande Kaval, Post Attur, Yelahanka, Bangalore -560 106, India. E-mail: gurmeet.singh@tdu.edu.in , sugandhi.rani@tdu.edu.in	1. Nursery techniques and homestead cultivation of medicinal plants 2. Vermi-composting techniques

List of Abbreviation

Disclaimer

The information contained in this 'Report' is to showcase the findings and outcomes of the study conducted on 'Women Technology Parks' (WTPs) and suggest recommendations for making these parks self-sustainable and meet the objectives as laid by the Science for Equity, Empowerment, and Development (SEED) Division, Department of Science & Technology (DST), Government of India. The content is solely based on the information provided by the respective WTPs and the reports submitted to DST. It is purely for reference purposes only.

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To know about Women Technoligy Parks, visit
www.dst-wtp.in