

Journey of Women Technology Parks towards Sustenance



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**Journey of
Women Technology Parks
towards Sustenance**

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Disclaimer

The information contained in this compilation 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 also on the reports submitted by them to DST. It is purely for reference purposes only.

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Introduction

The WTPs across the country have been instrumental in realizing the empowerment of rural women by imparting and honing their skills pertaining to various livelihood activities and providing them a suitable platform where the efforts toward income-generation through micro-enterprises based on local resources can be aggrandized, optimized, channelized, and curated.

The WTPs have been provided the much-needed support by the Science for Equity Empowerment SEED Division of the Department of Science & Technology (DST) which has leveraged every effort be it logistical, financial, technical, marketing, etc. to make WTPs sustainable and long-lasting entities capable of extending livelihood support to a greater number of women and tap new opportunities for consolidating its position in terms of livelihood generation.

Although the empowerment of rural women by income generation through livelihood ventures is a long and bumpy road, WTPs have certainly gone miles in making the womenfolk financially independent and have inculcated confidence and a notion of self-worth among them. Women at WTPs are surging with confidence that they can shape their own destinies.

Among the 46 WTPs, some have certainly outperformed others and stand as a glaring example of how these entities should ideally function and operate so as to derive the optimum output in terms of resource utilization and productivity, besides being a treasure trove of locally manufactured indigenous products and a center for enhancing the standard of living and livelihood of women members. Some of the broad parameters on which the performance of these WTPs has been analyzed are Training and Capacity Building, Innovative Solutions, Standardization and Validation of Products, Establishing Market Linkages, Product Development and Branding, and Local Enterprise Development, Natural Resource Management among others.

There are some WTPs that have performed excellently on at least one of these parameters and have set a benchmark of a sort, being an ideal example for other WTPs on that particular parameter. Such WTPs have been classified as "Best Practices". On the other hand, there are some having an overall performance above the average and are the ones that have been able to excel on most of these parameters. The tale of their success is narrated under the "Success Stories".

Keeping the wheel of WTPs rolling is as important as floating these parks. Sustained inputs in form of support from S&T Organization, Infrastructural support, information, and awareness generation are crucial for the survival of these entities. The underlying basic philosophy is that more-and-more rural women should be drawn toward entrepreneurship based on optimum utilization of local resources and thus pave way for the empowerment of the community.

Since evaluation is a continual process that entails learning and improvement, continuous assessment of WTPs is essential. This also helps identify loopholes and bottlenecks and devise a strategy to do away with these. There cannot be and shouldn't be ideally any single strategy for improving the performance

of WTPs as each of them require specific or tailored-made interventions depending upon the parameters on which they are lagging. There cannot be “one-size-fits-all” types of solutions in the context of improving the performance of WTPs and plugging the loopholes. Each needs to be specifically addressed.

WTPs have evolved as potent centers for improving the lives and livelihood of rural women and have helped them realize their worth. Simple technologies which optimally tap local resources for production lie at the helm of WTPs. The technologies used by WTPs are often simple improvisations over the existing ones that incorporate some Science, technology, and Innovation (STI) component in their design. The prowess of such technologies – they are not cutting-edge or avant-garde technologies— lies in the simplicity of their design and operation and their capacity to generate livelihood for rural women.

When the nation is surging ahead with technological improvements and Startup ventures that have left their mark globally, it’s the right time to remember and cherish the ideas of WTPs and the ideology that lies at its core— empowerment of women via livelihood generation through simple technologies by optimally utilizing the local resources. It also augurs well with the philosophy of “Vocal for Local” and would help make India “self-reliant” or “Aatmanirbhar”.

Best Practices of the Women Technology Parks (WTPs)

- 1. Development of Linkages and Local Enterprise Development**
- 2. Innovative Solutions for Equity And Inclusion**
- 3. Capacity Building and Skill Enhancement**
- 4. Certification and Standardization**
- 5. Use of Advanced Technologies**
- 6. Similar Technologies**

1. Development of Linkages and Local Enterprise Development

Establishment of linkages is a weighty parameter, if established effectively helps to fulfil one of the objective of SEED division i.e. generation of livelihood for rural women. Most of the WTPs have established linkages with community groups, local governing bodies like panchayat or other active groups in that region. This has also helped in identification of the interested trainees. Further linkages were also developed with the Science & Technology organizations to develop the selected technology, train and demonstrate the trainees with the help of experts. Also, the linkages were developed with market agencies to sell the products developed by the trainees to generated income and livelihood sources. As can be seen from the above table, 26 WTPs have successfully developed the linkages with the communities and S&T organizations and tried for developing linkages with market but only few of them (around 6-10) have succeeded.

12 WTPs were effective in establishing local enterprises for the sale and marketing of the products developed under their aegis. In some of the cases, the WTPs themselves have been developed as enterprise. In other cases, they have supported SHGs to develop their own enterprises. All the support and guidance about formation of enterprises was provided by the WTPs during the training programs. The WTPs converted as enterprises are growing in sustainable way, but the status of enterprises formed by SHGs are unknown. Following are some of the examples of the local enterprises developed and supported by WTPs.

Empowerment of rural women through agro-allied Micro and Small Enterprise Development, Idukki, Kerala

In the Kanjirapally, Ranny, and Pathanamthitta Taluks of Kerala the technologies adopted by the WTP were nursery techniques and seed production, white pepper production, Vetiver (*Vetiveria zizanioides*) cultivation, and production of value-added products from Cassava and Passion fruit. The technology employed was Vetiver Box of different shapes based on the requirement of the export market.

A facilitation cum marketing centre was set up and linkages with 32 experts/trainers and 11 S&T institutions have been established. Due to the food processing unit, a three-fold rise in the production of value-added products was witnessed while the benefits of Vetiver value addition units recorded an increase to Rs.4875000 from Rs.84000 in 4 years. A total of 720 women benefited and 219 SHGs have been formed while 330 training programs were conducted.



As many as 15 nurseries were established leading to income generation, while 23 new products were developed under the four enterprises. Market linkages were developed with the help of Peramade Development Society (PDS), local shops, and exhibitions by various Government and non-government agencies, etc. A three-fold benefit is recorded due to food processing units producing value-added products like jam, squash, jelly, crushes, and juice.

Some of these enterprises have registered themselves as independent entities which led to the registration of women startups in agriculture and allied sectors and also availing FSSAI & other approvals.

Enterprises developed

S.No.	Technology	No. of Enterprises	No of People employed
1	Vetiver	17	195
2	White pepper	3	10
3	Passion fruit	7	85
4	Cassava	6	63
	Total	30	353

Rural Women Technology Park at University Of Petroleum and Energy Studies, Dehradun, Uttarakhand

WTP at the University of Petroleum and Energy Studies in Dehradun works on three technologies namely, recycling of waste paper, identification & cultivation of Medicinal and Aromatic Plant (MAP) species, and Information and Communication Technology (ICT) assisted art and craft design.

The WTP has trained around 390 women by conducting 14 training programmes. For facilitating the connection between the women who have been provided training, they have been registered as a cooperative society named "Mera Kaushal Mera Vikas". Technology for manufacturing pencils out of waste paper was deployed and women were empowered.



Jewelry items were made by the rural women using date palm leaves, bamboo cutouts, wild non-edible seeds, and other plant products. Following the 'waste to best' philosophy, adapting to market and customer demands, the whole exercise was made economically more viable. These products are eco-friendly and make a good source of income for rural women. These women now use the internet to analyze the market requirements, developed a website for product display and promotion, and came up with products that can fetch higher prices.

The basic idea was to maintain a balance between the environment and the wise use of technology for the economic independence of rural women. The aim was to help rural women earn a fair wage by training them to make high-quality products using waste.

Rural Women Technology Park in Chittoor District, Andhra Pradesh

Andhra Pradesh-based WTP at Chittoor district, use raw materials, Tulsi and tender mango leaves, for manufacturing of products like cosmetics, fragrances. As many as 19 herbal products were produced and 10 dehydrated food products using fruits, vegetables, and also the production of virgin coconut oil have been produced. Both the herbal product and packaging technology were eco-friendly. Around 400 women were trained by conducting 8 training programmes, planned as per NSQF guidelines.



The products were certified with an FSSAI license and are with the brand name SPURThE (Sri Padmavati University Rural women Technology Enterprise). A small-scale sustainable enterprise was thus developed by rural women.

Value-added livestock products for socio-economic empowerment of rural women



WTP at Deoli village, Bishnah Block, Jammu district, established by Dr Arvind Kumar utilizes milk, meat and fish, and other local resources for producing value-added products. These products were sold by popular food outlets in the city and also by local food outlets. Thus a sustainable business model is also being developed and new opportunities are being explored.

Women involved in dairy, poultry, and fisheries have been provided training. A total of 546 participants have trained through 54 training programs conducted at the center. While around 75 women entrepreneurs have benefitted, women have been facilitated for obtaining Municipal Identification Number

(MIN) for their food carts as well as fssai number for the value-added products.

2. Innovative Solutions for Equity And Inclusion

In some cases, WTPs have identified a local problem and provided innovative solutions to the problems. It has been seen that some of the WTPs have identified the local problem of the women and provided innovative solutions for their problems. Some of them have even adapted the already-developed technologies or adapted and customized the available technologies with few technical adaptations in the old one with the help of S&T organizations and experts. Case studies of WTPs providing innovative solutions have also been detailed as under.

Rural Women Technology Park in Warangal District, Telangana

WTP in Hasanparthy Mandal of Warangal District of Telangana came up with a number of innovative technologies in weaving and handloom, banana fiber extraction, construction and habitat, metal Crafts, Agro, and forest-based processing, etc. Around 2700 women were trained and better technology has been transferred in weaving, designing and processing banana fiber extraction, developing blended fabric using banana fiber and cotton, building material production, etc.



WTP is planning to run the training programmes and serve as a resource centre for addressing the problems and needs of women. It will help in acquiring quality raw material at a reasonable cost; provide equipment for the processing (weaving & construction technologies) and help in the marketing of products etc. A small percentage of profits will be used for the sustainability of the centre.

Rural Women Technology Park (RWTP) under CSIR-NEIST, Jorhat, Assam prepares products to combat COVID19

Rural Women Technology Park (RWTP) under CSIR-North East Institute of Science and Technology, Jorhat, has engaged rural women to prepare various products such as hand sanitizer, homemade masks, and liquid disinfectant to be distributed freely among family members and poor people in the nearby village to help combat COVID 19 in the area.

Rural women from the region were trained to produce homemade masks from traditional 'Gamocha' (a traditional Assamese cotton towel) by RWTP, Jorhat. The design of the homemade mask has been finalized, around 150 Gamochas purchased, and two sewing machines arranged (6 homemade masks can be prepared from one Gamocha). Apart from this, 200 liters of liquid disinfectant are being produced. The raw materials required for liquid disinfectants like dettol, ethanol, glycerine, and essential oil have been acquired. The disinfectant will also be distributed freely among the family members and poor people in the nearby village.

The participant women prepared about 50 liters of hand sanitizer, 160 liters of liquid disinfectant which have been distributed among the 60 women participants and their family members. The RWTP also prepared posters and leaflets on 'COVID19: Do's and Don'ts' in the Assamese language for making people aware of the Corona Virus and precautionary measures.



Rural Woman Technology Park in Salem, Tamil Nadu

Rural Woman Technology Park in Salem, Tamil Nadu has set an example for the society by coming up with sewing machines for differently-abled persons so that they can have equal opportunities in the growth and development of the country.



Rural Women Technology Park, Hasanparthy Mandal, Warangal District, Telangana

Even if women masons have proficiency in their work, they lack confidence in delivering quality finished construction products such as fencing poles, water harvesting pits, cement rings, bricks, blocks, and tiles grouting. A 'Rural Women Technology Park in Hasanparthy Mandal of Warangal District of Telangana Region, Andhra Pradesh empowered rural women, masons, by capacity building in construction and habitat sectors.



3. Capacity Building and Skill Enhancement

All the WTPs has efficiently provided training & capacity building program on the selected technology after conducting a baseline survey to identify the interest of the trainees. Based on the interest and concern of the trainees for the selected technology the training program was conducted and further the capacity-building programmes are also being organized by the WTPs to improve their overall skills like knowledge about developing linkages, market analysis, product branding, banking etc.

These training programmes are supervised by a scientific or technical expert from an S&T organization or a master resource person in the related field or domain. In some of the cases, additional related information like maintenance of the technologies, and market prospects for the technology, etc are also included in the training programmes. Such information forms an integral part of the capacity-building programmes and cater to the holistic development of the trainees.

Women Technology Park at Chikarta, Berhampur



The establishment of the WTP in rural Berhampur has given new hope and faith to the people particularly women in large numbers. WTP for rural women at Chikarta, Berhampur (KIIT) has forayed into a diverse set of micro-enterprises, ranging from the production of biodegradable sanitary napkins (to address the issues of menstrual hygiene) to the production of millet-based noodles for healthy eating habits of rural populace. It helped in income generation for the women engaged in these enterprises and has thus elevated their living standards.

Private companies have sponsored and approached products like Millet-based Noodles and Incense sticks. The WTP is currently operating in the B2B model, where all the manufactured products are being procured by private entities for marketing purposes. Women who are working in the micro-enterprises are economically well-off and it has increased their social acceptance.

Establishment of a WTP as a Model Resource Centre for Aquaculture at South 24 Parganas

WTP at South 24 Parganas', West Bengal is operated by Ramakrishna Ashram. The WTP works on a number of technologies like fresh and brackish water poly culture, quality seed production, and fish feed production through available local resources, dry fish production through solar dryer facilities, and low external input bases aqua farming/Integrated fish farming.

The WTP has imparted skill training to as many as 22 women SHGs wherein, 1044 women have been trained in agriculture and aquaculture practices that are scientific and sustainable. Due to the integration of the S&T component in fisheries, the income of rural women increased several folds thus empowering them immensely



Around 200 women from the fisherman community have been trained and have created 87 action SHGs. About 37 training programmes have been conducted. The fish products are sold in the local market and opportunities for creating further market linkages with the help of Government agencies are being explored. A suitable marketing strategy has led to a significant increase in income for rural women.

Standardized Value - Added Jack Fruit Products for Supplements Income for Women through Jack Fruit

A WTP from Kerala has used Jack fruit for producing value-added products like jam, jelly, candy, cake, peda, halwa, squash, chips, jaggery, pickle, etc. Around 150 women and 15 men have benefited through 6 training programmes conducted at the WTP.

Through the process of dehydration of jack fruit bulbs and seeds and the pulping process, as many as 33 new value-added jackfruit products were developed and have been standardized. The trained persons started 7 production units and manage these enterprises to sell the products in different outlets/markets. Out of 33, 14 products were tested and 7 were standardized. The fruit was wasted annually in huge quantities but by a process not only the wastage was stopped but also income was increased significantly. About 625 people who reside in and around the WTP have benefitted.



Rural Women Technology Park in Coimbatore District, Tamil Nadu

In Tamil Nadu at Annur Taluk a WTP was established with technologies like Water Purification by using copper and herbal product for microbe-free potable water, Banana fiber extraction by utilizing the banana sap, coir pot from Areca nut fiber waste, a community nursery, Bio briquettes manufacturing through cotton stalks (after harvesting cotton).

Around 4000 women were trained and 16 SHGs were formed by conducting 154 training programs. Close to 120 women are using WTP as an incubation centre. They have three success stories to their credit- bakery, masala power, and Areca nut plate production.

This led to a three times increase in income from Rs 150 to 450 per day and thus women are able to get a reliable and sustainable livelihood source.



4. Certification and Standardisation

After successfully developing and manufacturing products, some of the WTPs have also put in efforts to standardize and brand recognition of their products. 6 WTPs have standardized the product developed from the local or governmental bodies/organizations. The kind of products are varied and the associated standardization process and organizations have been approached for standardization and certification. The enterprises established are generating good income after selling the products due to standardization and certification.

To standardize the training programmes, few WTPs had planned the training program as per NSQF. While framing the



training program on specific technology the WTPs has also taken the support of S&T institutions, Governmental agencies and the involved industry for better understanding. Some of the examples of the same are:

- Women Technology Parks at Santhigram, Thiruvananthapuram, Kerala has developed 33 products from Jack fruits out of which 14 products have been tested and 7 products were standardized through FSSAI.
- RWTP at Sri Padmavati Mahila Visvavidyalayam, Tirupati, Andhra Pradesh, has developed start-ups with women entrepreneurs by setting up their own small-scale enterprises in rural areas with a brand name of SPURThe (Sri Padmavati University Rural women Technology Enterprise) products. The products include health benefits such as antidiabetic, antimicrobial, anti-aging and antioxidants properties and have been standardized.
- WTP at Peermade Development Society (PDS), Idukki, Kerala is managing and coordinating 33 Techno-based enterprises with 7 Passion fruit processing units, 17 Vetiver value addition units, 3 White pepper production units, and 6 Tapioca processing. Quality products of Cassava, Passion fruit etc manufactured at the established women's enterprises, are sold in the nearby areas. For the production, region-wise common facilities centre (like weighing & packaging etc) were set up so that the entrepreneurs can utilize these at an affordable cost without any initial investment. FSSAI certification & other legal formalities have been arranged for all enterprises. A quality monitoring team has been set for ensuring the quality of produce from various established enterprises.
- WTP at Shere-e-Kashmir University of Agriculture Sciences and Technology, R.S Pura, Jammu has facilitated the women trainees in getting the Municipal Identification Number of their Food Carts(Reris). They have also facilitated them in obtaining the FSSAI Number of their valued added Milk, Meat, Egg and Fish Products. The Nutritional profile, Sensory evaluation, Storage profile and Texture Profile Analysis of the products made by Entrepreneurs/ Beneficiaries have been detailed and documented by each one of them.



5. Use of Advanced Technologies

Rural Women Technology Park of University of Petroleum and Energy Studies at Dehradun, Uttarakhand

Rural Women Technology Park of University of Petroleum and Energy Studies at Dehradun, Uttarakhand empowered rural women by income generation through Information and Communication Technology (ICT) assisted art and craft design. It gave exposure to rural women to ICT, through a systematic training cycle ranging from basic IT awareness, to craft design education, and progressing towards design innovation. In addition, activities like recycling waste paper (utilization of unused or leftover paper/newspaper for manufacturing pencils instead of using wood from trees and saving trees) and cultivation of aromatic and medicinal plants for which a laboratory has been established were undertaken for income generation.

Women's Technology Park at Sonoabori Village, Bhurbandha Block, Morigaon district, Assam

Women's Technology Park at Sonoabori Village, Bhurbandha Block, Morigaon district, Assam have trained ten women representatives on SPV service & repair, which lead to sustained improvement in the electrification of the households and also solved the problem of electricity in the region.



6. Similar Technologies

Following technologies, processes and products are being taken up by more than one WTP for technology demonstration and adoption:

S.No.	Technology	Location Of WTP
1	Palletisation Technology	Technological Empowerment Of Women On Energy From Rural Biomass in Chandigarh
		Establishment Of The Rural Women Technology Park In KVK -II Sitapur, Uttar Pradesh
		Rural Women Technology Park, Annur Taluk, Coimbatore District, Tamil Nadu
2	Preparation of Cow Dung Logs	Establishment Of The Rural Women Technology Park In KVK -II Sitapur, Uttar Pradesh
		Empowerment Of Women In Rural Areas Science-Based Skill Development At Kapurthala, Punjab
3	Waste Paper Recycling	Rural Women Technology Park Of University Of Petroleum And Energy Studies At Dehradun, Uttarakhand
		Establishment Of Rural Women Technology Park In CSIR - North East Institute Of Science & Technology, Jorhat, Assam
		Rural Women Technology Park On Vidhani Village (Sanganer Block, Jaipur District, Rajasthan)
		Rural Women Technology Park In Salem (Kandarkulamanickem Panchayat), Tamil Nadu
4	Sanitary Napkin Unit	Establishment Of Rural Women Technology Park, For Women Empowerment Through Technological Approaches at Chikarta, Odisha
		Development Of Women Technology Park For Empowerment Of Rural Women In Selected Villages Of Fatehgarh Sahib, Punjab Using Eco-Friendly Innovation
		Empowering Rural Women Through Various Technology Based Livelihood Opportunities Under Women Technology Park In Tripura
		Rural Women Technology Park, Annur Taluk, Coimbatore District, Tamil Nadu

S.No.	Technology	Location Of WTP
5	Mushroom Cultivation	Rural Women Technology Park (Coimbatore District Tamil Nadu)
		Establishment Of Rural Women Technology Park, For Women Empowerment Through Technological Approaches at Chikarta, Odisha
		Women Technology Park In Tumkur District, Karnataka
		Empowerment Of Women In Rural Areas Through Science Based Skill Development At Kapurthala, Punjab
6	Nursery	Rural Women Technology Park For The Holistic Empowerment Of Women In Rural And Semi Urban Areas Of Idukki, Kottayam And Pathanamthitta Districts Of Kerala Through Agro- Allied Micro And Small Enterprise Development
		Rural Women Technology Park, Annur Taluk, Coimbatore District, Tamil Nadu
		Enhanced Livelihood Of Women In Selected Villages Of Karnataka Through Green Technologies(WTP) By FRLHT, Bengaluru, Karnataka
		Rural Women Technology Park Of University Of Petroleum And Energy Studies At Dehradun, Uttarakhand
7	Leaf Plates	Development Of Women Technology Park For Empowerment Of Rural Women In Selected Villages Of Fatehgarh Sahib, Punjab Using Eco-Friendly Innovation
		Empowering Rural women Through various Technology based Livelihood Opportunities under women Technology park At Tripura
		Women Technology Park In Tumkur District, Karnataka
		Rural Women Technology Park, Annur Taluk, Coimbatore District, Tamil Nadu
8	Water Quality Management	Women's Technology Park At Sonoabori Village, Bhurbanda Block, Morigaon District, Assam
		Integrate Livelihood Technologies As Women Technology Park For Tribal Women In Paderu, Visakhapatnam District, Andhra Pradesh
		Rural Women Technology Park, Annur Taluk, Coimbatore District, Tamil Nadu
9	Application of ICTs	Rural Women Technology Park Of University Of Petroleum And Energy Studies At Dehradun, Uttarakhand
		Setting Up Of Rural Women Technology Park At Bansani, Varanasi (Target Block - Baragaon, Pindra & Haruha In District Varanasi, Uttar Pradesh)
		Centre For Enhancement Of Livelihood And Enterprise Models For Rural Women (Celem) In Sahoologiri Taluk, Hosur, Tamil Nadu

Success Stories of Women Technology Parks

- 1. WTP at Pushpa Gujral Science City, Jalandhar, Punjab**
- 2. Rural Women Technology Park of University of Petroleum and Energy Studies, Dehradun, Uttarakhand**
- 3. Women Technology Park at Sonoabori Village, Bhurbandha Block, Morigaon district, Assam**
- 4. Bolmoram Technology Resource Centre Cum Knowledge and Innovation Park, Meghalaya**
- 5. Rural Women Technology Park at Chikiti Block, Ganjam, Odisha**
- 6. Rural Women Technology Park –Kacharam, Telangana**
- 7. Women’s Technology Park of Technology Informatics Design Endeavour (TIDE), Bangalore**
- 8. Rural Woman Technology Park in Salem, Tamil Nadu**
- 9. Rural Women Technology Park in Kasaragod District, Kerala**
- 10. Rural Women Technology Park of Kanjirapally, Ranny and Pathanamthitta Taluks of Kerala**

1. WTP at Pushpa Gujral Science City, Jalandhar, Punjab

Name of Park

Empowerment of Rural Women Through Science-Based Skill Development

Implementing Institute

Pushpa Gujral Science City, Jalandhar- Kapurthala Road, Punjab

About the WTP

The park was established by the Pushpa Gujral Science City (PGSC) in collaboration with the SEED Division, Department of Science and Technology, Government of India, to empower women in rural areas. The project aims to ensure that the benefits of science and technology percolate to rural women of the surrounding villages and provides them with skill training and incubation facility to earn their livelihood in a dignified manner.

The park was launched with the following objectives:

- To provide and improve livelihood activities of rural unemployed women through scientific guidance and skill training.
- To develop entrepreneurial skills among rural girls and women through training and capacity-building programmes.



- To utilize unused local resources for income generation and reduce women's drudgery through Science and Technology application.
- To use the organization's (Science City) resources for the socio-economic betterment of rural slouches in the catchment area.
- To create a strong network of skilled women

The training at the WTP, PGSC included building awareness, technical training as per technology, field/practical training, hands-on experience, marketing training, essential financial management, incubation facility, and interaction with experts and banks/funding bodies. During Covid-19, Science City introduced training in a hybrid mode, whereby the theory classes were imparted online, and practical classes were offered at the beneficiaries' homes. The WTP PGSC has trained 62 Krishi Sakhis across the state of Punjab state in the cultivation of Pleurotus mushrooms. These Krishi Sakhis shall further give training to 10,000-15,000 women in Punjab. During the second wave of the Covid-19 pandemic, the PGSC trained 50 women across Punjab in Block printing and mask making.

Use of E-commerce platforms

The WTP worked with ITC Kapurthala on women empowerment by livelihood generation. Additionally, Cheema Boilers, a reputed manufacturer of boilers in Northern India, showed keen interest in purchasing cow dung logs.

Status of WTP and activities carried out

PGSC offered both short-term and long-term training programmes to the women groups. The beneficiaries were identified by the Department of Rural Development and Panchayats, Punjab. The WTP team visited the villages the Department of Rural Development and Panchayats identified and conducted orientation sessions on livelihood generation. The interested women then enrolled themselves in the training.

The WTP comprised three training units

- Value addition to existing textile materials
- Preparation of cow dung logs to use cow dung in an innovative way
- Cultivation of mushroom (Pleurotus sajor caju)

For carrying out the project, a training shed (600 sq. ft) was constructed, and additional space was allocated for training on using hand block printers and mushroom growing. PGSC also procured machines for training on cow dung logs and pots, a computer embroidery machine, and set up a lab for block printing and Pleurotus cultivation.

The WTP concluded that although there was a willingness to learn, the women often did not wish to leave their homes. They preferred physical training within their village. Rural women were also inexperienced in banking and loan procedures. In addition, they required training for marketing skills and preferred the existence of tie-ups before they initiated production with their resources/cash.

The WTP also noted that a series of orientation sessions before the actual training helped mobilize participants. It also perceived the essentiality of training in essential skills such as marketing, banking, and accounting. The WTP also realised the need to provide an incubation facility for the long-term success of WTPs. The WTP encouraged the trained women to set up their enterprises individually or in groups. Until then, they will be allowed to use the resources/machinery/equipment available at PGSC, for which a minimal fee will be charged (towards space and machine use time), or a profit share mechanism will be worked out. The proceeds will be used for the sustenance of the project.

Technologies developed

1. Mushroom Cultivation [with particular focus on *Pleurotus sajor caju* (Dhingri)]

Mushroom cultivation is one of the most profitable agribusinesses that can be started with minimum investment and space. Mushroom farming is growing steadily as an alternative source of income. *Pleurotus* is a special variety of high-value fungi used in food, especially as a flavouring agent. It is one of the most suitable fungal organisms for producing protein-rich food from various agro-wastes or forest wastes without composting. The cultivation of this fungi is simple and economical in rural areas where raw materials (typically straw) are readily available. Decaying wheat/paddy straw is an important organic matter used as a substrate for spawning that is easily available in Punjab. Cultivation of this fungi commercially is quite profitable as capital costs are minimal. The park also has a facility to dry the product, which helps increase the shelf life of the mushroom to up to one year so that it can be sold in fresh and dried forms. The training course aligned with National Skill Qualifications Framework (NSQF) guidelines.

2. Value addition to existing textile materials

In this unit, practical training was provided on value addition to textiles through traditional hand block printing coupled with computer-aided embroidery. Embroidery on clothes is popular in the clothing of both men and women. It was earlier done by hand or by the zigzag action of power-operated embroidery machines, but the change in the industrial scenario and people's demand for quality products has ushered in great demand for computerised embroidery. The demand is excellent, especially among the fashionable clientele in Punjab & other parts of Northern India. The embroidery work on fabric coupled with traditional block printing provided an added advantage in the sale of the material. This training unit was equipped with engraved wooden blocks, dyes, printing tables, a computerised embroidery machine, simple machines for stitching and finishing the final product, and other requisite accessories. The course content was based on NSQF guidelines.

3. Preparation of Cow Dung Logs and Pots: An Innovative Way of Using Cow Dung

Cow dung logs: For decades, rural women have used cow dung to make patties used in chulhaas (wooden ovens) as fuel. The training programme helped in upgrading the work of these women. The use of technology to enable the change from hand-made cow dung cakes to cow dung logs and pots reduced their drudgery and relieved them of a menial job. Cow dung log is a combination of dung and straw (or any agro waste/harvested crop residues) fed into the machine's hopper. The machine mixes the raw materials thoroughly, compresses them, and extrudes the mixture. Logs of different shapes and sizes can be produced using different die sizes. The resultant logs are then laid in the sunlight to remove their moisture, thus making them hard and sturdy. Using cow dung logs has several economic, social, and environmental advantages. These low-cost, readily available logs can replace conventional fossil fuels in bhattis in dhabas and industrial boilers, thus contributing to the mitigation of climate change. They reduce wastage of menial waste and are easier to handle, store, and transport. These densified logs also have improved C.V. (Calorific Value) as compared to patties due to the presence of other agricultural wastes. The logs can be cut out per purpose and reduce the risk of explosion and fire.

Cow dung Pots: Most plant nurseries sell the saplings in plastic bags. The plastic bags are discarded once the plant is transferred to mud/cement pots. They end up either in landfills or are burnt, thus causing pollution and harming the environment. Many of these plastic bags fly around and land on green patches or water bodies, where the grazing animals or aquatic organisms ingest them. The animals consequently die of stomach ailments. These innovative pots furnished out of cow dung can help reduce the menace of plastic bags.

Reasons for the success

The success of this WTP can be attributed to several factors such as:

- The uniqueness of products: No other institution offered similar training in the region.
- The high price of the final product: The cost of Pleurotus mushrooms in the market is approximately Rs 1000/kg, and the product is used in high-end hotels and restaurants as a flavouring agent. Block printing and computerized embroidery enhance the value of raw textile material, and the value of cow dung logs and pots is much higher than raw cow dung used for traditional fuel patties.
- Ease of production: The machines used for producing cow dung logs and pots and for computerized embroidery can be easily operated and enhance the speed manifold times, thereby increasing production/efficiency. The cultivation of Pleurotus also requires fewer inputs and infrastructure.
- Removes Drudgery: The computer embroidery machine designed one motif in five to ten minutes, while it took one to two days to create the same motif by hand.
- Environment friendly: The cow dung logs and pots are eco-friendly. The logs help save trees, and the pots reduce the menace of plastic bags used in sapling plantations.
- Ease of access: The beneficiaries could bring their raw materials to the incubation facility at PGSC and use the WTP facilities until they were confident to do it on their own.

Obstacles faced by WTP

The WTP faced a few obstacles, such as the closing down of the park during the second wave of the Covid-19 pandemic. A significant impediment to its functioning was the mobilization of women for the training programmes, as women were unwilling to attend the training for long durations. To overcome this, PGSC came up with the hybrid mode of training, where the theory/ basics of the training were imparted online, while the practical training was provided either at the WTP or in the villages of the beneficiaries, subject to the availability of infrastructure.

Another challenge was the lack of smartphones among the women. Most women did not have smartphones to attend the online training; if they owned a phone, the phone would be with the husband (for his work) or the children (for online classes). The WTP thus fixed the timings of online training as per the availability of mobile phones with the trainees (sometimes even during late evenings and early mornings).

Suggestions for future WTP

A few suggestions were compiled based on the working and the outcomes of this WTP. The courses offered in the WTPs should be of short duration or spread over 2-3 sessions since it's difficult for women to remain out of their houses for a long time. The training should also not be restricted to on-site; instead, off-site training or training in hybrid mode should be provided. The women should also be trained beforehand in essential skills like marketing and banking. Training on marketing should also be provided to a male member of the family since women are generally hesitant to go out and sell the product. An incubation facility should also be set up to aid the beneficiaries until they become independent.

Besides the training in the technologies mentioned above, the WTP, PGSC regularly organises awareness programmes. During Covid-19, they organized an 'Online Training Programmes on Stitching of three-layered cloth mask' and a 'Webinar on Stress Management in COVID times, How to Boost Immunity, Strategies to prevent Dengue epidemic and Vaccine awareness programs (Online)'.

2. Rural Women Technology Park of University of Petroleum and Energy Studies, Dehradun, Uttarakhand

Name of Park

Rural Women Technology Park (WTP), University of Petroleum and Energy Studies, Dehradun, Uttarakhand

Implementing Institute

University of Petroleum and Energy Studies (UPES), Dehradun, Uttarakhand

About the WTP

The WTP-UPES was established with the aim of helping rural women earn a fair wage by training them to make high-quality products from waste. The basic idea was to maintain a balance between the environment and the wise use of technology for the economic independence of rural women. The WTP works on three technologies: recycling of wastepaper, identification & cultivation of medicinal and aromatic plant (MAP) species, and information and communication technology (ICT) assisted art and craft design.

Through the implementation of 14 training programmes, the WTP trained almost 390 women. The women who received the training have been organised into a cooperative society called “Mera Kaushal, Mera Vikas” to facilitate communication among them. The training session empowered the women to create marketable products from waste and become independent. The rural ladies created jewellery from date palm leaves, bamboo cut-outs, non-edible wild seeds, and other plant materials. The entire exercise was made more economically viable by adopting the “waste to best” mindset and adapting to meet consumer and market demands. These eco-friendly goods provide rural women with a reliable source of income. These ladies used the internet to research market needs, created a website for product marketing and presentation, and created goods that may command greater pricing.



Status of WTP and activities carried out

The WTP assisted more than ninety households who live in the project's region. The activity was highly relevant because the raw resources were native, widely accessible, and locally abundant. The WTP made use of eco-friendly methods throughout the project's life cycle. The primary feature of the WTP was the multi-agency connection with a participative approach, which produced numerous benefits. The rural women acquired skills and are boldly moving toward achieving economic independence and providing labour for the country. Women's capacity building has led to a shift in attitude, the development of leadership skills, and active engagement in household decision-making. The women have earned the title of farmer because they have successfully grown medicinal and aromatic plants and have shown a desire to convert their land-holding practices from non-agricultural to agricultural. Beneficiaries of all three project components displayed an increased income and a higher standard of living.

Technologies developed

1. Recycling of Wastepaper

In the present scenario, waste recycling is being done on a larger scale and in practically every society. The WTP primarily concentrated on the recycling of wastepaper. The fundamental justification for this stems from the fact that the global consumption of paper products is massive and results in substantial disposal issues, generally involving incineration or landfills.

The fundamental concept was to create a balance between the environment and technological use for rural women's economic independence. The aim was to train rural women from the indigenous community to produce high-quality products such as paper pencils, jewellery, stationery, and other items out of wastepaper to earn a decent salary.

2. Information and Communications Technology-assisted Art & Craft Design

The computer-assisted art and craft design training was provided to the rural women to enable the development of innovative handicrafts/designer apparel that could preserve their unique identity in the local/global market, generating livelihood for talented women. The idea of locally accessible natural resources and innate local knowledge was applied to the development of handcrafted goods. The designs were infused with local culture, legacy, and custom. The designs were infused with local culture, legacy, and custom. Bamboo, rambaans/ringaal, jute, date leaves, plant parts, wild non-edible seeds and fruits, fibre, natural thread, etc., are locally and readily available raw materials in Uttarakhand. Additionally, certain other raw materials were employed, such as non-woven cloth and hessian cloth (a form of jute).

With careful instruction, the beneficiaries produced a wide range of crafts, from functional items to office supplies to fashionable clothing. They produced environmentally friendly goods such as dustbins, office supplies, pen holders, baskets, conference bags, laptop bags, ornamental flowers, and carry bags for bottles. The beneficiaries received basic computer training, where they learned how to polish their ideas and use design software for artistic improvisation and color mixing, among other things. Additionally, the recipients created jewellery pieces based on their interests, inventiveness, and market demands utilising date palm leaves, bamboo cut-outs, wild non-edible seeds, and other plant materials. The entire exercise was made more economically viable and satisfying by adhering to the "waste to best" philosophy and continuously responding to market demand and client input. These goods are environmentally sustainable and provide our beneficiaries with a reliable source of income. The beneficiaries employ computer expertise to examine market demands, create websites for product promotion and display, and create goods that may command greater prices. Artificial jewellery produced from date leaves has received praise, and its patterns and shapes have been compared to temple domes and buildings in Uttarakhand.

The WTP's primary feature is the multi-agency connection with a participative approach, which has produced numerous benefits. The "Mera Kaushal, Mera Vikas" Cooperative Society (Reg. No. TV: 13)

was established under which the self-help group (SHG) is operating. The WTP also established partnerships with Yuwayana Tech and the Uttarakhand Bamboo and Fiber Development Board (UBFDB). The SHGs operate on an order basis and generate income from sales. They have linkages with markets and stores with shelf space, where they market their products internally and present at various fairs and shows. By experimenting with new raw materials and designs, they have been developing their talents and adding new knowledge continuously.

The beneficiaries were overjoyed in getting the opportunity to utilise computers, and they saw it as a necessity for survival. They believed it would aid them in developing their sense of self in society. Thanks to their acquired skills, the beneficiaries now produce goods at home and make money by selling them. They found it so beneficial that they decided to carry on the activity themselves and spread the knowledge to others as well. They are now content with their role in making India 'Digital'.

3. Identification and Cultivation of Medicinal and Aromatic Plant

The baseline survey was conducted in ten selected villages. An SHG was established after selecting the poor and marginal farmers. Workshops, training sessions, and sharing traditional skill experiences were carried out. Nearby organisations like Navdhanya and the Forest Research Institute (FRI) provided technical help and linkages for the growth of medicinal plant species like Chamomile, Tulsi, Shatavari, Aswagandha, Sarpagandha, Stevia, Kaliyari, Aloe Vera, and Lemon Grass.

Use of E-commerce platforms

The WTP established linkages with partnerships with Yuwayana Tech and the UBFDB to enable the sale of locally made products. The farmers growing medicinal plants were connected with SMPB Vasant Vihar, CAP, Selaqui, Bagwaan Gramoudyog Samiti, Premnagar, Aushadhigharbha Himalaya Pvt. Ltd., Multiple Action Group for Integrated Rural Development Society, Herbertpur, Himalayan Organics, and Flex food Pvt. Ltd. to receive technical support and establish market connections for their products.

Reason for success

The rural women were exposed to a novel technique and received training on the operation of big machines and their general maintenance. They collaborated as a group, improving their teamwork capacity and discovering how to work toward a goal set to fulfill a market order. The women carried out all the tasks, including creating pencils, product separation, and packing. They were also made aware of the necessity of conserving trees by recycling waste paper, which is crucial for the present and coming generations.

They successfully delivered numerous orders: 5000 pencils for the Vikram Sarabhai Community Science Centre; 3000 pencils for Hon'ble Members of Parliament at the Science Exhibition event held in New Delhi (March 2017); 300 pencils for the Vendor meet, organized by UPES; 100 pencils for the participants of the national conference organized at UPES. The pencils are also available for sale at the stationery shop, UPES campus.

The cultivation of MAP helped empower the women: The farmers sold 120 kg of Tulsi for Rs.5000 and received the opportunity to sell Lemongrass plantlets to UPES itself under an 'Indo-French workshop on Energy and Water'. In addition, UPES provided markets to the farmers via different stalls and exhibitions in trade fairs such as the spring fest in the Governor's house, cooperative societies fair on the Parade ground, and even on the UPES campus from time to time.

The women engaged in craft work were connected for several market orders, where, as per the requirement, they developed the products and delivered them, earning befitting monetary amounts, contributing to their economic independence and confidence. The beneficiaries employed date leaves, date seeds, and other natural materials to increase the marketability of their jewellery items, making the

entire endeavour profitable. Through their partnership with Uttarakhand Fibre and Bamboo Board, they received help with additional training and details of locations where they could showcase and sell their products. They have established their presence at UPES Events for more than two years, including the "Diwali Fair," where they have showcased and sold their goods.

Obstacles faced by WTP

Due to the plastic sleeve that covers the pencils when they are made, it is not possible to refer to them entirely as green pencils. The installation of a machine that can provide a coating and afterward strength via the application of eco-friendly colors has already been discussed with a few providers.

Suggestions for future WTPs

- The WTP provided a commutation facility to the rural women so that they could come to the campus and work.
- The WTP has maintained telephonic contact with beneficiaries and keeps an eye on their progress/income generated/opportunities leveraged. They are developing a database/repository of photographs with details of the entire project.
- The WTP regularly invites active beneficiaries and provides them opportunities to sell their products at trade fairs and community events. In addition, they motivate the beneficiaries to create market-valued products and to join fairs at their local area and district level.
- The beneficiaries have been trained to train other interested rural women further and thereby include them in their SHG and cooperative society. This has helped expand the workforce and successfully deliver high-quality market orders.

Success Stories

The successful work of The WTP has been featured in multiple newspapers.

In 2018, Mrs. Najma Iqbal (Village: Dhakrani, Sahaspur Block, Dehradun District, Uttarakhand) enrolled in the WTP as a trainee. The training programme was divided into two parts, the first of which concentrated on ICT skills and the second on art and craft activities. Mrs. Najma showed genuine interest in the training and picked up the basics quickly. Key components of the training included product design and material diversification. The trainees used sustainable raw materials, including bamboo, ringal, and jute, to create items like baskets, pen holders, casseroles, bags, file folders, and office supplies. Mrs. Najma researched new materials, created several goods, and assisted the other participants. She quickly rose to the position of co-trainer in succeeding batches and tested new raw materials, including date leaves and hessian fabric (a form of jute). She participated in the project's survey work and recruited numerous more ladies. She unveiled a fresh line of jewellery from date leaves, seeds, and plant by-products like barks and threads. With 14 team members, she has formed a group that collaborates and learns. They have created the goods and delivered them, receiving an appropriate wage that has boosted their self-assurance and independence financially.



3. Women Technology Park at Sonoabori Village, Bhurbandha Block, Morigaon district, Assam

Name of Park

Women Technology Park at Sonoabori Village, Bhurbandha Block, Morigaon district, Assam

Implementing Institute

Resources Centre for Sustainable Development (RCSD), Guwahati, Assam

About the WTP

The WTP aimed to empower women by providing technological solutions to location-specific problems that these women face, thereby helping improve their livelihood. This would result in the sustainable use of natural resources through the promotion of women-friendly technologies such as energy-saving solar crop driers, improved cooking stoves, agro-food processing and value addition processes of local agriculture and horticultural products, water quality management, and enabling local capacities for maintaining and repairing photovoltaic (PV) systems.

Village-level awareness camps were held in seven project villages and Panchayats to identify key individuals and potential women SHGs with relevant technological interests in the following areas: improve cook stoves (ICS), solar crop dryers, solar lighting services, water and sanitation, agro-food processing, and value addition process. A network of 32 women self-help groups (SHGs) came to the forefront, where 15 SHGs registered for value addition of food crops and convenience food, 16 groups registered for ICS, and 11 groups registered for Biosand filter production, installation & management of hand pumps.

The park was launched with the following objectives:

- To provide technology for sustainable utilization of natural resources-for livelihood generation.
- To provide technological solutions to location-specific problems faced by women
- To serve as a common platform for developing or deploying location-specific technologies for women and S&T institutions local & elsewhere for wider dissemination of technologies.
- To create a network of women groups and facilitate an income generation program
- To provide training and backward and forward linkages



The WTP established a common facility centre for the women groups to organize further activities and deployed user-friendly locally available technologies to empower the women. All the technologies such as ICS models, solar crop dryer, bio-sand filter (plastic barrel), and value addition of food crops were launched in a decentralised satellite mode as micro-enterprises within the seven project villages that housed the relevant women SHGs.

This approach overcame challenges such as low literacy, a lack of infrastructure, and subsidies that muddled the process and found effective partners to

perform rural distribution, resulting in consistent and reliable service and maintenance. Performing S&T activities through a network of local women's SHGs that were previously primarily active in lending and savings has established an enabling social and economic climate, thus removing institutional and financial barriers and promoting an inclusive supply chain model.

Use of E-commerce platform

After completing capacity-building exercises on specific topics, SHGs successfully implemented and executed horizontal technology transfer. The bio-sand filter SHGs distributed 150 bio-sand filters on an EMI basis at the cost of Rs 1800 apiece, with the goal of multiplying the technology with the money gained. They intend to grow into new areas. The SHGs working on ICS were able to distribute 262 two-pot ICS at a cost ranging from Rs 1000 to 1300, depending on the ICS model.

The SHGs working on the value addition of food crops engaged themselves in making various value-based food products from local food crops: pickles (king chili, gooseberry, ginger, lemon, star fruit, elephant apple, mango, bamboo, mixed pickle, coco pickle, tamarind); jam & jelly (starfruit, coconut); biscuits & cookies (coconut, coco chips, chocolates); fruit juice (orange, lemon, cocoa). Most of the products were sold in the village and neighbouring villages, but some groups could expand their marketing reach to the marketplaces at the district headquarters.

Status of WTP and activities carried out

Lectures and leaflets were used to organise village-level awareness camps on pertinent technologies. With comments and active cooperation from technical support agencies, manuals for capacity building on a specific technology (solar crop dryer, agro-food processing, bio-sand filter, water quality management, PV system) were developed. The Assam Energy Development Agency, Govt. of Assam, provided training and capacity building on ICS production and solar PV service and repair, while the Indian Institute of Crop Processing Technology (IICPT), Ministry of Food Processing Industries, Government of India, provided training on value addition of food crops and convenience food. Bio-sand filter production, water quality, handpump management, and solar crop drier were among the topics covered by RCSD. The SHGs, after gaining capacity in specific technologies, formed themselves as small company enterprises in energy, water, and agro- and food industries.

In terms of the specific technical innovation being utilised and implemented in the daily life of individual families, the grassroots penetration of the introduced technologies (improved mud cook stoves, bio-sand filters, value addition of food crops) was high.

In addition to the above, the project's post-capacity-building activities included the installation of 262 ICS stoves in 262 homes, the installation of 150 bio-sand filters with post-installation services, and the formation and operation of 7 SHGs as domestic-level food processing units through the 28 women-led SHG enterprises.

The WTP conducts local awareness events on safe health and Covid-19 preventative measures on a regular basis. To serve as a knowledge centre for the local community, the WTP houses a multitude of rural technologies such as drip irrigation, home gardening, ICS, solar cooker (box & parabolic), bio-sand filters, water quality monitoring and management, food processing, and solar crop dryer. The WTP-developed technologies are still in use today.

Technologies developed

1. Improved Cooking Stoves (ICS)

Firewood is the primary source of rural energy requirement for 94% of the households in the region. Since the region is a wetland, the women face additional stress in foraging firewood. Hence, an ener-

gy-efficient mud cooking stove was introduced to enhance firewood savings, improve health and indoor air quality, and generate employment. The raw materials include sawdust, brick, sand, cow dung, clay, and a pottery chimney with coal. Under this technology, 11 women SHGs were organised and trained. The SHGs implementing the ICS built demo ICS models for potential beneficiaries to visit and gain the necessary knowledge on the product. Thereafter, the SHGs made house-to-house visits inviting women folks to visit the demo sites and also appraised them about the possibilities of the monthly installment (EMI) system. Spreading the ICS activity beyond the village was achieved from the awareness activity executed by the implementing SHGs at the local historic annual fair (Jun beel mela).

2. Biosand Filters

About 82 percent of families rely on private hand pumps for drinking water, and it is well known that the local populace does not treat their water before consumption, resulting in the spread of water-borne diseases. As a result, involving women in water quality monitoring and management and the deployment of bio-sand filters is critical. 10 women SHGs were organized & trained as water managers. They gained a thorough understanding of water quality monitoring and began advocating bio-sand filters that can be used as microenterprises. The raw materials used were plastic barrel, tap, pipe and accessory fittings, strainer net, coarse sand, charcoal, stone chips, and charcoal holding bag. They exclusively offered the products to known consumers through EMI (equated monthly installment). Following the installation of the filters, the SHGs conducted and demonstrated water quality tests for the customers, thus instilling trust. The technology witnessed an expansion when existing customers referred to new customers.

3. Micro-Food Processing and Value Addition Unit

Agriculture is the principal source of income for 86.9% of the people. While practically every home grows seasonal vegetables and spices as part of summer and winter vegetable gardening, there is no value-added option for local food products, which might increase income options in rural areas. As a result, the practical option was to intervene by establishing small agro-processing businesses to provide value to local fruits and vegetables for rural income generation. Following capacity building, 7 women SHGs established themselves as small-scale agro-processing businesses that process local food products and provide meaningful work. The SHGs involved in the activity obtained most of the raw ingredients from families in the village and processed the food at a common facility chosen by the group members. The SHGs' value-added products were sold at village shops, weekly markets, and adjacent townships.

4. Photovoltaic cells (PV)

According to a baseline survey, while 23.20 % of households were connected to the grid, the majority of 61.32 % of households did not have access to electricity due to inadequate or non-availability of the grid, and only 14.71 % of households had access to solar lighting. It was discovered that due to a lack of support services for maintaining solar lighting systems, the percentage of houses using solar lights was decreasing, hence increasing the percentage of households without electricity. As a result, establishing the local capacity for maintaining and repairing PV systems was critical for continuous operation in the chosen communities and providing better energy services. The service and repair of SPVs were taught to ten women village representatives. Maintaining and repairing PV systems will ensure that they continue to operate in the identified remote hamlet, and the presence of a backup service will likely increase the percentage of houses with SPV power.

Reasons for the success

The WTP was highly successful because the interventions were primarily need-based. For example, firewood was the primary source of rural energy for 94 % of the families. Because the geographical setting was a wetland, getting firewood was difficult for the homes. As a result of the introduction of energy-efficient mud cook stoves, which helped increase fuel savings while also improving interior air

quality, there was a growing need for technology adaption

About 82 % of households in the area relied on private hand pumps to get their drinking water. A chemical study of the groundwater in the area revealed significant concentrations of iron ranging from 2 to above 10 ppm, nitrate ranging from 10 to 20 ppm, fluorides ranging from 0.5 to 2 ppm, and bacterial contamination in about 35 % of source water locations. Apart from that, the local community did not treat their water before drinking it, resulting in spreading diseases such as dysentery, cholera, gastroenteritis, jaundice, and typhoid. Thus, installing bio-sand filters in conjunction with community awareness of source water protection and water quality monitoring resulted in significant reductions in gastrointestinal sickness and high community acceptance.

Agriculture is the principal source of income for 86.9% of the people. While practically every home grows seasonal vegetables and spices under summer and winter vegetable gardening, no value-added option for local food crops has been noticed in the area, which could increase economic opportunities among rural communities. The establishment of women-owned small agro-processing businesses for the value addition of local food crops and the manufacturing of convenience food products for the micro-income generation has gained traction and has been a new eye-opener for women. The majority of the products found a ready market in the village shops, where there was a keen demand for the food.

Obstacles faced by WTP

Once the women-led microenterprises were created, it was critical to expand the reach of interventions beyond the project villages, incorporating new women SHGs. This necessitated a basic core funding to ensure the continuation of intervention activities and their refinement. The products other than food processing cannot be taken up by private companies and sponsoring agencies for marketing as the ICS is mud based and the sand filter is a large barrel of 200 L capacity. Under the current pandemic situation, local communities' need-based priorities and concerns are becoming more dynamic, necessitating a greater diversification of activities toward food production through the promotion of intensive multiple cropping on small land holdings.

Suggestions for future WTP

The WTP will provide technical support to other WTPs on renewable energy and water challenges (water quality management, groundwater exploration and monitoring, landscape-level water management, and watershed management).

In comparable scenarios, RCSD's creative distribution model approach can be beneficial in raising awareness of S&T potential, bringing small microfinance players (SHGs) into the mix, and stimulating inclusive supply chain challenges. To sustain the activities beyond the project, RCSD proposes to undertake periodic review meetings at the WTP with the implementing SHGs to identify shortcomings and propose ways and means to overcome them collectively.

Research professionals from RCSD will make a periodic visit to the women's SHG enterprise to encourage and assist the groups with all possible technical backstopping issues. RCSD will further scope out with other technical support agencies for additional improvement, which could deliver incredible benefits and expand the activities.



4. Bolmoram Technology Resource Centre Cum Knowledge and Innovation Park, Meghalaya

Name of Park

Bolmoram Technology Resource Centre Cum Knowledge and Innovation Park

Implementing Institute

State Council of Science, Technology & Environment (SCSTE), East Garo Hills, Meghalaya

About the WTP

The Bolmoram Technology Resource Centre cum Knowledge and Innovation Park was established by the SCSTE in partnership with the Consortium of Resource Persons (CoRP) in Bolmoram, Meghalaya. The residents of the area were dealing with a number of socio-economic problems such as the lack of electricity, water, sanitation, health, and education. The WTP aspired to engage women as instruments of socio-economic change. Agriculture and horticulture are the main livelihood generation activities. The people grow ginger and pineapple in abundance but still suffer economically due to a lack of transport and technical know-how, which impedes regional development. In addition to agriculture, the region also possesses excellent natural resources like bamboo, forest products, and waterfalls that provide good opportunities for improving the standard of living.

The prime objective of the WTP was to act as a repository as well as a training centre for the promotion and adaptation of science and technology targeting the rural community at the grassroots level regardless of gender. The park was launched with the following objectives:

- To create awareness of technologies that can improve the livelihood of the people.
- To organise capacity-building programmes for the community to own and manage their enterprises sustainably.
- To create a platform for the exchange of knowledge between Community to Community (C2C) and Community to Scientist (C2S).



- To establish linkages of enterprises with development agencies, financial institutions, and markets.
- To develop technologies that focus mainly on reducing the drudgery of women and increasing their livelihood through skills enhancement.

The park operates on the concept of 'Seeing is believing' and has accordingly been designed as a centre for green technologies ranging from housing, water, sanitation, green energy, and other allied technologies.

Status of WTP and activities carried out

The WTP promoted the development and adaptation of appropriate technologies, the distribution of established technologies, and the exhibition of operational technology models and units to better the rural population's living circumstances and standard of living. The different programmes and trainings provided at the centre helped the rural community build their knowledge and skill sets, which was crucial for generating revenue. The WTP received financial support from its parent organisation, the SCSTE, Meghalaya, through a number of its projects and programmes. The WTP also collaborated with a technical NGO for management and day-to-day operations. The WTP actively supported self-help groups (SHGs) by offering guidance and technical assistance and is currently helping fifteen SHGs. The WTP's connections with the rural community at the local level are crucial. As a result, the WTP presented and disseminated scientific technology as frequently as possible through practical demonstrations, awareness campaigns, and training sessions and was involved with the SHGs in the local communities.

The WTP trained men and women to create products like food items (juice, pickles, candies, and jam), bamboo handicrafts and furniture, incense sticks, sanitary napkins, and building materials like mud blocks and bamboo thrust. It also used locally accessible resources like bamboo and a variety of horticultural produce like ginger, pineapple, jackfruit, and others. The WTP worked with fisheries, scientific breeding of pigs using bokashi, the use of solar dryer for hatchery and fishery, the cultivation of lemon-grass, strawberries, bananas, and cardamom, and constructed a seed bank.

The WTP adopted and promoted several technologies/methodologies, including improved chulhas, mud block technology, bamboo thrust, solar dryers, fruit processing units, rainwater harvesting units, low-cost water filtration units, small biogas plants, twin pit sanitation units, sanitary pad manufacturing units, agarbati manufacturing units, solar electrification units, solar incubators, and bokashi pig farms. Technologies like the twin pit toilet and the rainwater harvesting unit were successfully installed in many regions. The SHGs were equally active in producing sanitary napkins, drying horticulture produce using solar dryers, and creating food products using fruit processing equipment. The center adopted the practice of utilising an incense stick maker to create incense sticks. The centre also provided rural children with an online education programme.

Technologies developed

Village women have traditionally been involved in social work and advocate for the community's welfare. The women expanded their participation in S&T activities to improve social uplift and livelihood after receiving S&T assistance. As part of the project's training and efforts to incorporate more women, women from the region assisted in clearing the jungle for the construction of a Training Resource Centre.

1. Installation of Micro-Hydro Power (MHP) plant:

The Micro Hydro Power (MHP) Project was started in partnership with MBDA & SCSTE to improve the facilities at the Resource Centre. This project was begun due to the area's intermittent and frequent power outages. After the village officials and SCSTE officials met to discuss the issue of electricity, site surveys and feasibility testing were conducted throughout the entire village, and the dam construction

and site preparation were completed. More work is being done to provide lighting for the households without access to electricity and the entire region.

2. Designing of Green Building

Green buildings were designed for the WTP centre, and renovation of the existing structures was also carried out. The beneficiaries were trained to make Stabilised Mud Block for the construction of the centre's infrastructure.

3. Installation of Solar Dryer

Given that these communities generate a lot of ginger and other regional fruits, one solar dryer was installed in the area in collaboration with Clean Energy Access Network, New Delhi, EmSys Electronics Pvt Ltd, Bengaluru, and PLUSS Advanced Technologies Pvt Ltd, Haryana. Twelve participants participated in a demonstration during the installation when local goods like ginger and pineapples were dried using the aforementioned device.

4. Capacity Building Programme

The Tripura Cane and Bamboo Center taught eight beneficiaries how to make agarbatti bamboo sticks and bamboo furniture. Along with receiving training in these areas, the recipients also received training in bokashi piggery, integrated farming, low-cost breeding of poultry (chicken and ducks), bamboo technology, craft items and utility products, bamboo vinegar, organic composting, and solar hatchery incubator. A livestock training programme on pig farming was performed in cooperation with the Meghalaya Institute of Entrepreneurship (MIE) to raise the value of pork. In five villages, training was provided on beekeeping as an initiative between the apiculture programme at the Barefoot College in Rajasthan and SauraMandala.

5. Functional Literacy School and Spoken English

The community highly prizes this educational programme for the poor and underprivileged because it benefits the children in the region. The programme was boosted by the arrival of the DST Project in 2017. The programme began with two regular teachers, and more than 100 kids signed up for it. An E-Learning classroom was also set up at the centre.

Reasons for the success

The success of the WTP rests heavily on its model of promoting innovation, the successful commercialization of scientific methods and technologies, and its contribution to economic growth. Other factors that contribute to its success include the local availability of raw materials, the pleasant climate, the accessibility of a workforce, the generosity of the local population, and the rural community's willingness to learn. Regarding product selection, the centre provided a platform for manufacturing food products that are not only easily prepared, transported, and stored but are in demand in the market. Income generation training was provided through proper scientific methodologies, enterprises, standard packaging, and labelling.

The dissemination of scientific technologies to the rural population benefited their livelihood, health, and standard of living (proper sanitation, hygienic living, healthy eating habits, permanent water source, and lighting). The linkages established by the centre through the transfer of technologies and scientific methods, as well as product generation, made it possible for the rural population to gain access to streamlined product generation, income generation, conscious technological knowledge, and market access. The centre promoted entrepreneurship by assisting self-help groups, primarily through technical expertise, until these groups became self-sufficient and independent.

Training on various aspects of S&T interventions was offered on a regular basis to provide the rural community with up-to-date knowledge, and this also served as a referral for the community to return regularly.

Obstacles faced by WTP

The establishment and successful operation of the park is based on various criteria. First and foremost, the funding agencies' financial support—or lack thereof—is the biggest challenge. This becomes even more crucial when the centre is still in its initial phase and depends entirely on outside funding.

Second, the WTP's location allows us to draw in significant stakeholders. The centre is appropriately situated in a rural location with plenty of natural resources and labour, but it is still reachable and not entirely isolated. Effective management, R&D initiatives, infrastructure, a lack of electrification, mobile networks, adequate road connectivity, etc., are possible additional variables that add to the problems.

Suggestions for future WTP

At the time of WTP establishment, having a clear strategy and firm approach, as well as focusing on specific aspects of S&T intervention, becomes an essential directive for future WTP. Linkages with agencies and technical institutions that fit the WTP's R&D profile may also significantly improve the center's performance. The WTP's processes and methodologies should be used in place of traditional S&T knowledge. The methods may be straightforward, simple, and easy to implement, especially since they may significantly impact the WTP's success in fostering the rural community.

Furthermore, the transfer of intangible knowledge, expertise, and technologies through scientific training and programmes should be done so that it creates a simple dynamic in the interaction between the WTP and the rural community where the training is held. This aids in promoting the rural populace's ability to maximise their benefits, whether through income generation or the improvement of their living standards.

In the future, the WTP will encourage the use of green technologies through demonstrations, hands-on training, and information sharing. The park will house an information point where visitors can learn about the various technologies through publications and videos.

The project is expected to further evolve with the following objectives:

- i. Formation of a registered cooperative society to manage the WTP sustainably.
- ii. The project will be able to demonstrate eco-friendly technologies for housing components, sanitation, bamboo products, and livestock, including value-addition of agriculture and horticulture products.
- iii. Conduct regular community to scientist workshops.
- iv. Attract tourists and promote eco-tourism.
- v. The WTP will host a 'Green shop' on agarbatti sticks, bamboo products, handmade paper, agro-products, local fruit products, and herbs.
- vi. The centre will also offer a venue for conducting action-based research programs.

5. Rural Women Technology Park at Chikiti Block, Ganjam, Odisha

Name of Park

Rural Women Technology Park (WTP) for the Empowerment of Women through Technology Approaches at Chikiti Block, Ganjam, Odisha

Implementing Institute

KIIT-TBI, Campus-11, KIIT-University, KIIT Road, Bhubaneswar, Odisha

About the WTP

The WTP was set up in Chikiti, Berhampur to empower women by connecting with existing self-help groups (SHGs) and creating avenues for income generation. The project was launched with the following objectives:

1. Skill enhancement in optimizing available natural resources through the conduction of quarterly training sessions.
2. Awareness training on health and hygiene for a better lifestyle and decreased mortality and morbidity rates in women.
3. Handholding support in creating the initial market linkages and mentoring and monitoring them till they could handle it independently. Assisting them in the creation of FPOs to strengthen their bargaining power.
4. Integrating the basic business dynamics in the SHG groups to convert them into revenue-generating self-sustaining models.
5. Creation of business enterprises that is for the women and by the women.



The WTP was able to establish its uniqueness by foraying into a diverse set of micro-enterprises, such as the production of biodegradable sanitary napkins to address the issues of menstrual hygiene and the production of millet-based noodles to integrate health into the inherent snacking habits of the rural people. The WTP also trained the women and set up mushroom cultivation and incense stick production units. Besides these, the WTP also conducted multiple workshops to identify latent skills and teach financial management, making organic manure, soil testing, and increasing the shelf-life of vegetables.

Use of E-commerce platforms

Two of the products manufactured at the WTP (millet-based noodles and incense sticks) were operated in the B2B model, where all the products manufactured were procured by private entities for marketing purposes.

Status of WTP and activities carried out

The enterprises established by the WTP are still operational and the technologies introduced are also active. The PI, Dr. Mrutyunjay Suar, has reached out to several corporates to support the expansion of the WTP unit that had been set up with the support of the DST Seed Fund.

The establishment of the WTP in the rural landscape and the sustainability of the model inculcated new hope and faith in the people and the community at large. The WTP has received interest from several SHG groups for support to replicate the model in their respective villages. Presently, the WTP is conducting monthly awareness workshops and training programs.

The annual reports published by KIIT-TBI cover the significant achievements/activities carried out at the Chikiti-WTP. The WTP is an integral, important, and prestigious project that has been able to create socio-economic and socio-behavioral change in the rural demography and hence needs to be sustained and constantly highlighted.

The WTP was able to generate revenue by establishing four model enterprises, creating six new SHGs, and providing support for value addition to more than 25 SHGs. These units will serve as a pilot model for replication in other areas.

The WTP also achieved the following objectives

- Increased awareness amongst local women regarding personal hygiene through awareness camps and distribution of sanitary napkins. Improved health and reduced morbidity due to better nutrition intake in pre and postnatal women.
- Reduction of the drudgery of work in the field with the introduction of low-cost paddy transplanter machines.
- Reduction in cost of farming by optimum fertilizer utilization and water conservation due to use of soil testing kit.

Technologies developed

1. Mushroom Farming & Food Processing

Mushrooms are fungi with fleshy, spore-bearing fruiting bodies that grow above ground on soil or their food source. They contain numerous spores for propagation that behave similarly to seeds in higher plants. The current detailed project was designed with mushroom farming as a potential market opportunity. KIIT-TBI works in agriculture technology and provides Agri-startups with incubation support. To maximise productivity at the lowest cost, the KIIT-TBI project team has transferred best prac-

tises for mushroom growing to chosen SHGs. Mushroom production has also embraced the concept of precision agriculture.

2. Sanitary Napkin

Menstruation is a natural biological occurrence in women, but due to illiteracy, ignorance of religious teachings, poverty, socio-cultural tendencies, and a lack of concern for psychological health and inadequate health facilities, the issue is not being effectively addressed. Menstrual hygiene management is one of the most critical and basic components of feminine health that is sadly overlooked in under-developed countries and globally. Expensive sanitary materials, unavailability of soap, sufficient water, and the inexistence of toilets and incinerators, especially in rural areas, contribute greatly to the negative consequences of menstrual hygiene mismanagement. Menstruating women use sanitary napkins to safely collect and dispose of their menstrual blood. The women today favour multi-layer foam with poly film napkins over traditional cloths. Using a high-speed or regular sewing machine, sanitary napkins can be made. The items are washed with Dettol water/spritichloxynol and autoclaved at a temperature of more than 100 °C to kill microorganisms, thus making the end products hygienic.

KIIT-TBI joined hands with the National Innovation Foundation to provide technology and machinery to local SHGs to produce sanitary napkins. The livelihood programme motivates villagers to participate in income-generating activities. KIIT-TBI provides training, infrastructure, and financial support for the machine.

3. Making of Millet Noodles

Noodles, a value-added processed food item made from wheat flour, are extremely popular in India. To enhance their nutritional aspect, millet flour and tapioca flour were added to the wheat flour. The technology for the production of noodles from millet was provided by KIIT-TBI in collaboration with one of its Startups-Kreya Foods, which is working extensively with millet-based products. The inclusion of millet flour in this widely accepted extrusion product has played a key role in creating some reduction in the nutrition gap in the rural ecosphere.

4. Making Incense sticks

The technology and process to produce incense sticks were provided by KIIT-TBI in collaboration with NIF. Local bamboo was used as a raw material for the production of incense sticks. The use of the local resources and indigenously developed technologies created a new product different from the ubiquitous traditional incense stick units. Due to the in-house production of the sticks, the quality of the incense sticks has been greatly appreciated by all the vendors.

Reasons for the success of WTP

The key elements that enabled the setting up of a sustainable WTP were:

- In-depth study of the unmet needs of the local community
- Engagement of the local administration
- Setting appropriate goals for the team
- Selection of technologies based on the availability of local raw material (millets for noodles and bamboo for incense sticks)
- Engagement of women across all age profiles to reduce social barriers and the introduction of the MIL-DIL concept (mother-in-law-daughter-in-law).

Obstacles faced by the WTP

The process of building and running a WTP was fascinating, with many exhilarating moments and bottlenecks that slowed the learning curve. The WTP was hampered by operational issues such as a shortage of transportation to the WTP's location. As a result, the cost of transporting raw materials increased, and the WTP had to look for local vendors ready to accept the finished goods and reimburse the transportation costs. Power interruptions regularly, especially during the summer, would lower monthly production volumes. As a result, units that were not blatantly dependent on electricity were set up, and the production process was aligned in such a way that the sections of the task that required manual intervention were completed during the outage. As a result, the cost of transporting raw materials increased, and the WTP had to look for local vendors ready to accept the finished goods and reimburse the transportation costs.

Initially, the lack of trust led to a large attendance for the awareness workshops. However, it translated only to a small attendance when a daily time commitment was required to set up the micro-enterprises.

Suggestions for future WTP

The following are some major lessons learned throughout establishing the WTP and transitioning it to a sustainable operational mode: It is critical to develop a vision of the project early on so that all concerned parties begin to conceive of it in a commercial rather than a grant-oriented approach. This would make the transition easier and ensure that the unit's activities would continue and grow once the monetary support was removed.

To ensure the seamless operation of the unit, a defined road map with clear roles and responsibilities for all stakeholders is required. The involvement of local administrative officials will allow SHG groups to gain access and mobilise and boost acceptance among the local population.

Success stories

- 1) Direct Beneficiaries: Women who work in micro-enterprises and the influence that a different source of income has had on their well-being, economic well-being, and social acceptance.
- 2) Indirect beneficiaries: Family members and tertiary business units that have been involved in the entire cycle and have seen an increase in their economic growth due to the unit's establishment.
- 3) Civil society: Behavioural transformation in the rural ecosystem has resulted in a good mindset and societal acceptance of technology.



6. Rural Women Technology Park–Kacharam, Telangana

Name of Park

Rural Women Technology Park – Kacharam

Implementing Institute

Vardhaman College of Engineering (Autonomous Institute, Affiliated to JNTUH), Hyderabad

About the WTP

This Women Technology Park (WTP) in Kacharam Gram Panchayat of Shamshabad Mandal, Rangareddy district, is located approximately 30 km from the city of Hyderabad. The district has no river in its vicinity, and farmers are dependent on rain-fed agriculture. The principal crops of the district are rice, jowar, ragi, cotton, sugarcane, mango, tobacco, castor, oil seeds, and pulses. The district witnesses erratic rainfall with intermittent or prolonged dry spells and is a semi-arid region with perennial water scarcity. This influences the time of sowings, crop stand, and yield of rain-fed crops due to poor recharge of groundwater.

The WTP was introduced with the following objectives based on the terrain and the geographical constraints of the region:

- i. To introduce the cultivation of Low Volume High Value (LVHV) crops, quinoa, and chia.
- ii. To prepare value-added products from LVHV grains for health and additional income generation.
- iii. To produce value-added products (VAPs) from village waste.
- iv. For value addition of horticultural crops through the introduction of energy-efficient and eco-friendly solar dryers.

The rural women were trained in new technologies for cultivating low volume, high value (LVHV), drought, and pest-resistant crops like quinoa and chia. The beneficiaries received inputs from agronomists and experienced farmers and implemented them.



Status of WTP and activities carried out

The semi-arid regions of Telangana were chosen for the project/technological intervention. The Shamshabad Mandal of Rangareddy district was zeroed upon, as this Mandal was reported to be a region with perennial water scarcity. The farmers make a living by growing leafy vegetables, flowers, and other crops that require little irrigation in contrast to income crops like paddy. The villages chosen were within a radius of 8-10 km from the WTP to minimize logistic constraints and improve access to beneficiary fields. The project team visited the designated villages on a regular basis and spoke one-on-one with the Gram Sarpanch and the villagers to raise general awareness. The WTP displayed LVHV crops and educated the farmers about the advantages of adopting the intervention.

The committee focused on one crop in the pilot project and introduced quinoa in the first year. This was followed by the introduction of chia and the supervised cultivation of quinoa in the second year. The instructions for cultivation were delivered in the local language by utilizing the services of the faculty from the College of Agriculture (COA, Hyderabad), experienced farmers from adjacent states, industry experts, and the project staff. In addition, on-site support through regular field visits and supervision was planned for beneficiaries during the crops' pre-harvest, harvest, and post-harvest stages. The enrolled beneficiaries attended classroom lectures with flexible schedules for 4-6 months. They were provided with transport facilities and refreshments to improve attendance. The knowledge transfer sessions were planned at the Gram Panchayat, where the villagers were briefed on LVHV crops, their nutritional benefits, challenges in irrigation, ease of cultivation, dietary requirements of the family, family health, and economic development of the family. The WTP also encouraged the villagers to include the LVHV crops in their diets. The beneficiaries received training regarding sowing, seedling transplantation, and planting along with activities like soil testing and characterization, field preparation, seed procurement, germination tests, sowing, irrigation, nutrition, pest control, weed management, initial stage irrigation, pest control, and preparation and application of organic manure, harvesting, and post-harvesting. The beneficiaries were also taken for on-site briefings, lab demonstrations, visits to agricultural college fields, and the processing industry. Farm implements were supplied to select beneficiaries willing to cultivate the new crops on their land.

The WTP calculated that a quinoa yield of 2000kg/acre in this region was possible. A few families agreed to sow quinoa in lands measuring nearly 100 sq. m area. The WTP supported and guided each beneficiary during the entire process.

Technologies developed

Due to the prevailing weather conditions, most of the villagers depend on rain-fed agriculture, and the productivity of most of the crops is very low.

1. Processed grains of Quinoa and Chia

The crops quinoa and chia are preferred for their nutritional contents and medical benefits. They require significantly less investment for cultivation but provide a high yield. These LVHV crops can be grown relatively easily in the semi-arid region of Telangana since they require minimal nutrition, which can be supplied through organic manure/controlled quantities of urea. After harvest, all the produce from different beneficiaries was bulked together and taken to a processing unit where it was polished, desaponized (to make it edible), and washed. The grains were subsequently weighed and packed in moisture-free pouches of different sizes (0.2/0.5/1.0 Kgs) and sold for direct consumption. This project benefitted almost fifty marginal women farmers who were able to grow more than 50 kg of LVHV crop per season and earned an income of Rs.16,000 for a Minimum Support Price (MSP) of Rs 200/kg.

2. Value-added products from quinoa

The VAPs manufactured from these plants were quinoa energy bar (chikki), quinoa payasam/kheer, quinoa pulihora, chapathi, and bakery items like cake and biscuits. Other products include dry quinoa leaf powder, an iron and calcium supplement, and chia oil, which is rich in OMEGA-3 and has medicinal values. In addition, quinoa leaves are also in great demand as a leafy vegetable due to their high calcium and iron content and nutritional values. The farmers get a quick return for its sale (less than 30 days) compared to vegetables and flowers.

3. Value-added products from village waste

The WTP observed a large amount of leftover vegetables and leaf waste in the village. They attempted to convert this waste into cattle fodder that could be suitably stored during dry seasons, thus saving the expenditure on buying fodder. The WTP initiated the solar drying of the greens to convert them into a dry

nutritious mass often blended with supplements like oil seed cakes, rice husk, jaggery, etc., and palletized in a suitable size for storage and use as cattle feed during non-harvesting seasons/cattle feed shortage. For drying purposes, the WTP installed two types of energy-efficient, low-cost solar driers: the hybrid solar drier that can be operated both on electricity as well as solar power and the mobile solar drier that can be moved from place to place and oriented in the direction of sunlight to enhance its efficiency.

Use of E-commerce platforms

Based on a market survey, the WTP devised a different marketing strategy to benefit the beneficiaries and sustain the intervention. The successfully implemented model included the following strategies:

- Development of a specific internal and external demand,
- Identification of genuine end-users
- Creation of internal demand amongst beneficiaries through VAPs
- Determining the MSP for the products and ensuring that the farmers do not sell their yield at prices below the MSP

The Vardhaman College of Engineering's staff and students were informed about the health advantages of these grains and their value-added products through awareness campaigns. These campaigns effectively increased the demand for LVHV among the college personnel who bought their produce straight from farmers at a minimum price of Rs. 200 per kg for quinoa and Rs. 250 per kg for chia. The beneficiaries were also pleased since they received a return of Rs. 200-250/kg for a minimal investment without incurring transportation costs.

Two models were discussed and proposed for implementation during the initial and commercial phase of the WTP with the sole objective of economic upliftment of marginal women farmers and their families through technological intervention. In the first model (Farmer Product Account-FPA), the farmers deposited the harvested grains with the WTP, and the quantity was logged into their respective accounts. The WTP arranged the post-harvesting processes, packaging, marketing, and sale. The farmers were able to withdraw cash against 'grain/ product credit' in their accounts. This model relieved the farmer of post-harvesting activities and helped in averaging the processing costs favourably. The main drawback of this model was the availability of a minimum amount of grains for processing.

In the second model (Single point of Contact-SPC), the farmer retained the grains after post-harvest processing, which the WTP arranged. The farmers and customers were not in contact, and the orders were managed/accepted by the WTP. The farmers sold their products at the MSP or above it. In this model, the farmer has to stock and protect the grains until they are sold. This model does not have WTP overheads and economically benefits the farmers.



Reason for the success

The project's overall impact was tremendous; its recipients expressed delight at learning and implementing the new technology that increased their revenue. They were able to stabilise their finances as a result. Additionally, including these grains in their daily diets provided health benefits that enabled them to reduce some of the nutritional issues.

In the initial stages, the WTP visited the farmers frequently because they understood that the farmers were reluctant to adopt the cultivation of new crops, about which they had little under-

standing. The WTP delivered the training on-site, rather than at the host institute, with teams visiting beneficiaries rather than the other way around. The team frequently visited the farms of the beneficiaries and assisted them at every turn, and the beneficiaries benefited from availability, assurance, and time savings. Additionally, the technologies taught to beneficiaries during the training sessions were applied practically at the WTP site, and results were displayed at each critical stage of crop cultivation, winning the confidence of the sceptic farmers. After the crop was harvested, a quick and affordable market with no middlemen or transportation costs was developed for the product disposal. The farmers earned outstanding returns upon the sale of the products, which further encouraged them.

The following points resulted in the success of the implemented technologies:

- Continuous motivation and encouragement to farmers at every step
- Hard-working team constantly supporting the beneficiaries and providing on-farm assistance.
- Expertise from respective fields supported by PJTSAU, Hyderabad
- Mentorship by Dr K. B. Suneetha Devi, Professor, and Head, Dept of Agronomy, PJTSAU, Hyderabad, and immense support from PJTSAU, Hyderabad in providing access to their experimental farms and supplying saplings for demonstration in training sessions.
- Introduction of new recipes with LVHV Quinoa and Chia to beneficiaries
- Training on pollution-free and hassle-free solar drying, even in the off-season
- Production of VAP from farm waste to reduce waste production and utilization of VAP as cattle feed
- Marketing of these products at the host institute, thus enabling the local market and reducing transportation costs.
- Provision of farm equipment like weeders and power sprayers and organic fertilizers like vermi-compost, neem cake, and neem oil to beneficiaries to reduce their dependence on agriculture labour, and chemical inputs, thus reducing their cost of production
- Using the capabilities of the in-house staff made it possible to optimize the training cost. The team was able to reduce training costs to almost 50%.

The WTP-Kacharam recipients are now self-sufficient owing to the information and skills they acquired during training.

The WTP further intends to:

- Enlarge the activity by identifying new beneficiaries in 43 villages in the adjoining areas.
- Shortlist farmers with marginal land and add them to the list of beneficiaries for the project's expansion.
- Continue priming and motivation every season before sowing.
- Arrange seed/saplings supply to new beneficiaries,
- Use WTP training/farmer interaction modes for knowledge transfer.
- Facilitate post-processing support, generating revenue for the WTP.
- Package and market grains for the beneficiaries.



- Ensure higher margins/income for beneficiaries through MSP control
- Form an SHG or tie-up with existing ones
- Extend necessary support to the WTP, and review and monitor its operations for sustenance.
- Provide technical support to beneficiaries through institutional support and online consultation.
- Expand the activities of the WTP and its product range to sustain operations.

Obstacles faced by WTP

- Women farmers were preoccupied with their day-to-day work at their farms/homes and thus were reluctant to attend meetings and classes.
- Farmers were apprehensive about adopting new technologies as most were small-scale/marginal farmers and did not want to risk their regular source of income from the cultivation of leafy vegetables and flowers. They also were unsure of adopting crops with a very long harvest time (110-130 days after sowing).
- Farmers were also uneasy due to the uncertainties of growing and selling a new crop. If the crop failed due to any external or internal factor (dry land, irrigation issues, any other uncertainties) or if the farmers could not sell it, they would be debt-ridden.
- There were also other issues in the implementation of the project, such as the non-availability of land (the land was already sown with vegetables or flowers) or severe water scarcity during summers.

Despite the obstacles, the beneficiaries showed up and attended the training session due to constant encouragement.

Suggestions for future WTP

A few suggestions were compiled based on the working and the outcomes of this WTP.

- The WTP must interact with and inspire the farmers regularly. Additionally, they must always be available to assist the beneficiaries, if not immediately.
- Before planting crops, the WTP must undertake thorough market analysis to verify that the product will be sold without harming the intended beneficiaries and with maximum profit.
- The WTP should provide prompt expert advice to solve unforeseen issues.
- The WTP noted that field-based training was more successful than providing instruction inside the host institute. The WTP should also always attempt to contact farmers rather than the other way around.
- The WTP should carefully choose suitable regions and beneficiaries (early adopters) to allow for the simple adoption of newly introduced technology or processes.

Success stories

Mrs. Swaroopa, a beneficiary who underwent training under WTP-K, said, "I live in Sulthanpally village. We were cultivating leafy vegetables, chrysanthemum, and paddy. Though we had our land, we were only left with a few savings. Due to the drought, the land remained barren over the summer, and we were left without money. We were unaware of LVHV crops until people from Vardhaman College

conducted meetings in our village. We were unwilling to put our regular revenue at risk by allocating our land to unknown crops that might result in debt. They persisted in coming to see us and persuaded us that we could grow these LVHV crops alongside conventional crops on a tiny piece of our property. After that, we organised a group and began attending training sessions at both our fields and VCE. Attending training and growing quinoa at our farm makes me very pleased. It made crop rotation easier. Since we used organic farming methods, our production costs were lower, which led to a healthy profit. Additionally, this sold for more money than typical harvests. More training in other sectors will be advantageous to us”.

Mrs. Sobha from Malkaram mentioned, “Our visit to the quinoa processing unit- Shamirpet, helped us gain first-hand information on the processing of quinoa. Also, field experts’ lectures helped us utilize available farm resources to grow these LVHV crops, thus reducing the cost of production by about a quarter. Farm implements supplied through the project helped us further reduce labor cost, bringing down the cost of cultivation to about half”. Another farmer, Mrs. Sabitha from Kacharam, stated, “We started consuming quinoa and chia as part of a regular diet. They are nutritious, and the taste is relished even by toddlers. In addition, we started consuming quinoa as a green leafy vegetable, which is a good source of iron. Implements provided through this project were very useful in daily fieldwork, reducing dependence on labour for weeding and spraying, thus saving on the cost of cultivation. Thanks to DST and Vardhaman College”.

Mrs. Ramanamma from Narkuda said, “Even though I attended training on cultivation, we do not own any land, and my husband and I work as agricultural labourers in the village. I also attended training programs on VAPs, which helped us understand their nutritional value and enabled us to prepare and enjoy eating them at home. Even our grandchildren enjoy them. All our family members eat them as part of their daily diet because they are healthy snacks and foods that diabetic people can also consume. This gave me the idea to form a group of three women and prepare these LVHV and VAPs in greater amounts and sell them in my village and adjacent villages, helping me establish a small-scale business and bringing in more income for the family.



7. Women's Technology Park of Technology Informatics Design Endeavour (TIDE), Bangalore

Name of Park

Women Technology Park, Bengaluru, Karnataka

Implementing Institute

Technology Informatics Design Endeavour (TIDE), Malleswaram, Bengaluru, Karnataka

About the WTP

TIDE is a non-governmental organisation (NGO) promoting sustainable development through innovative technological interventions for last 26 years. Its work encompasses energy access and biomass-based cooking/industry solutions, renewable energy and energy efficiency/conservation, environment management, and technology-based and innovative livelihoods, particularly with a focus on rural women. Since its inception, it has developed/adapted and transferred technology options like improved cooking stoves, biogas, biomass gasification, biomass briquetting, and energy audits. Its work aligns with the Sustainable Development Goals (SDGs) of the United Nations. TIDE's programs are primarily funded by the Government of India, international aid institutions, foundations, and corporate social responsibility (CSR) entities.

The current projects of TIDE are in the broad areas listed below

1. Biomass technologies: Research and development (R&D) and field acceptance efforts on innovative, LPG equivalent agro-fuel burning stoves, biomass conservation and biomass-based livelihoods, R&D and dissemination of efficient cooking devices for livelihoods.
2. Energy and resource conservation: Urban electricity conservation program VidyutRakshaka, VR lite, and school programs centered on environmental sustainability and climate education.
3. Gender & Livelihoods: Encompasses mobilisation and awareness for rural women on innovative livelihoods, WTP as a hub for incubating rural, technology-based women's enterprises, rural women leadership programs, and village development.



TIDE tracks and reports their impact based on four parameters: Social, Economic, Environmental, and Institutional. Some knowledge products/platforms from TIDE are TIDE Slate (a Digital platform for training, knowledge repository), VidyutRakshaka Mobile app (for electricity consumers in Bangalore), Technologies for dissemination (through Department of Science & Technology, Govt), and WTP (for rural outreach).

The project was implemented for all the women in Aralaguppe Gram Panchayat, in Tiptur taluk (comprising 227 villages), of Tumkur district in southern Karnataka. Tiptur largely depends on agriculture, with 65% of families involved in farming. About 62% of the women in the taluk are literate and therefore have the potential to learn technical skills and earn livelihoods. Self-reliant women contribute to the well-being of the family and nation-building. Women comprise 50% of the population and have the potential to earn livelihoods other than agricultural labour. Livelihood activities would enable women to move into decision-making roles that are socially empowering and financially remunerative. Activities that use locally available resources, materials, and inherent skills are preferred. A WTP with facilities for awareness creation, technical, and enterprise training and production would enable rural women to earn livelihoods in non-traditional activities such as greenhouse horticultural crops cultivation, nursery, making smokeless stoves, bricks making, and firing using LCBK, areca plate making, dehydration of vegetables and fruits. The women can be trained in the conservation of water, effective ways of rainwater harvesting, and the use of drip irrigation.

The WTP was implemented with the following objectives

1. To create infrastructure for a women's technology park with environment-friendly livelihood options.
2. To develop awareness and training packages on environment-friendly livelihoods for community-based organisations of women, NGOs, and train women groups
3. To offer marketing support and other facilitation services for the trained women.
4. To demonstrate the financial sustainability of the technology park.

Status of WTP and activities carried out

The WTP was established to offer a wide range of facilities and resources to rural women for micro-enterprise development and management, enabling them to secure their livelihoods.

The layout of the WTP was planned with provision for a training hall of 80 sq. ms area. The training hall was constructed with local materials and low-cost construction technology developed at the Centre for Sustainable Technologies (IISc) under the guidance of Prof. K.S. Jagadish. The WTP installed a low-capacity brick kiln (LCBK), smokeless stoves, a greenhouse with drip irrigation and rainwater harvesting rooftops, a nursery, a vermicomposting facility, an Areca leaf plate-making enterprise, a food processing shed with biomass dryer, stoves for processing ragi and value-added products, drying of vegetables and fruits, nursery, a computer centre, and a dormitory. The centre was also FSSAI certified and had a production facility for value-added millet products and drying of vegetables. The WTP was able to conduct residential programs owing to the ten-bed dormitory and caretaker room. The WTP provided the beneficiaries with awareness and technical training packages for all the technologies installed. It also offered forward and backward linkage for the enterprises set up by women. The WTP conducted training in oyster mushroom cultivation, value addition of ragi, pressed flower technique training, production of value-added products from pressed flowers (bookmarks, greeting cards, wall hangings, table mats, and coaster sets, de-skeletoning of bodhi leaves, and mounting painted leaves, customised conference pads from pressed flowers as cover page, etc.). These programs were a big hit with rural women who found these residential programs a welcome break in their routine, allowing them to pick up new skills and bond with peers.

The WTP developed linkages with experts

Designed the LCBK (Prof. K.S. Jagadish, retired from the Indian Institute of Science); Nursery and Green House cultivation (Prof. Krishna Manohar of GKVK, Bangalore and Dr. Balakrishna of Indian Institute of Horticulture Research (IIHR), Bangalore); Value addition of mushroom (Dr. Meera Pandey, Principal Scientist, Mushroom lab, IIHR Bangalore); Value addition of Ragi and Bakery enterprise (Dr. Jamuna K.V., Assistant Professor, University of Agriculture, Bangalore); Pressed flower technique and value addition (Dr. Sangama, Scientist, Post-harvest lab and Dr. Nita Khandekar, IIHR); Organic farming and sustainable agriculture (Eco-Agri Research Foundation Bangalore).

Additionally, the WTP nurtured a self-help group (SHG) called MANINI, which began about five years with production activities on vegetable drying. It has grown to undertake more production activities, including millet products, pickles, papad, masks, etc. The SHG also buys from other women and acts as a marketing agency. During COVID times, SHG sold masks worth about a lakh, sourcing them locally.

The WTP now functions as an aggregation centre or a hub linked with various women supplying products/services, acting as spokes. TIDE-WTP conceptualised this Hub and Spoke model of WTP to fulfill its mission and vision. It serves as a rural enterprise facilitation centre offering support services for access to information, technology, financial linkages, market linkages, and peer network. The WTP developed brochures regarding the activities carried out in Kannada and distributed them among NGOs, banks, taluks, and village panchayats. The WTP conducted meetings in 18 villages which covered over 1000 people.

Technologies developed

All the technologies installed in the WTP were to ensure the sustainable development of the local communities. The technologies were largely biomass energy-based or related to water conservation or sustainable agriculture. These technologies are in line with the region's needs and hence provide possible solutions to the issues of local communities. The technologies use local materials and are open for use by local women. The WTP intended to empower the women by initiating them into micro-enterprises using technological interventions that do not harm the environment. The process of initiating women into enterprises was developed by considering the socio-cultural circumstances that the women live in. The process involves discussions, awareness meetings, and training.

1. Eco-friendly Plates

The WTP conducted three technical training on areca leaf plate production. A total of thirty-two women participated in specialised training on areca leaf plate production, out of which eight women started their enterprise at WTP using the infrastructure provided at WTP, and four women started the enterprise on their own with the technical guidance of TIDE.

2. Green Bricks and Firing in LCBK

The group received technical training and started the enterprise. They produced 31,500 green bricks and fired them in three batches. The WTP assisted them in developing the market linkages. A total of five women are involved in a brick enterprise.

3. Minor Millet (Ragi) Value Addition

Technical training was provided to twelve women linked with the University of Agricultural Science, Bangalore, in value addition of ragi (minor millet). Women were taught to make popped ragi flour, ragi malt, papad, cake, and biscuits. Linkages were developed with UAS (University of Agricultural Science), while ten women were trained in making bakery products using ragi.

4. Oyster Mushroom Cultivation & Value Addition

Twenty women linked with the Indian Institute of Horticulture Research, Bengaluru, were trained in oyster mushroom cultivation and value addition of dehydrated mushrooms.

5. Organic Farming & Sustainable Agriculture

A one-day training on organic farming and sustainable agriculture was organised at the WTP for thirty-five women farmers in collaboration with Eco-Agri Research India, Bangalore. Information was provided on organic farming and its benefits, and practical sessions, including the preparation method of organic compost, were conducted.

6. Pressed Flower Technique

Twelve women were trained in the pressed flower technique and value-added products like book-marks, greeting cards, wall hangings, table mats, tea coasters, customised stationery items, de-skeletonised bodhi leaf, etc.

7. Paper Bag Making

Ten women were trained to make paper bags using old newspaper and craft paper, and women started selling them to local vendors.

Technologies such as the value-addition of millets, stoves, and areca enterprises became highly popular with the creation of more than twenty areca-based enterprises and a hundred micro-home-based ragi enterprises.

Use of E-commerce platforms

The areca plates were successfully marketed by TIDE entrepreneur Girijamma who successfully runs an enterprise and trains other women and has a good market linkage with Bangalore airport. The women making ragi-based products were encouraged to participate in exhibitions held at AGRITECH 2013 in August 2013, sponsored by NABARD, and in Rashtriya Mahila Krishi Mahotsav at Lalbagh in December 2013, sponsored by IIHR. Many groups of women were formed & these groups look after the markets of all the products produced by the women at WTP and market the promotional materials developed by TIDE.

Reasons for the success

The WTP activities were aligned with various projects that promote rural development, gender work, livelihood, and enterprise promotion. The WTP initiated production activities at WTP through SHG for financial sustainability and networked with various government and non-government organisations.

TIDE's WTP will be ten years old in 2022. In just a decade, it has evolved from a barren land to a place buzzing with activity, providing training, employment, and enterprise facilitation services to rural women. The campus strives to be self-sustainable financially and in resource management (energy, water, and waste). TIDE has been able to visualise the long-term mission for the WTP successfully.

Obstacles faced by WTP

The WTP was situated in a location with poor connectivity, which it overcame by provisioning a travel budget, providing a dormitory, and using the railway network. Since the project area was desolate,

the WTP spent regreening it and managing its water, electricity, and garbage use. The people expected donations to help them launch their businesses, so the WTP stepped in to offer assistance, support with training, and some operational assistance. Consequently, based on the WTP's business plan, the investors made investments in the company.

Suggestions for future WTP

- The WTP should also focus on the entire family instead of just the women because families are essential for the success of women. Awareness and training alone were insufficient to ensure the project's smooth operation. It was necessary to break the pattern by demonstrating how education and skills may provide a living.
- The WTP should expect a high dropout rate of 50 to 100 percent and budget accordingly. It should establish effective communication with the beneficiaries and the neighborhood, pay attention to their concerns, and try to match the initiatives with the neighborhood issues. The WTP should become an outreach and community connect center sensitive to the needs of the local communities.
- The SHGs should operate from the WTP, with members drawn from nearby local communities. While the WTP is long-term, the people/SHG should be groomed and given an exit strategy to become independent while the SHG continues grooming more people.
- The WTP should prepare a business plan and establish market links.
- The WTP observed that rural women enjoyed hanging out at the project WTP during residential training and treated it like a holiday.

8. Rural Women Technology Park in Salem, Tamil Nadu

Name of Park

Rural Women Technology Park in Salem, Tamil Nadu

Implementing Institute

Sona College of Technology, Salem, Tamil Nadu

About the WTP

The majority of people in the Salem district are lower middle class or below the poverty line and reside in rural areas. For a living, the inhabitants are reliant on daily wages or farming. Most individuals hail from farming backgrounds, and as most farm products have a short shelf life and are seasonal, their value plummets throughout the growing season, sometimes leaving farmers unable to recoup their initial investment. This WTP aims to give rural women the chance to obtain training in cutting-edge technology, giving them the opportunity to launch their enterprises.

The park was launched with the following objectives:

- To provide technology for sustainable utilization of natural resources for livelihood generation and provide opportunities for better utilization of waste/by-products for income generation.
- To serve as a common platform for deploying location-specific technologies for women and broader dissemination of these technologies, and establish their linkages with R&D institutes to promote and develop appropriate technologies.
- To develop individual and group entrepreneurship by providing training in backward and forward linkages.
- To create a network of women groups and facilitate an income generation program.
- To develop audio-visual aids for technology dissemination.

The WTP trained 725 women from 25 villages (9 blocks) in the Salem district who worked as daily wage labourers, farmers, silver anklet makers, masons, and tailors. The WTP introduced technology like pulse plating for silver work, appropriate storage facilities and solar drying for seasonal produce, paver blocks, and recycled waste paper for use in producing paper goods.

Status of WTP and activities carried out

The WTP introduced five location-specific technologies based on the needs of the beneficiaries and supported the rural women in establishing and managing the production units.



Technologies developed

1. Development of paver block

Pavements made of concrete blocks first appeared in Europe in the 19th century. They served as both roadways and walkways. To provide pavements in areas where conventional construction was less durable due to multiple technical and environmental constraints, interlocking concrete paving, an environmentally friendly and labor-saving technology, was developed during the Compulsory Rotary Residential Internship. The main components of such paver blocks are stone chips, fine aggregate, cement, and water. Currently, paver blocks are used in commercial industries, residential areas, and the paving of malls, plazas, parking lots, and bus stops.

The demand for sand and aggregates has risen due to infrastructure expansion, creating a need for alternatives. A significant amount of steel slag is produced every year, which causes stockpiling. Steel slag can be used in place of paver block aggregate to create a durable pavement. In this study, 10-100% of the fine aggregate and 100% of the coarse aggregate were replaced. In contrast to the hydraulic pressure type machinery utilised in commercial paver block manufacturing, we used vibrating tables, which are easier to handle for women.

Steel slag of nearly 500 tonnes per day is generated as waste material from the steel industry in Salem. It can effectively be utilised as a composite in making paver blocks. The steel slag improves the strength of the paver blocks compared to the conventional ones. The methods involved in the paver block making can be quickly adopted by the rural women, opening the door for them to start their businesses.

2. Pulse plating for silver anklets

Silver anklet production has traditionally been done by women in rural Salem. However, they suffer from low pay, dangerous chemicals used in the plating process, like sodium and potassium cyanide salts, and unfavourable working conditions. The silver anklet industries in Salem use the conventional DC plating method for electroplating silver anklets after the pre-processing. However, they are now adopting a DC-modified pulse plating technology to improve the quality and lengthen the lifespan of plated silver anklets. This technique minimises contact with chemicals by disseminating the plating in the nanomaterial range. The shortcomings of the conventional method have been lessened by switching from DC signal to pulse signal.

The following products were created using this technology: Anklets made of electroplated silver, silver-plated cookware, and silver-plated contacts on circuit breakers; spares for electroplated electronics

3. Solar food processing



Many seasonal vegetables and fruits are cultivated in Salem but have a short shelf life. During the season, the products are available in a large quantity at a meager cost; hence, the farmers cannot earn even the invested amount. But, during the off-season, the same products are sold at a very high price. To overcome this problem, the products can be dried and preserved. Utilizing a solar tunnel dryer during food processing boosts the product's value and extends its shelf life. For the benefit of both farmers and consumers, better drying, processing, and storage facilities are crucial. Simple direct sun drying costs nothing, and solar tunnel drying requires a small area based on the dryer's capacity. The food processing methods are simple to teach to rural women and benefit those from farming families.

The solar drier was designed in a parabolic shape to guide sunlight from all angles towards the center, and the drying chamber possessed a unique

airflow pattern. In cloudy weather or days with less solar radiation, Kudappa stone floors were used for re-radiating the stored heat. Using a solar dryer, the farmers could enhance their profit by drying the goods during the season and releasing them when demand was high. Some trained candidates with a farming background established solar dryers for personal use.

Using the solar food processing techniques, the beneficiaries started producing spices (green powder, moringa leaf powder, august tree leaves powder, matura tea powder), soup mix (tomato, onion), vegetable flakes (tomato, turkey berry), dry fruits and candies (orange, amla, banana, dry grapes).

4. Sewing Machine for differently-abled women

In our society, people with disabilities who have received a good education are more likely to be employed and have pleasant living conditions than those who are uneducated. The lives of women with disabilities are extremely difficult. To make such women self-reliant, the WTP introduced a modified sewing machine and trained the women to use it.

In the garment industry, foot pedal sewing machines (single needle lock stitch-SNLS) are typically used for making clothes. These foot-pedal sewing machines are not appropriate for women with disabilities of the lower limb. To assist women with disabilities and provide them with the ability to make apparel, the WTP developed a tool that allows the operation of sewing machines by hand. An existing industrial-grade sewing machine was automated with the help of an optical sensor and microcontroller-based motor control system. This technology was developed by the college staff involved with the WTP (Patent Reference Number: 201841044569). Because the clothing business requires a lot of labour, women with impairments can work in these industries by making certain modifications to the current sewing machines. A business called 'Vee Protect' hired trained women to sew clothing, different kinds of masks, and coveralls.

5. Wastepaper recycling

A significant amount of paper waste is produced daily, but only some get recycled while the majority are disposed of or dumped. In and around Salem, there are only a few wastepaper recycling businesses. A group of women were trained to prepare recycled paper goods such as paper files, bags, and envelopes from wastepaper. The rural women trained in this technique can work in industries producing paper goods or starting their businesses.

Use of E-commerce platforms

The company 'Vee Protect' marketed the masks and coveralls prepared by the differently-abled women.

The WTP planned to follow up with some companies to market the technologies.

Reasons for the success

In the Salem district, there are several villages. Most of the population lives in rural areas, where they are lower middle class or below the poverty line. The rural population makes a living as daily wage workers or through farming. The WTP chose the technologies best suited for the Salem district based on resource availability, knowledge of rural women, and prior job experience. The WTP provided the rural women an opportunity to train in the newest technological components and a chance to start their businesses.



All the five technologies introduced received good responses from the candidates and are still active. The success of the WTP can be attributed to several factors:

- The WTP was situated at the center of the Salem district, just 5km from Salem junction and 8 km from Salem bus stand, so it was well connected by transport services and easily accessible to the rural women.
- The technologies were simple to use and highly beneficial to the recipients. The health risks faced by women were lessened by the implementation of a unique pulse plating method in the silver anklet sector. Additionally, it strengthened the durability and quality of the anklets. Introducing a solar dryer enabled the proper drying and preservation of seasonal produce. The technology was low-cost, simple, and helped users make a wide range of goods for sale. The introduction of the modified sewing machine for women with disabilities enabled them to work and become independent. The women could efficiently operate the vibrating tables used for creating paver blocks, increasing technology acceptance. The rural women who received training in wastepaper recycling could get employment in the sectors that produce paper goods and have an excellent opportunity to start their own business.
- One of the most crucial factors for the project's success was follow-up actions. Upon completing the training, the WTP established linkages with banks and government departments such as DIC, Productive council, etc., to help the candidates start their businesses. The WTP also allowed the candidates to use the WTPs facilities until they could launch their businesses. In addition, the WTP established connections between the candidates and the raw material suppliers and markets for the finished goods.

Obstacles faced by WTP

Finding women candidates was extremely challenging for the WTP. The WTP reached out to candidates through government officials and cluster facilitators and conducted meetings with rural women. Still, even those interested in the training were unwilling to travel to attend it because of the expenses incurred. The WTP thus decided to award the candidates a travel allowance and stipend.

Another challenge was in finding a suitable location for site construction. The WTP intended to train applicants from across Salem District, so the training location had to be easily accessible, with transportation available from across the Salem District. The WTP was thus built in the heart of Salem, close to the Salem bus stop and Salem intersection, which allowed the WTP to cover 41 villages from just ten blocks in the Salem district.

The government officials helped the WTP find the differently-abled women, however, transporting them to the WTP center was challenging. The WTP availed a shared vehicle to bring such beneficiaries to the center.

Suggestions for future WTP

To ensure the success of the WTP, the following points must be considered before selecting the technologies:

- i. The project/technology must be suitable for the target area
- ii. The target women should have basic knowledge about the technologies
- iii. The target area must have the resources required for the implementation of the technology
- iv. The selected technology must be cost-effective, and the initial investment must be minimal to ensure that the trained beneficiaries adopt the technology upon completing the training.

- v. Theoretical instruction is sufficient for understanding technology fundamentals, but rural women prefer additional hands-on training in handling machinery, raw materials, product manufacturing, and marketing.
- vi. The training time must be brief because rural women dislike lengthy training programmes. Only when the training period and timings are appropriate for rural women will they be able to attend the training readily.
- vii. To develop individual and group entrepreneurship with the trained candidates and arrange backward and forward linkages.
- viii. The women groups should be informed about and guided through the process of availing bank loans for their projects.

Success stories

In this project, the WTP created 13 self-help groups and trained almost 750 rural women applicants. Around 80 were running their businesses using the resources at the WTP facility, while a few more established their businesses with bank financing. The earnings of the candidates increased from Rs. 8,000 to 15,000 per month as a result of this training. Typically, these women earned a daily income of Rs. 300 or around Rs. 6000 per month due to the unavailability of steady jobs. But as a result of the training and the fact that they launched their own company, their income increased.

Many of the ladies associated with the WTP established successful careers. Within a short period of starting their paver block manufacturing business using the facilities at the WTP site, a team led by Mrs. B. Sumathi received an order from 'Vee Technologies Pvt. Ltd.' for the making one lakh paver blocks. They recently successfully fulfilled the order, and with their earnings, they decided to launch their own business. They experienced a rapid expansion and are now consistently receiving more orders. The status of these women has now changed from labour to owner.

A group of women with disabilities who had received training on modified sewing machines began to get orders for sewing shirts and ran a profitable business. Some women started making masks on an order basis during the COVID-19 era. For the production of masks and coveralls, the company Vee Protect hired a group of women with disabilities.

A group of women led by Mrs. R. Sumathi, who had received training in solar food processing, began making masala goods and solar-dried food items. They started delivering the masala products to schools and institutions close to Salem. A few trained individuals were hired by Mukunth Food Industries Pvt. Ltd., a manufacturer of food goods. Some of the beneficiaries installed tiny solar dryers on their farms.



9. Rural Women Technology Park in Kasaragod District, Kerala

Name of the park

Rural Women Technology Park-Parappa Block, Kasaragod District, Kerala

Implementing Institute

Malabar Social Service Society (MASSS), Sreepuram, Kannur, Kerala

About the WTP

The WTP was established in the Parappa block of the Kasaragod District, Kerala, to enhance the rural area's agricultural income, encourage farm mechanization in cash crops, highlight the value-addition technologies from agricultural waste, and develop a technology training centre for women empowerment. Agriculture is the primary source of income for the rural population of the Kasaragod district. The commonly cultivated crops include rice, coconut, areca nut, cashew nut, rubber, and pepper. The district has been fatally affected by the indiscriminate use of Endosulfan pesticide.

The park was launched with the following objectives:

- To train the women groups in techno-entrepreneurship skills by providing appropriate technical and financial assistance to start micro and small enterprises among women self-help groups (SHGs).
- To establish a Women Technology Training Centre as a knowledge centre to disseminate location-specific women-friendly technologies by providing hands-on training and demonstration.
- To establish a facilitation cum marketing centre for promoting established enterprises by offering marketing support and ensuring the quality and branding of the product.
- To facilitate dissemination of proven innovations/technologies/knowledge/ practices of national-level R&D institutes/NGOs by establishing micro-enterprises among women self-help groups in agro-allied sectors.
- To disseminate various technologies suitable for the production of different value-added products from agricultural waste.



Status of WTP and activities carried out

The selected rural region in the Kasaragod district is rich in vegetation, with areca nut, coconut, rubber, tubers, etc., being the major cultivations. Low agricultural income, disapproval of farm mechanisation in cash crops, ignorance of value-adding technologies from agricultural waste and techno-based enterprises and product diversification, a lack of technology training centres for women's empowerment, and ignorance of marketing trends and product development are the main problems seen in the project area.

All of the traditional processing techniques are laborious. Crop processing facilities are designed to lower crop processing costs and raise the quality of the finished product. Through these facilities, the WTP introduced a brand-new source of revenue generation for the local rural women's community. Organic concoctions were synthesised from the cow manure and urine of a native breed known as the 'Kasaragod Dwarf'. This organic manure improves crop productivity and soil quality. Since these products were unavailable in the market, the WTP tried to bridge the existing gap. In rural areas, raising poultry was a common way to make money. However, the elevated cost of healthy coops forced the farmers to quit this activity. Micro-hatchery units, uncommon in the Kasaragod district, can produce large quantities of healthy poultry. The introduction of these business strategies helped the farmers in this area by transforming the rural women's population into income-producing partners in households.

To empower the community, awareness programs were conducted, and more than 800 rural women were trained. To generate livelihood diversification, various technology transfer/training programs were conducted for rural women, and eleven new technologies (organic formulation and bio-manure production; bamboo craft unit; micro-hatchery and poultry farming; areca nut de-husking unit; weeding unit; coconut drying unit; pearl culture unit; herbal medicinal oil; coconut shell crafts unit; virgin coconut oil; coir pith compost unit) were adapted and four new/modulated technologies were field-tested. A total of 29 enterprising units with the necessary machinery were set up under the project, and for the implementation of each technology in the WTP, 25 SHGs with 20 members each were formed in different villages in the Kasaragod district. Towards the end, all the 500 beneficiaries received support from the project to begin their enterprises. The WTP provided marketing centres and network linkages to aid in increased household income and established a Training cum knowledge Centre for the beneficiaries at Rajapuram, Kasaragod district.

The technologies introduced were identified based on the need and availability of suitable raw materials. The scopes and market potential of the technologies were determined through a survey.

Technologies developed

1. Organic formulation and bio-manure production

The raw materials (cow dung and urine, milk, ghee, tender coconut water) required to make these formulations were widely available in the project location. The products, Geevamruth, Beejamrutham, etc., cannot be stored for an extended period. This issue was discussed with agriculture experts, who suggested preparing these formulations as the order is received and may produce organic manure using these raw materials. The beneficiaries were trained in preparing various organic formulations and fertilizers, organic disease and pest management, and taught to identify common herbs with pest repellent properties.

2. Areca nut de-husker

This machine peels the husk instead of cutting it to remove the nuts. With the aid of this machine, 200-250 kg of nuts can be processed every hour. This reduces drudgery, processing time, and cost. The device weighs around 200 kg and can fit in a compact space. Both operation and maintenance of the machine are simple. The finished product will be obtained at one end, and the husks will be eliminated from the opposite end.

3. Enhancing Pearl culture production

In this technology, the beneficiaries were taught to select appropriate mussels, feed them properly, and manage their diseases. They were further trained to produce and inoculate the nucleus. To enhance pearl production, pearl culture was carried out in a Ferro-cement tank and plastic buckets instead of a natural pond.

4. Production of herbal medicinal oil (Murivenna)

The beneficiaries were trained to identify the herbs and taught about the medicinal value of the herbs, the methodology of oil production, and its marketing. The medicinal oil currently available in the market comprises 7-12 herbs, whereas the medicinal oil introduced through this project uses 32 herbal extracts.

5. Increasing shelf life of Bamboo craft

The local community has been using bamboo treated with turmeric and hot water to increase the product's life. The beneficiaries were trained in using machinery for producing bamboo crafts and the processing and marketing of the crafts.

6. Weed plucker and Bush cutter

The weed plucking device helps control weeds' fast growth by easily pulling out the deep roots. In these trainings, the technology behind the machines was explained, and the beneficiaries were taught to operate and maintain these machineries.

7. Virgin coconut oil production and waste utilization

Coconut is one of the major crops cultivated in Kasaragod and is widely available. The beneficiaries were made aware of the medicinal properties of coconut oil and taught the methodology of virgin coconut oil extraction and traditional and advanced oil extraction methods. After virgin oil extraction, grated coconut and coconut water were used to make value-added products such as dried coconut chutney powder, curry powder, coconut cookies, and squash. The coconut shells were polished to produce crafts and ground for ash production.

8. Coir pith compost-making unit

The trainees were taught to clean and grade coir pith, make coir pith compost, and package and market it. Two methods were followed in compost making: the first used urea and the second used asola and fish waste.

9. Micro-hatchery unit

The beneficiaries were trained in hatching technology, temperature settings, feeding and medicines for the chickens, and marketing. Breeding batches are maintained to ensure the availability of fertilized eggs.

The medicinal oil produced using more herbal extract was very effective in pain relief. The organic formulations such as Jeevamrutham, Panchagavya, etc., had more yield, and bamboo treated with turmeric was more resistant to pest attack than the untreated ones. Based on the product's demand in the market, many enterprises were established for each technology. Additionally, beneficiaries were trained in entrepreneurship development, financial management, banking, marketing management, crop management and value-addition of vegetables, covid awareness, and informed of various government schemes and subsidiaries. Regular field visits and project monitoring were conducted to ensure the project's progress, and the beneficiaries' problems were discussed and solved through the technical centre.

Use of E-commerce platforms:

The marketing of the products developed was done through various NGOs, Farmers Producer Organisation (FPOs), and SHG networks such as Bhoomika FPO Wayanad, New Model FPO Jannie, Elements Crafts, Wayanad, and Pearl Center, Malakkallu. The Freshwater pearls are being bought by Pearl Oyster farm, Malakkallu.

Reasons for the success:

Several factors contributed to the success of this WTP:

- All the products were made using local resources and were in good demand in the market.
- Various R&D/S&T institutions assisted the locals by undertaking activities and offering training and technology support. Furthermore, marketing linkages and credit were provided to the locals to give them stability.
- The WTP incorporated the suggestions and recommendations of the Local Project Advisory Committee (LPAC) and local self-government organisations.
- The beneficiaries were provided entrepreneurship training to support the growth of locally managed businesses.

Obstacles faced by WTP:

The preservation of organic formulations like Geevamruth, Beejamrutham, etc., presented challenges for the WTP because they cannot be kept for long periods of time. The residual grated coconut and coconut water from the extraction of virgin coconut oil presented another problem. The solution to this issue was the development of value-added products from grated coconut and coconut water, such as dry coconut chutney powder, squash, and other items.

Suggestions for future WTP:

Based on the operations and results of this WTP, a few recommendations were put together, such as the idea that following the action plan methodically will help implement the project effectively. Future WTPs will receive support, both online and in person. Future WTPs may also choose to consider loans from the Kerala State Backward Development Corporation and Kerala Gramin Bank for the development of microenterprises, which have helped SHGs improve their operations and become more sustainable. Fourteen businesses and entrepreneurs were also motivated and inspired to continue the project's success. Due to its success, numerous districts in the area and its bordering districts have expressed interest in replicating the concept.

Success stories:

The rural women from the Kasaragod district are the project's beneficiaries. If training programmes and knowledge centre activities, success stories and experiences of women, and unit activities could be incorporated into a video it would inspire others. The implementation process and experience of the project team would allow other WTPs to better their project. It is important to communicate with others the experiences of beneficiaries of skill development programmes, businesses, income growth, and improvements in their social and economic standing.

10. Rural Women Technology Park of Kanjirapally, Ranny and Pathanamthitta Taluks of Kerala

Name of Park

Rural Women Technology Park for the Holistic Empowerment of Women in Rural and Semi-Urban Areas of Kanjirapally, Ranny, and Pathanamthitta Taluks of Kerala through Agro-Allied Micro and Small Enterprise Development

Implementing Institute

Peermade Development Society (PDS), P. B. No. 11, Peermade, District, Idukki, Kerala

About the WTP

The Women Technology Park (WTP) was conceptualised and designed to enhance women's ability to take up innovative programmes for income generation through adopting new technologies. To achieve this goal, a Women Training School was established in the project area with four extents, each of which had specific training areas. The centers functioned as demonstration cum training centers of the identified technologies, and external experts were hired to conduct the training programmes classes. Most farmers of the region, where the project was implemented, were still dependent on conventional crops such as pepper and cardamom, so new crops were introduced to diversify the income source. These new crops have massive potential for enterprise development compared to the conventional crops and thus were an added advantage to the WTP.

Status of WTP and activities carried out

The WTP successfully trained 720 women beneficiaries in technical skills. The successful establishment of 30 enterprises by the WTP provided employment opportunities to 390 trained women, thus helping improve their livelihood generation. In addition, the WTP indirectly benefited approximately 4000 marginal farmers as backward linkages through the purchase of raw materials for the enterprises.

For the production enterprises, centralized or region-wise common facilities centres (like weighing & packaging, etc.) were set up so that the entrepreneurs could utilize these at an affordable cost without



any initial investment. The services enterprises envisaged in the project mainly require machines/ implements, and a custom hiring facility for these was set up at the facilitation centre. A pool of workers who could operate these were created so that the facilitation centre could act as a one-point contact for providing these services. The WTP also developed a centralized marketing system along with various marketing tie-ups for the smooth marketing of the products.

Technologies developed

1. Tapioca processing units

Cassava, locally called Tapioca, is a woody shrub extensively cultivated as an annual crop in the tropical and subtropical regions. Its edible starchy tuberous root is a significant source of 35 carbohydrates. But the cassava tubers have a very short shelf life and need rapid processing into some storable form within two days of harvest. One of the best ways to tackle this issue is by adding value to the crop through conversion to shelf-stable products with high-end value and nutritional quality. The WTP established enterprises for tapioca processing in the form of sweet fries, pakkavada, flour chips, fries, and crisps products.

2. Vetiver cultivation and the creation of value-added products

Vetiver is an aromatic plant grown exclusively for the extraction of aromatic oil from the roots. Vetiver roots contain a fragrant oil, considered one of the finest aromatic oils. This oil has been utilized as a primary raw material in various scented products (cosmetics, perfumes, deodorants, lotions, and soaps).

The young leaves are used as fodder, and the dry leaves are used for thatching and making brooms. The above-ground portion is used in various ways, such as making paper, mats, ropes, hats, and baskets. The WTP aimed to introduce the technologies of cultivating, processing, and preparing value-added products from vetiver.

The cultivation of vetiver is ideally suited to the climatic conditions of the project area. At the same time, the requirement for the products made from vetiver leaves is in very high demand. The women's group started the basket production from the vetiver leaves and produced more than 250 baskets each month. The product was diversified in various shapes, molds, and replays plastic pouches, thus acting as the best example of 'Waste to Wealth'.

3. Passion fruit cultivation and value addition

Passion fruit cultivation is a new trend in Kerala; passion fruit is an underutilized crop used only for raw consumption with no value-added products available in the market. In 2015, the Kerala Agricultural University (KAU) started the production of value-added products from passion fruit. The WTP adapted this technology from KAU and popularized it through the women's training school. The cultivation of passion fruit and implementation of this technology helped establish five nurseries of passion fruit, two enterprises, and the development of five new products. It provided a new source of income for rural homemakers.

4. White pepper production using Bacillus strains

The production of white pepper helped establish an enterprise where four spice products were developed, and these provided additional income to the women.

5. Nursery techniques

The rural WTP ultimately aimed for the holistic development of rural and semi-urban communities in the target area through Agri-allied activities. A vital requirement for the success of such project

activities is the supply of quality planting materials. To enable this, the WTP team established fifteen nurseries widespread in the region through fifteen women Self-help Groups (SHGs). These nurseries also function as independent business units.

Reason for the success of the WTP

The WTP established a Women Training School as a knowledge hub for processing and disseminating location-specific gender-friendly technologies by providing hands-on training and familiarizing the women groups with successful technological operations. It also established a facilitation cum marketing centre for promoting established enterprises of women SHGs for custom hiring of shared facilities, effective quality control, and proper marketing of products. The women groups were trained in techno-entrepreneurial skills in value addition of cassava, vetiver, passion fruit, and pepper by providing appropriate technical and financial support to set up micro and small enterprises.

Various other schools approached the Women Training School to link their entrepreneurship clubs to get techno-based training programmes. This model received wide acceptability among the public. The project team initiated the Joint Liability Group (JLG) bank linkage programme for getting credit facility; the women groups got Rs. 2 lakhs as a loan for three years with 11% interest.

Use of E-commerce platforms: For marketing the products, the WTP worked with Lissy Spices, Amazon Saheli, Flipkart, Kerala SME, etc.

Obstacles faced by the WTP

The WTP faced certain significant obstacles, such as the lack of infrastructure in the area. The area is yet to receive rail and air connectivity, and despite the villages having road connectivity, the condition of the roads is miserable. The public transportation systems do not yet connect many villages. The WTP faced an initial delay in obtaining credit facilities from banks to set up new enterprises initiated through the women's training school. The WTP was also met with a lack of technology for the production of White Pepper. The WTP observed a loss of output during the Kerala flood, which affected the availability of raw materials from August to December 2018. The adverse climatic conditions during the middle of the year also impacted the projected sale of the enterprises.

Suggestions for future WTP

The WTP should keep enhancing the number of trainees and adopting new technologies. It should also provide consultancy services for arranging credit facilities for new entrepreneurs and arrange FSSAI and other legal formalities for the enterprises.

Success stories

Pratheeksha, a women's SHG with sixteen members, is located in the project region. All the members come from middle-class families and are homemakers. They occasionally work as daily wage labourers to meet their needs. In the initial stages, the women depended on their spouses for weekly savings. The women then attended the orientation programme and training for food processing organized by the rural WTP in their village. The WTP arranged a credit facility from the bank and created a viable business plan for the SHG. Despite the initial struggle in business development, the SHG, with the support of the WTP, initiated the preparation and marketing of white pepper, and the marketing of black pepper. The main reason to select pepper was its easy availability. The SHG began selling white and black pepper through the PDS network and local shops. After a year, they were able to widen their product range from five to twelve and began selling on Amazon. Their brand "Lissy Spices" has become a global seller on Amazon India.

Abbreviations

B2B: Business-to-Business
C.V.: Calorific Value
C2C: Community to Community
C2S: Community to Scientist
CAP: Community-Acquired Pneumonia
COA: College of Agriculture, Hyderabad
CoRP: Consortium of Resource Persons
COVID: Coronavirus Disease
CSIR-NEIST: Council of Scientific & Industrial Research-North East Institute of Science and Technology
DC: Direct Current
DIC: District Industries Centre
DST: Department of Science & Technology
EMI: Equated Monthly Instalment
FPOs: Food Producer Organizations
FRI: Forest Research Institute
FRLHT: Foundation for Revitalization of Local Health Traditions
FSSAI: Food Safety and Standards Authority of India
i.e.: That is
ICS: Improve Cook Stoves
ICT: Information and Communication Technology
IICPT: Indian Institute of Crop Processing Technology
IT: Information Technology
ITC: Indian Tobacco Company, Kapurthala
JLG: Joint Liability Group
JNTUH: Jawaharlal Nehru Technological University Hyderabad
KAU: Kerala Agricultural University
Kg: Kilo gram
KIIT-TBI: Kalinga Institute of Industrial Technology, Technology Business Incubator, Odisha
KVK: Krishi Vigyan Kendra
L: Litre
LPAC: Local Project Advisory Committee
LVHV: Low Volume High Value
MAP: Medicinal and Aromatic Plant
MASSS: Malabar Social Service Society
MBDA: Meghalaya Basin Development Authority
MHP: Micro-Hydro Power
MIE: Meghalaya Institute of Entrepreneurship
MIL-DIL: Mother-in-Law-Daughter-in-Law
MIN: Municipal Identification Number
MSP: Minimum Support Price
NGOs: Non-Governmental Organizations

NIF: National Innovation Foundation
NSQF: National Skill Qualifications Framework
PDS: Peramade Development Society, Kerala
PGSC: Pushpa Gujral Science City, Punjab
PJ TSAU: Professor Jayashankar Telangana State Agricultural University, Hyderabad
PV: Photovoltaic
Pvt. Ltd.: Private Limited
R&D: Research & Development
RCSD: Resources Centre for Sustainable Development
RWTP: Rural Women Technology Park
S&T: Science and Technology
SCSTE: State Council of Science, Technology & Environment, Meghalaya
SEED: Science for Equity Empowerment and Development
SHGs: Self-Help Groups
SMPB: State Medicinal Plants Board, New Delhi
SNLS: Single Needle Lock Stitch
SPC: Single Point of Contact
SPURThe: Sri Padmavati University Rural Women Technology Enterprise
SPV: Solar Photovoltaic
TIDE: Technology Informatics Design Endeavour
UBFDB: Uttarakhand Bamboo and Fiber Development Board
UPES: University of Petroleum and Energy Studies, Uttarakhand
VAPs: Value-Added Products
WTP: Women Technology Parks

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