

Skill Development Training for Unemployed Youth of Lucknow Region, Uttar Pradesh on Solar Energy and Its Technologies with Reference to Agriculture

Prepared for

**National Bank for Agriculture and Rural Development (NABARD),
Lucknow, Uttar Pradesh**

&

**Indian Science Technology and Engineering (ISTEM), Bengaluru,
Karnataka**

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Background

India has a large working age population of 15 to 59 years of age which can make a significant contribution to the country's growth provided it is equipped to be productive. This working age population is estimated to rise by many times over the coming decades. This rise would escalate the number of people in the unorganized sector of work unless they are encouraged to acquire the right set of skills and knowledge and prepared for employability. As India faces rising fuel demand, threats to energy security, and the high GHG emissions leading to adverse impacts on climate; renewable energy and solar energy application in particular, offers critical low carbon emission solution. Innovative clean energy solutions, including large solar mini-grid development, conceptualizing creation of solar parks and installation of rooftop solar panels in dense urban and rural areas, can help to resolve increasing fossil fuel demand and moving towards low carbon energy generation. Across the States, SAPCC policies have emphasized solar technology applications in power generation, industrial processes, decarbonisation of transportation, solarisation of agricultural practices etc to reduce carbon emission and meeting climatic goal. India being an agrarian economy, large impact of solar technology use to bring innovation in agricultural practices can be seen in recent years. Recognizing the vast number of jobs that a scaled up clean energy market would create, domestic initiatives that support manufacturing, job creation and skill development have been introduced. For example, solar manufacturing capacity is receiving a needed boost under the "Make in India" initiative.

Agriculture and Solar Technologies: Groundwater levels in India are depleting, while groundwater has played a key role in boosting agricultural production, the provision of subsidized power to farmers has led to the ubiquitous use of irrigation pumps and the over-extraction of this vital resource. Government of India has introduced schemes like KUSUM which aims to leverage solar technology applications in a big way in agriculture sector – irrigation, crop protection, harvesting, crop drying, cold storage etc - all aimed at providing clean, reliable power and doubling farmer incomes in near future. Therefore it is very necessary to aware the communities and develop skills of local youths on solar technologies applications through intensive skill training, where trainees will evolve from joblessness to implementer and entrepreneurs. We strongly believe and have proven through our past 25 Green Skill Development Trainings that such skills will increase their employability in industries, support them to bring innovative changes in local agricultural practices and evolving entrepreneurship.

Solar companies find a lack of proximity to training institutes to be the most difficult challenge to overcome in hiring trained personnel and are currently relying primarily on in-house training to meet their needs. The poor quality of existing training programs was identified by respondents as the biggest challenge facing existing training programs for solar employers in India. High quality, accessible certification programs that reduce the need for on-site internal trainings of new workers is a big opportunity. In this regard, TERI intends to organize two training programmes jointly with NABARD and ISTEM (IISc) at Lucknow, Uttar Pradesh to train ITI/Polytechnic/Diploma holders and /BSc/BTech/MSc graduates, who will then become employable, furthering Atma Nirbhar.

TERI's impactful Capacity Building Initiatives

TERI has been engaged in capability development activities for last over three decades. TERI's strength in the area of training lies in its multi-disciplinary experience gained through extensive field and project work. Besides carrying out training programmes for various government ministries and agencies, multilateral and bilateral agencies, TERI also conducts regular training programmes for IAS, IFS, and central and state government ministries/departments.

In recent times, in line with the Skill India Mission, Ministry of Environment, Forest & Climate Change (MoEF&CC) utilizing the vast network of Environment Information System (ENVIS) and National Mission on Himalayan Studies has taken up a pan-India initiative for green skill development. As part of ENVIS programme, TERI had already successfully conducted 25 residential Green Skill Development Programmes (GSDP) — each spanning 240 hours - for over 780 students (nearly 45% of them are from different tribes across India) on “Sustain and Enhance Technical Knowledge in Solar Energy Systems” and Waste management (Solid waste, Biomedical waste, plastic waste, E-waste, construction & Demolition waste) in Bihar, Uttarakhand, Uttar Pradesh, West Bengal, Tamil Nadu, Maharashtra, Meghalaya, Odisha and Jharkhand. Unemployed youths including standard 12th dropouts, ITI, diploma holders, and graduate students were given a chance to learn on application of solar energy technologies in industrial processes and agricultural practices including use of solar pump, heater/dryers, solar fencing etc. and use the learning's into livelihood options. Similarly, waste management trainings have turned them into practitioners and help local youths to engage in livelihood generation. TERI has been successful in providing livelihood option for over 50% of the trainees in the relevant areas through its strong partner network and industry linkages.

In alignment with the objectives of Government of India, TERI has been conducting Training programmes for Women Entrepreneurships and Green Skills Training. In all such customized initiatives, gender-balance remains one of the key considerations. Women Entrepreneurship Skill Development Programme. TERI has conducted three online Women Entrepreneurship Development Programmes (WEDP) between January and April 2021. The programmes were sponsored by The National Science & Technology Entrepreneurship Development Board (NSTEDB), Department of Science & Technology (DST), and Government of India. The programmes aimed to equip the women - who are science graduates and diploma holders - with the entrepreneurship essentials like conceive ideas, plan, initiate, launch and maintain economic activity to run a successful enterprise.

TERI and TERI School of Advanced Studies also acted as a global capacity building Hub for the Sustainable Energy for All (SE4ALL) Initiative. This Hub blended the research and training expertise of TERI and TERI University to empower individuals and institutions along the entire energy value chain. TERI and TERI School of Advanced Studies also organized very unique, Sustainable Energy Leadership Programmes (SELP) for mid-career officials from across the globe in association with UNIDO. Drawing from its experiences at the grassroots level, TERI recognized the need for capacity building, training, and skill development of a category that matters most in the whole value chain, namely, technicians and rural entrepreneurs. The severity of the problem can be gauged considering that India currently faces a severe shortage of well-trained, skilled workers. It is estimated that only 2.3 % of the workforce in India has undergone formal skill training as compared to 68% in the UK, 75% in Germany, 52% in USA, 80% in Japan and 96% in South Korea (Source: Ministry of Skill Development and Entrepreneurship). Large sections of the educated workforce have little or no job skills, making them largely

unemployable. Therefore, India must focus on scaling up skill training efforts to meet the demands of employers and drive economic growth.

TERI has been regularly organizing international training programmes for the developing countries under Government of India's ITEC programme covering various topics pertaining to energy, environment, climate change, and sustainable development. Over the years, TERI has conducted 72 training programmes under ITEC, some of them jointly with TERI School of Advanced Studies. Indeed, TERI has been organizing tailor-made training programmes on a variety of topics for decision-makers, practitioners, technicians, as well as entrepreneurs. Beside India, TERI had also organized specific training programmes in the field of sustainable energy and sustainable development aspects for different developing countries. Many of these programmes were organized in those countries themselves.

Project Area

TERI, with its extensive experience of working on rural development programmes, and expertise in enterprise development and capacity building in the solar energy sector, proposes to conduct two specialized skill development training programmes for unemployed youth of Lucknow, Uttar Pradesh.

Objectives

- To provide trainings to three year diploma holders and graduates of the ITI's at the local to state level.
- The overall objective of the project is to create a pool of employees/ solar enterprises/youth at different levels and build necessary skills and capacities of solar entrepreneurs for effective implementation and dissemination of solar energy systems and services in agricultural practices in rural and peri-urban areas of Lucknow.
- This initiative can generate an indigenous cadre for maintaining complex solar apparatus / equipment, reducing maintenance costs as well as ensuring prompt servicing so that tool-downtime is kept to a minimum.
- These trainings will be used to train youngsters to open up, strip, repair, and/or retrieve useful spare parts.
- Establishing network between Energy Enterprise, trainees and Industries.
- Linkages creation between trainees and financial institution / MFI for secure loan

Along with these, the outcomes would also contribute to the national process of achieving Sustainable Development Goals by reducing poverty (SGD-1), Quality education (SDG-4), Affordable and clean energy (SDG-7).

Besides creating industry/academic connect for students to get a job, a list of solar technicians will be published through I-STEM portal for better job opportunities.

Project Beneficiaries

- ITI/Polytechnic/Diploma holders and /BSc/BTech/MSc graduates / Rural Youth / farmers/ local technician/ entrepreneur/ Women in Lucknow as direct project beneficiaries.
- Nearby industries, academic labs and technology suppliers, who are looking for trained technicians.
- I-STEM website with a list of trained solar technicians as outcome of the ongoing project of skill development.
- Awareness creation regarding benefits of solar technology applications would encourage nearby stakeholders to use solar equipment's for residential and commercial use.
- Nearby stakeholders who have purchased solar equipment's for residential and commercial use.

Participants

Participants of around 25-30 numbers in each batch. Total 2 residential trainings will be conducted.

- **Duration of Training Course:** 240+ hour / 30days (In addition to these programmes, 10 students would be selected and encouraged for ToT training with additional features for incubation workshops)
- **Medium of Training Programme:** English / Hindi

Methodology

Training methodology consist of development/modification of course modules, mobilizing interested students, printing and distribution of course modules, setting up temporary solar technology lab, installation of solar micro-grid by students, field trips, awareness generation among local communities and certification of students. To provide trainings to the youth at specific locations, TERI had good connections with UPNEDA as training partner, develop course modules (adopt NSDA approved courses and customized them), identify youths from the locations nearer to Lucknow, coordinate resource persons, conduct trainings, measure skillsets developed through a number of assessments, develop industry linkages for livelihood generation for stakeholders.

This course will introduce and train candidates on the concepts of solar energy and solar power generation, provide hands-on training and practical exposure to solar equipment, system components and tools, etc. and will understand new technologies its skill and knowledge to perform R&D, project implementation as well as installation, operation and maintenance related tasks efficiently. Skill development training on solar energy helps to provide skilled manpower for emerging sector and bridging the gap between job requirement and skills currently available with potential solar technicians. Additionally, during the training period, community awareness highlighting benefits of solar technologies with specific reference to solarization of agriculture will be carried out. Following are the activities performed:

1.	To provide trainings to the rural youth preferably at specific locations, TERI will mobilize training partners, develop course modules (adopt NSDA approved courses and customized them), identify youths from the locations, coordinate resource persons, conduct trainings, measure skillsets developed through a number of assessments, develop industry linkages for livelihood generation of students.
2.	During the training programmes practical and theoretical knowledge of installation, Solar pump, cold storage technology, irrigation techniques, Street lighting, maintenance & repairing of solar equipment will be imparted to the participants. Basic solar energy concepts, basic electrical principles, and their usage, along with the practical use of associated tools; instruments will be introduced in the training program.
3.	During the training programmes various business models & employment opportunities through solar technologies will also be covered. Training program will include improved cook stove system that helps in reducing emissions by 30%, the forced draft improved cook stove is improvised based on locally available materials and adapted to suit the region and usage behavior and is designed to provide 4 hours of cooking time in a day.
4.	Training program will primarily focus to skill participants about the solar technologies; develop entrepreneurs to strengthen supply chain of solar energy devices. Linkage of potential entrepreneur with financial institution for assistance on seed capital.
5.	The training program will also include site visits to provide practical understating of the functioning & maintenance of installed pilots done at Lucknow or nearby areas.
6.	Soft skills : Basic of MS Word, MS Excel, PowerPoint Presentation, Geographic Information Systems (GIS), E-commerce, Personality Development etc.
7.	Report preparation and submission of First Draft
8.	Final Report Preparation

Delivery Model and Pedagogy

This is nearly 30 days training, UPNEDA, Lucknow will help TERI in logistical arrangement. UPNEDA is functioning as nodal agency for implementation of various schemes in the state. UPNEDA training centers has been set up in Lucknow and Mau to develop efficiency regarding installation, operation, maintenance and servicing of projects based on renewable energy sources. In view of the growing need of training for servicing / repairing of renewable energy plants a training center is being established in Kannauj district. Efforts are being made to develop the capacity in renewable energy sources such as solar energy, small-scale hydroelectricity and biomass-based electricity production in the state. Previously, TERI has conducted one GSDP programmes in Lucknow, Uttar Pradesh with UPNEDA.

- TERI will provide classroom based training programmes (comprising of 40% theory and 60% practical) at the designated site for two batches of 25-30 trainees per programme. The training programmes will also include site visits and handholding to provide practical understanding of the functioning & maintenance of solar power plants, solar pump, solar dryers, solar cold storage, solar lighting-cooking and other solar systems.
- The training in-UPNEDA, Lucknow campus. Intention is to train local youth for O&M and collection purposes. It will focus more on micro-grid based electricity supply/ distribution along-with RE plus storage.

- The training programme will also include site visits to provide practical understating of the functioning & maintenance of installed pilots done at UPNEDA campus and nearby areas. Batteries, centralized solar power plants, smart meters will be included in the training for better understanding.
- For practical training sessions participants will have opportunity to use UPNEDA campus facilities.

Exit Strategy

While completing the project, we will create green jobs skill for the youth to be used in agricultural practices. Engagement of technical entrepreneurs through skill development and training to trainers, so that they are able to teach others and provide training to the other youths and make them sustainable at the ground. The project which is a joint effort of TERI, ISTEM and NABARD is expected to create both short term and long term impacts. We are going to tie up with Government Institution like NSIC for incubation assessment and entrepreneur development programme (EDP) for advance training for ToT's selected students. Students will be encouraged to take up these advance incubation training for entrepreneurship NSIC training will also help us to create Master Trainers / ToT.

1.	Exit strategy-1: A select trainee group will be developed who will be engaged to impart training to other rural people in the area thus spreading awareness of solar application in agriculture as well as in other TERI trainings in future. About 10% of the selected trainees will be engaged in 6-days incubation workshop for entrepreneurship development.
2.	Exit strategy-2: TERI will work to create industry linkages for the students using our existing network and placement brochure. This will help us to place 70% of the students as technicians/electrician /entrepreneur /Master Trainer etc.
3.	Exit strategy-3: While trainees will receive direct benefits, simultaneous awareness generation of local communities will be carried out to create scope for the trainees and emerging industries for clean energy adoption. A total 4 such awareness generation programmes will be conducted in the identified locations covering over 500 villagers, who will receive indirect benefits of the project.

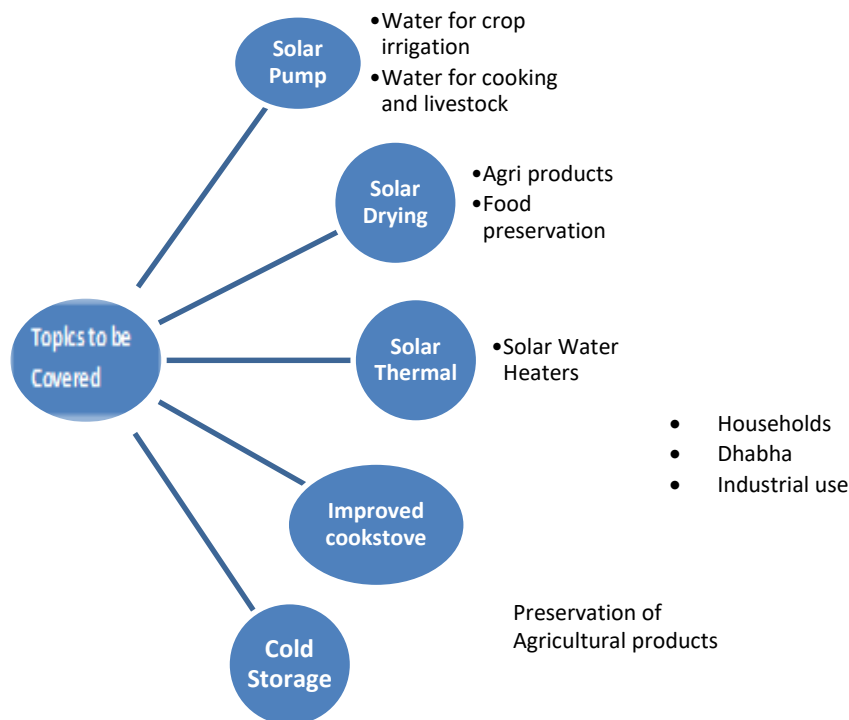


Figure 1: Awareness Generation

Training rationale

In line with India's NAPCC and State action Plan on Climate Change, creating, identifying Green Jobs which help at the enterprise level to bring down GHG emissions and improve efficiency in sustainable agri-practices. Green jobs can produce sustainable practices that benefit the environment, improve energy and raw materials efficiency, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems and support adaptation to the effects of climate change.

These trainings and awareness programme on solar technology applications are necessary as it caters multiple need of the rural economy and livelihood options as mentioned below:

- Skill development programme which improves learning and employability of youths to perform as trainers, repairing experts, small business entrepreneurship etc.
- This program will impart practical knowledge and enhance entrepreneurial capabilities which in turn generate small business initiatives for individual and ensure availability of better services in product delivery and after sale service for the user.
- Improvement in local skilled manpower would help in availability of industry ready skilled workforce, which would minimize project completion time for different nearby renewable energy power projects of various industries.
- The training would empower linkages creation between trained youths and with the local administrations, banks, industries, quality suppliers for better technologies & minimize the operation, maintenance and small business sustenance issues.
- Placement of total 70% of the Participants.

- Awareness programmes will generate awareness about clean energy; it motivates local community to understand the benefits of clean energy.

Timeline of work plan

(6 Months)

Sl No	ACTIVITY	M1	M2	M3	M4	M5	M6
1.	Project kick-off meeting and engaging Stakeholders						
2.	Project execution planning and meeting with the implementing partners, local partners, industry partners						
3.	Developing course material in vernacular language and other information leaflets						
4.	Two Training & capacity building programme- (On solar technologies) at the identified locations						
5.	Exposure trip during capacity building						
6.	Awareness generation in identified locations						
7.	Follow-up activity- (1) Interaction with stakeholders; (2) Handholding; (3) Impact analysis						
8.	Mobilization activities for the placement of students						
9.	Handholding of the students through incubation centers for developing entrepreneurs						
10.	Report submission						

Expected Outcomes

The project seeks to bring positive changes in the industries as well as the ecosystem. The multiple outcomes would benefit the different stakeholders involved. The outcomes that the project aims to bring are listed below:

- ✓ Mainstreaming of planning and implementation of climate adaptation plans; follow SDGs goal
- ✓ Improved adaptation capabilities of industry and its norms
- ✓ Better understanding of local risks and impacts;
- ✓ Capacity building of local and state level stakeholders;
- ✓ Strengthening of local institutions through participatory governance;
- ✓ Participants will learn about the current trends and study about the recent advancements. Also help us in understanding challenges related to sustainability of solar lighting.
- ✓ After successful completion of course, the participants will be issued completion certificates with TERI, ISTEM and NABARD logo.
- ✓ Farmers will be aware about the solar technologies useful for agriculture like solar pump, solar lighting, cold storage etc through awareness programme.
- ✓ TERI will prepare and maintain a database of trainees to know their contacts, proficiency level, etc. The existing project monitoring system will be developed into a robust tracking system to help out trainees through our different linkages.
- ✓ The project seeks to bring positive changes in the community through skill development training. The multiple outcomes would benefit the different stakeholders involved.
- ✓ Module development suitable for trainees in gaining skills for livelihood generation
- ✓ A minimum of 70% of the trainees will be in job, master trainer or own business.
- ✓ Opportunity for trainees to get engaged in Livelihood generation after taking the training.

Assessment & Feedback Mechanism

A thorough assessment and feedback mechanisms will be followed for the participants:

- ✓ Assessing the participants knowledge gain during the training through periodic tests.
- ✓ Students will be asked to provide feedback on training modules, faculty and arrangements.
- ✓ Assessment will be done fortnightly covering about 60% practical and 40% classroom based sessions.

Budget

Sl No	Heads	Remarks	Activity/ cost Details	Amount (INR)
A.	Funding break up for NABARD			
1.	Manpower	One of the Resource Person will carry out the task of training coordination	Rs 50000	50000

2.	Module Design, Development and printing cost	Preparation of course module in local language	✓ Cost of module preparation in local language = INR 50000 ✓ Printing of course material = INR 30,000/-	80000
3.	Training logistics	(a) Boarding & Lodging (including meals & tea) (b) Hiring Training venue (c) Boarding and lodging for experts	✓ Rs. 400 per person x 30 students x 32 days (This is inclusive of accommodation, tea/coffee, Breakfast, breaks, lunch and dinner, Saturday and Sunday)= 3,84,000 ✓ Accommodation & food of external experts (Rs.2000per person x 2 faculty x10 days =Rs 40,000)	4,24,000
4.	Industry Meet/Job fair	Arrangements for Industry Experts	25000	25000
5.	Training toolkit & field trips	(a) Toolkits @ INR 2,000 for 30 kits inclusive of tax and transportation = INR 60,000/- (b) Training Kit (Bag, Pen, Pad, etc.) @INR 200 for 30 participants = INR.6000/-	(c) Toolkits @ INR 2,000 for 30 kits inclusive of tax and transportation = INR 60,000/- (d) Training Kit (Bag, Pen, Pad, etc.) @INR 200 for 30 participants = INR.6000/-	66000
6.	Engagement of Experts / Resource Persons	Honorarium for experts (for theoretical sessions)	Rs 4000 per dayx12 days	48000
Total of component A				653000
B	Funding break up for ISTEM			
1.	Manpower	(a) Technical Manpower for installation and field visits= Rs 50,000 (b) Expert for Practical sessions =Rs 30,000		80000
2.	Field visits	Field visits for solar-Agro specific technology understanding (Demonstration)		25000
3.	Engagement of Experts / Resource	Honorarium for experts for practical sessions	Rs 4000 per dayx18 days	72000

	Persons (For practical sessions)			
4.	Solar equipment infrastructure	Temporary solar equipment infrastructure for training		150000
5.	Trainee profile brochures preparation and printing			20000
6.	Others	Photographs, Mementoes, banners, and rent/ hiring of logistics services		20000
7.	Awareness generation	Awareness generation programmes will be conducted in identified locations	- Tea, water, snacks for 125 persons per programme - Sound system and other miscellaneous expenses	50000
Total of component B				417000
Grand Total= Total of component A & B			1110,000 x 2 trainings = Rs 2220000	



We are an independent, multi-dimensional organization, with capabilities in research, policy, consultancy and implementation. We are innovators and agents of change in the energy, environment, climate change and sustainability space, having pioneered conversations and action in these areas for over four decades.

We believe that resource efficiency and waste management are the keys to smart, sustainable and inclusive development. Our work across sectors is focused on

- Promoting efficient use of resources
- Increasing access and uptake of sustainable inputs and practices
 - Reducing the impact on environment and climate

Headquartered in New Delhi, we have regional centres and campuses in Gurugram, Bengaluru, Guwahati, Mumbai, Panaji , and Nainital. Our 1000-plus team of scientists, sociologists, economists and engineers delivers insightful, high quality action-oriented research and transformative solutions supported by state- of-the-art infrastructure.

