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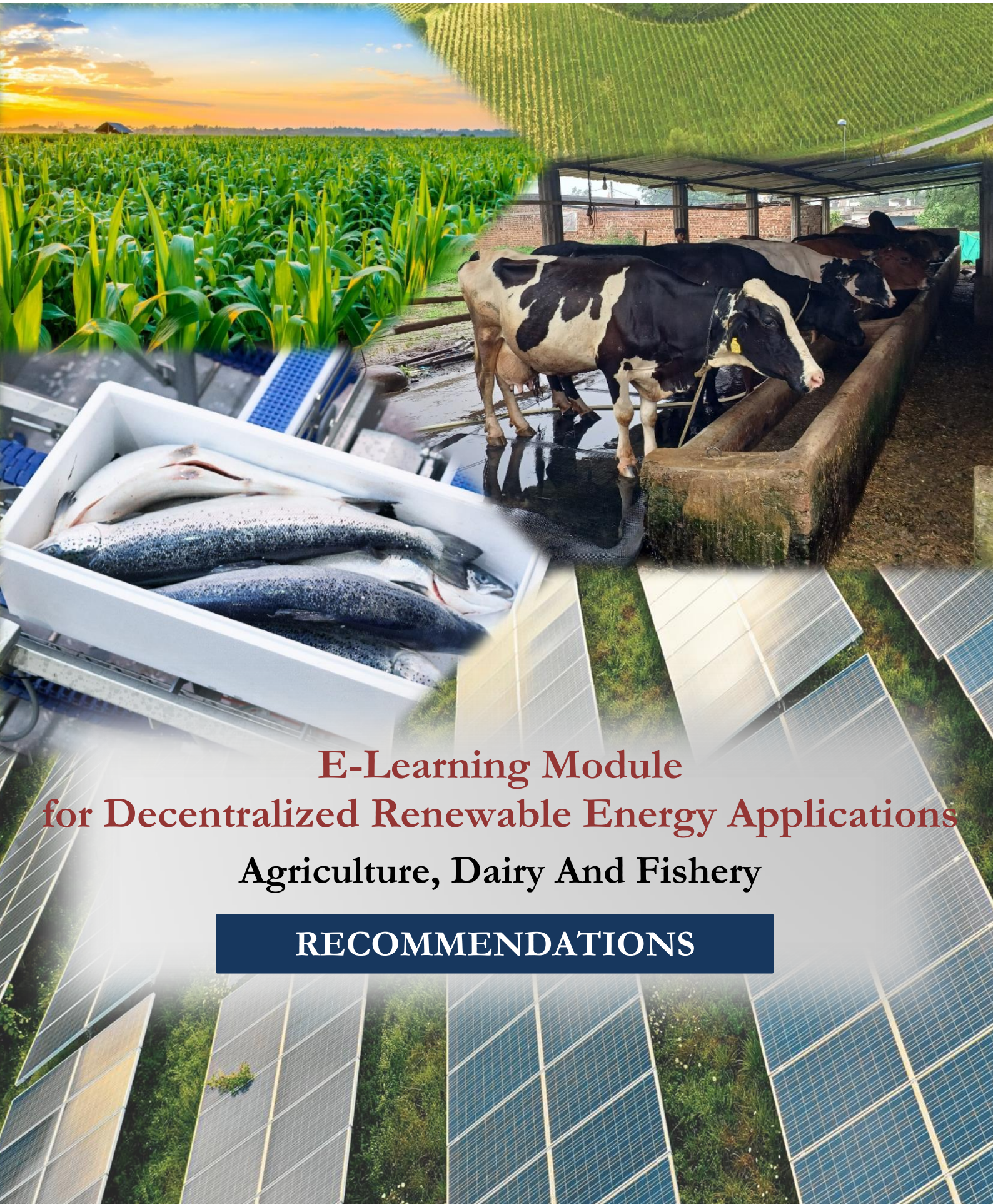

E-Learning Module for Decentralized Renewable Energy Applications

Agriculture, Dairy And Fishery

RECOMMENDATIONS

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Program/project description
Indo German Energy Programme- Promotion of Solar Water Pumps (IGEN-PWSP)

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On behalf of
German Federal Ministry of Economic Cooperation and Development (BMZ)

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List of Abbreviations

Abbreviation	Full Form
AAGC	Anil Agarwal Green College
AC	Alternating Current
AICTE	All India Council of Technical Education
APRACA	Asia-Pacific Rural and Agricultural Credit Association.
BABTPL	BAIF Agro and Biotechnology Pvt Ltd.
BCS	Battery-charging station
BOP	Bottom of the Pyramid
CAFT	Centre for Advanced Faculty Training
CEC	Consortium for Educational Communication
CEE	Clean Energy Entrepreneurs
CEEW	Council on Energy, Environment and Water
CIEMAT	Centre for Research in Energy, Environment and Technology
CIFRI	Central Inland Fisheries Research Institute
CIFT	Central Institute of Fishery Technology
CLEAN	Clean Energy Access Network
CPI	Climate Policy Initiative
CSE	Centre for Science and Environment
CSIR	Council of Scientific and Industrial Research
CSO	Civil society organization
DC	Direct Current
DISCOM	Distribution company
DRE	Distributed / decentralized renewable energy
DST	Department of Science & Technology
EPC	Engineering, Procurement & Construction
ESMAP	Energy Sector Management Assistance Program
FPC	Farmer Producer Company
FPO	Farmer Producer Organisation
GSES	Global Sustainable Energy Solutions
HACCP	Hazard analysis and critical control points
HKH	Hindu Kush Himalaya
HRD	Human Resource Development
ICAR	Indian Council of Agricultural Research
IGEN-PSWP	Indo-German Energy Programme, Promotion of Solar Water Pumps
IGNOU	Indira Gandhi National Open University
IIFPT	Indian Institute of Food Processing Technology
IIMB	Indian Institute of Management, Bangalore
IRENA	International Renewable Energy Agency
ISO	International Organization for Standardization
ITEC	Indian Technical and Economic Cooperation
ITI	Industrial Training Institute
IWMI	International Water Management Institute
JRF	Junior Research Fellow
KVK	Krishi Vigyan Kendra Knowledge
MANAGE	National Institute of Agricultural Extension Management

MFI	Microfinance institutions
MNRE	Ministry of New and Renewable Energy
MoFPI	Ministry of Food Processing Industries
MPPT	Maximum Power Point Tracking
MSME	Ministry of Micro, Small and Medium Enterprises
NABARD	National Bank for Agriculture and Rural Development
NARES	National Agricultural Research and Education System
NBFI	Non-bank financial institution
NCERT	National Council of Educational Research and Training
NERC	North-East Regional Centre
NERC	North-East Regional Centre Guwahati
NFDB	National Fisheries Development Board
NFFBB	National Fresh Water Fish Brood Bank Bhubaneshwar
NGO	Non-Government Organisation
NIESBUD	National Institute for Entrepreneurship and Small Business Development
NIMSME	National Institute for Micro, Small and Medium Enterprises
NIOS	National Institute of Open Schooling
NIRDPR	National Institute of Rural Development and Panchayati Raj
NISE	National Institute of Solar Energy
NITTTR	National Institute of Technical Teachers Training and Research
NMAET	National Mission on Agricultural Extension & Technology
NOS	National Occupational Standards
NPTEL	National Programme on Technology Enhanced Learning
NPTI	National Power Training Institute
NRESF	National Renewable Energy Science Fellow
NRREP	National Rural and Renewable Energy Programme
NSDC	National Skill Development Corporation
O&M	Operations & Maintenance
PAYG	Pay As You Go
PM KUSUM	Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahaabhiyan
PRI	Panchayati Raj Institutions
PV	Photovoltaic
QP	Qualification Packs
R&D	Research & Development
RA / PDF	Research Associates and Post-Doctoral Fellows
RAF	Rural and Agricultural Finance
RE	Renewable Energy
RECIPMT	REC Institute of Power Management & Training
RET	Renewable Energy Technologies
RFP	Request for Proposal
RSETI	Rural Self Employment Training Institutes
RUDSETI	National Academy of Rural Development & Self Employment Training Institute
SAME	Sub-Mission on Agricultural Extension
SCAAP	Supervisory Capital Assessment Program & Capital Assistance Program
SCFGJ	Skill Council for Green Jobs
SDC	Swiss Agency for Development and Cooperation
SDG	Sustainable Development Goal
SEC	Solar Energy Centre

SEED	Society for Energy, Environment and Development
SETNET	Solar Energy Training Network
SIP	Solar irrigation pumps
SME	Small & Medium Enterprises
SNA	State Nodal Agency
SPI	Smart Power India
SPV	Solar Photovoltaic
SRF	Senior Research Fellow
SRLM	State Rural Livelihood Mission
STRY	Skill Training of Rural Youth
SURE	Sakhi Unique Rural Enterprise

1. Executive Summary

The main goal of the project was to assess the capacity gaps of demand group of stakeholders such as farmers/FPOs, product manufacturers/service providers/rural entrepreneurs and SRLMs/SNAs and to create self-paced e-learning modules aimed at promotion of Distributed Renewable Energy (DRE) at various stages of agricultural, dairy, and fishery value chains. This project aligns well with the priorities of the Ministry of New and Renewable Energy (MNRE) as outlined in its draft policy framework for DRE livelihood applications. Capacity development in the DRE segment within the agriculture, dairy, and fishery sectors aims to empower local institutions to deliver relevant training and enhance the capabilities of decision-makers. This assignment serves as evidence of the need for assessing capacity gaps, developing curricula and training materials, and supporting training partners in conducting independent training courses.

The training modules developed under this project are designed to address the requirements of the DRE sector in the three focused value chains, with an emphasis on market viability of DRE systems in the short, medium, and long terms. This approach aligns with the identified needs highlighted by GIZ, which emphasize capacity building as a crucial element for the effective implementation of DRE in these three value chains. Therefore, our strategy for executing this project involves a combination of desk research and primary consultations. The main strategy for delivery of the study has been:

- Examining the available national and international resources and study materials related to decentralized renewable energy applications.
- Identifying the gaps in capacity within the decentralized renewable energy sector in the three relevant value chains.
- Creating a matrix for the development of e-learning materials, considering the demand, content selection, and availability of content, with priority levels based on the outcomes of work packages 1 and 2.

In addition, the team has also organized three separate roundtable conferences, one for each of the agriculture, dairy, and fishery value chains. These conferences were aimed at identifying gaps in the existing training materials related to DRE within the agriculture, dairy, and fishery sectors. The objective was to obtain valuable additions from the industry stakeholders that can enhance the utilization of DRE solutions throughout the various stages of these value chains. The outcomes of the roundtable conferences were also instrumental in shaping the structure of the proposed training modules, taking into account the specific needs identified by various stakeholder groups. These results provided valuable insights to the team for designing the flow of the e-learning training modules.

With the above defined approach, the outcomes of the training needs assessment and analysis enabled establishment of the training objectives by addressing two fundamental questions: who, if anyone, requires training, and what specific training is needed. The trainings identified have been divided into seven key buckets for each of the three value chains, namely, awareness enhancement, technical knowhow, Guidance on upscaling business opportunities, entrepreneurial skill development, policy guidance, financial aspects and training of trainers.

Based on these buckets, trainings needs have been identified for each stakeholder category including farmers, service providers, product developers, rural entrepreneurs, SRLMs, SNAs and State Government Departments. With all the three sectors the broader buckets of training gaps stay the same.

For farmer groups, the main training gaps exist around **awareness enhancement, technical know-how, guidance on expanding business opportunities in the focused sectors, policy and financial aspects.**

1. In the agriculture, dairy and fishery sectors, farmers have a clear understanding of the role of solar water pumps on their farmlands. However, their association with solar energy is primarily

limited to the usage of solar water pumps. There is a gap in knowledge regarding the potential application of solar technologies such as solar dryers, micro-grids, and mini-grids to power other farm equipment such as rice hullers, threshers, milling machines, aerators, etc. The connection between the adoption of solar-based agricultural equipment and its impact on productivity, livelihoods, and food security needs further exploration within the farming community. In dairy sector, for example, it is not clear to large farmers that DRE based cold storage products are cost-effective and have a sufficiently lucrative return on investment to warrant a change in how they store dairy products.

2. Furthermore, farmers still lack knowledge about how utilizing solar energy can enable them to increase irrigation intensity, and significantly enhance their income levels. Bridging this knowledge gap is crucial for farmers to understand the potential benefits of integrating solar-based technologies into their farming practices. In dairy sector, farmers have a limited understanding of technical aspects related to solar refrigeration systems, including monitoring temperature in control panels, utilizing remote monitoring systems, conducting inspections of solar panels, determining optimal locations for PV panel installation, performing basic O&M tasks, and cleaning the chillers.

3. In addition, farmers sometimes lack understanding of the intricacies involved in system installation, leading to potential investment losses or additional costs due to wrong choices. Therefore, it is crucial to enhance their capacity regarding essential equipment installation and maintenance practices in all the three sectors.

4. Additionally, farmers often have concerns about potential ground contamination when installing solar systems on their farmlands. They worry that the panels might render the land unusable after the end of the operational life of the solar system. It is essential at this stage to provide capacity building to farmers regarding the minimal risk of soil contamination after decommissioning and removing the DRE system from the farmland.

5. In terms of policy training gaps, within the farming community, there exists limited knowledge about the policies and schemes in the DRE sector which could potential increase their affordability of the DRE products. In certain cases, farmers have encountered information about these schemes and policies in passing, yet they lack a clear understanding of how to engage with such policies and reap the corresponding advantages. This challenge has been consistent across all matured DRE technologies within the agriculture, dairy and fishery sector.

6. As far as the financial aspects are concerned, farmers often encounter difficulties due to their inability to be able to make the initial investment required for acquiring DRE solutions. When farmers cannot afford these DRE solutions, their motivation to participate in such programs diminishes. Despite the presence of bank loans and other financial assistance options in the market, they tend to hesitate when it comes to seeking financial support from commercial institutions. Insights gathered from interactions with farmers reveal that they lack the technical expertise needed to prepare detailed project reports and financial models to present to banks or FIs for undergoing the due diligence process and securing loans. This reflects a significant gap in training within the farming community.

For service providers, product manufacturers and rural entrepreneurs, training gaps exist around **awareness enhancement, technical know-how, business model guidance on upscaling business opportunities, policy, financial and most importantly, entrepreneurial skill development.**

1. Like farmer groups, service providers, product manufacturers and rural entrepreneurs are also required to be capacitated around the different productive uses of DRE solutions. Capacity gaps have been identified among service providers, product manufacturers, and rural

entrepreneurs in terms of understanding the range of productive loads that businesses can support through their product offerings. Addressing these gaps is essential to facilitate the optimal utilization of DRE solutions for various productive purposes.

2. Furthermore, the product manufacturers, service providers, and rural entrepreneurs play a crucial role in meeting the specific demands of local customers and understanding their requirements to design optimal DRE systems. However, these stakeholders often struggle to comprehend the precise technology needs of DRE at the farm level. It is essential to design innovative DRE technologies while considering resource constraints, logistical challenges, and usability in rural contexts. Addressing this issue is a critical challenge that requires building the capacity of product manufacturers, service providers, and rural entrepreneurs. They need to be empowered with the knowledge and understanding of designing DRE solutions that effectively meet the needs and constraints of rural farming communities in agriculture, dairy and fishery value chains.

3. Additionally, service providers / rural entrepreneurs often lack the skills to identify sustainable, robust and cost effective supply chain processes, while focusing on business expansion for themselves and energy security enhancement for customers. At this stage, service providers / rural entrepreneurs are required to be capacitated around fundamental aspects of supply chain management with high relevance to their businesses.

4. Further, rural entrepreneurs frequently engage in experimenting with new customer value propositions. Therefore, their decision-making processes need to be adaptable and centered around learning. These enterprises may test various system or product variations before identifying a compelling value proposition and target customer segments. The objective of this decision-making approach is to minimize uncertainty regarding the product or service and the market in which the enterprise operates.

   However, rural entrepreneurs often lack the necessary skill set for effective decision-making of this nature. It is crucial to address this gap through training and capacity building initiatives. By equipping rural entrepreneurs with the knowledge and abilities required for adaptive decision-making and learning, they can navigate the challenges of experimentation, reduce uncertainties, and increase their chances of success in rural markets.

5. The training gaps in the policy and financial domains mirror those present in farmer groups. Often, manufacturers of products, providers of services, and rural entrepreneurs lack awareness of the available schemes and policies for DRE solutions within the market. Additionally, they lack comprehensive understanding of the procedures required to access the benefits provided by these schemes.

   Concerning financial matters, product developers, service providers, and rural entrepreneurs require training to grasp the cost-benefit analysis of investing in a DRE business. This entails acquiring a comprehensive understanding of how their investments and efforts translate into financial gains throughout the year. By recognizing the direct connection between business actions and income, they can make informed decisions and formulate strategies to optimize their profits. Equally important is their awareness of the specific documentation requirements necessary to secure loans from banks and other financial institutions.

For State Government Departments, SRLMs and SNAs, training gaps fall in the buckets of **awareness enhancement and training of trainers.**

1. SRLMs, SNAs and State Government Departments need capacity building around creating awareness about the favorable ecosystem they have established. This ecosystem encompasses various elements such as skill development, policy frameworks, fiscal and

financial incentives, technology support, and more. It is essential to disseminate information regarding these provisions to ensure that potential beneficiaries and stakeholders are aware of the support available to them.

2. Another aspect that requires capacity building for Government Departments, SRLMs and SNAs is conducting demand assessments of DRE livelihood applications in the agriculture, dairy and fishery sectors to prioritize market expansion. State Governments can provide support mechanisms for identifying and mapping beneficiaries, particularly for rural enterprises that may lack the capacity to conduct market and need assessments. These measures can significantly contribute to scaling up the adoption of DRE solutions for productive purposes within the farming community.

3. Another training need that SRLMs and SNAs have features training of trainers to undertake capacity building of different stakeholder groups. This necessitates the development of two crucial types of skills: domain skills and soft skills. Domain skills pertain to sector-specific expertise, technical knowledge, and proficiency in DRE technologies, their applications, and operations. On the other hand, soft skills encompass presentation techniques used by trainers to effectively convey key message. Currently, master trainers at SRLMs and SNAs lack these skills, highlighting the need for their development to enhance their effectiveness as trainers.

Based on the training gaps identified for each stakeholder group in agriculture, dairy and fishery value chains, training agendas have been developed for each stakeholder category.

- In the agriculture sector, training modules have been developed for solar water pumps, solar cold storages, solar dryers and RE-based mini-grids serving productive loads (such as rice hullers, millers, threshers, etc.).
- In the dairy sector, training modules have been developed for solar milk chillers, solar milking machines and solar refrigerators.
- In the fishery sector, training modules have been developed for solar water pumps, solar cold storages, solar dryers and solar aerators.

For farmer groups and private sector companies / rural entrepreneurs, two levels of training modules have been developed for each sector. The first level focuses on developing the basic proficiency of the stakeholder group for the DRE technology at hand. The second level delves deeper down into the key training issues and aims at providing more focused and technical input around the training needs.

In total, for all stakeholder categories in the three value chains**, 50 training agendas have been developed**. **The typical duration of each training agenda is between 60 minutes to 90 minutes.**

The primary objective of designing the training modules has been to create a platform for stakeholders to engage in self-paced learning through access to e-learning training materials. As a next step, to ensure sustainable e-learning for the identified stakeholders, a range of self-paced training modes have been recommended, including:

- Presentations (descriptive and scenario-based)
- Videos (informative videos, interactive story-based or case study based)
- Doodle videos
- Audio-visual clips

These diverse training modes aim to cater to different learning preferences and provide engaging and effective learning experiences for the stakeholders. For all the training agendas developed, a combination of these modes of trainings have been suggested.

Based on the training agendas developed for each sector, duration and overall cost for content development and designing the training program has been identified. **The average cost for training content development has been identified as INR 3,00,000 – 3,50,000 and that for designing the training module has been INR 2,50,000 – 3,50,000.**

Development of training content for RE-based mini-grids in the agriculture sector is the most time consuming and requires a larger budget for training content development and designing the training material since the complexities involved in such systems is more advanced and specialist skill set is required to design the trainings which entails time and effort.

Additionally, out of the modes of training modules identified, developing doodle videos entails the highest cost and hence, it is suggested that doodle videos be used only where feasible. A combination of audio visuals and presentations can be used as substitutes in this case.

The potential platforms for hosting these trainings have also been identified. A total of seven platforms have been identified. These include

- National Institute of Agricultural Extension Management (MANAGE)
- Indian Council of Agricultural Research
- National Power Training Institute
- Skill Council for Green Jobs
- National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad
- National Institute of Solar Energy (NISE)
- National Institute for Entrepreneurship and Small Business Development (NIESBUD)

All these organizations, in one way or another, maintain a knowledge repository of publications, presentations, reports and training material for trainings they have delivered in the past. As such, the integration of DRE-specific training courses for self-paced e-learning does not necessitate a continuous effort to create a new webpage to host it on these websites.

Out of the options suggested, MANAGE is the most suited platform for hosting the DRE-specific training courses for self-paced e-learning. The institute also manages Government of India's flagship programme, i.e., Skill Development of Rural Youth. Additionally, it maintains a knowledge repository on natural farming. In a similar vein, this platform can be utilized to host the training content developed for the 'Promoting Solar Water Pumps component of Indo-German Energy Programme' (PSWP module).

MANAGE's mission is to facilitate the acquisition of managerial and technical skills by extension officers, managers, scientists, and administrators across all sectors of the agricultural economy. This empowers them to provide the most effective support and services to farmers and fishermen in practicing sustainable farming. The inclusion of a knowledge repository on the institute's website, encompassing training content for DRE-specific livelihood applications, aligns perfectly with MANAGE's mission.

Platforms such as National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad, National Institute of Solar Energy (NISE) and National Institute for Entrepreneurship and Small Business Development currently do not feature (DRE) specific content on their websites. However, they have the capacity and potential to incorporate an e-learning module related to DRE on their respective platforms.

After the development of the training content, GIZ and MoRD can employ multiple communication channels to encourage the adoption and utilization of the content by various stakeholder groups. In order to maximize the impact of the training modules, it is essential to formulate a strategy that encompasses the following aspects:

- Enhancing public awareness
- Strengthening outreach initiatives
- Improving information dissemination

Therefore, a communication strategy for the training material should be devised to provide a guided and strategic approach in reaching the intended audiences and generating more impactful and effective communication materials through diverse outreach channels. This includes

- Partnering with local agricultural/ dairy/ fishery organizations, cooperatives or farmers associations and leveraging their network and resources can help in outreaching farmers
- Social media platforms can be suitably used for uploading the link for training content and sharing the link in WhatsApp announcements groups will guarantee awareness of such training module among farmers.
- Translating the training module content into local languages and integrating it with regional farming practices in agri/dairy/fishery sector will make the module more accessible and relatable to farmers
- Utilizing SRLMs/ SNAs websites for promotion
- Partnering with business association/ incubation centers and using their network and resources to connect with farmers
- Email marketing to service providers and product developers with the link of the platform where e-learning modules are hosted could be potential source of informing technology providers about training module
- Leveraging MNRE's social media communication channels to create and circulate targeted posts with link of the platform where the self-paced e-learning training modules can be found
- Industry specific hashtags can be used to increase the visibility of posts.

2. Introduction

2.1. Background and Objective of the Assignment

Ministry of New and Renewable Energy (MNRE) circulated the draft policy framework highlighting the importance, relevance of distributed renewable energy (DRE) powered livelihood solutions[1]. As per the policy framework, several livelihood applications can be integrated with DRE sources to provide clean and renewable energy in agriculture, dairy and fishery value chains and, in turn, increase productivity and income. It is noted that DRE has the potential to reduce and eventually eliminate the reliance of livelihoods on diesel and can supplement the grid supply. Furthermore, DRE application have the potential to open new job opportunities, at the rural level, creating decentralized energy entrepreneurs and operations and maintenance professionals. This can generate sustainable growth across the country and ease pressure on urban centres by driving local employment and economic growth. In India, there are successful pilots and business models on DRE applications in agriculture, agro-processing, dairy and fisheries sectors and these technologies have been tested at the field level by various agencies, demonstrating their potential to be integrated under Government programmes. CPI report outlines the benefits and market potential of India's DRE sector and highlighted that India will require annual DRE investment of USD 18 billion by 2024, 10 times increase from current levels to meet its sustainable energy targets[2].

MNRE framework also highlights the importance of skill development and capacity building. Trained human resources will be required across the country for these activities. The availability of a trained workforce will further help in increasing the credibility of products for consumers and financiers. In this vein, programmes like Skill India, Surya Mitra and Varun Mitra have not only created technology and allied service-specific training modules but also trained a large pool of unemployed youth and farmers across the country. Efforts are also being made for developing and implementing skills and training programs for DRE livelihood applications with Skill Council for Green Jobs, National Institute for Rural Development, NABARD, other public sector stakeholders and private sector organizations including training institutes. In addition, efforts are also being put in by the governing bodies of other sectors' skill councils to integrate training curriculum and modules for DRE technologies across sectors such as agriculture and allied activities, textiles, food processing, etc.

With this context, the current project's aim to develop e-learning modules to sensitize farmers and other identified stakeholders for the promotion of DRE for productive purposes especially in different stages like nursery; production; harvesting; post harvesting and processing within agriculture / dairy / fishery value chains holds significant importance. The overall objective of this assignment bodes well with MNRE's priorities in the sector. Capacity development in agriculture, dairy and fishery sectors in the DRE segment seeks to enable local institutions to provide relevant training as well as build capacities among decision makers. The need for capacity gap assessment – testimony of which is this assignment – the development of curricula and training material and to assist selected training partners in the independent conduct of these training courses.

The developed curriculum are expected to respond to the needs of the DRE segment in the three concerned value chains with a focus on marketability in short, medium and long-terms. This approach corresponds to the needs identified by GIZ which put a significant thrust on capacity building as an integral part of the successful deployment of DRE in the three concerned value chains.

[1] https://mnre.gov.in/img/documents/uploads/file_f-1644909209115.pdf, Accessed on February 10, 2023

[2] https://www.climatepolicyinitiative.org/going-beyond-the-grid-the-future-of-dre-in-india/, Accessed on February 10, 2023

2.2. Overall Approach and Methodology

Our approach for delivering this assignment is a combination of desk research and primary consultations. The primary objectives of the study have been:

- Reviewing existing National and International resource/study material available on decentralized renewable energy applications
- Identification of capacity gaps in decentralized renewable energy in the three concerned value chains
- Developing a matrix for developing e-learning material based on demand, selection of content, availability of content with priority level based on output of work package 1 and 2.

This has been divided into four key tasks:

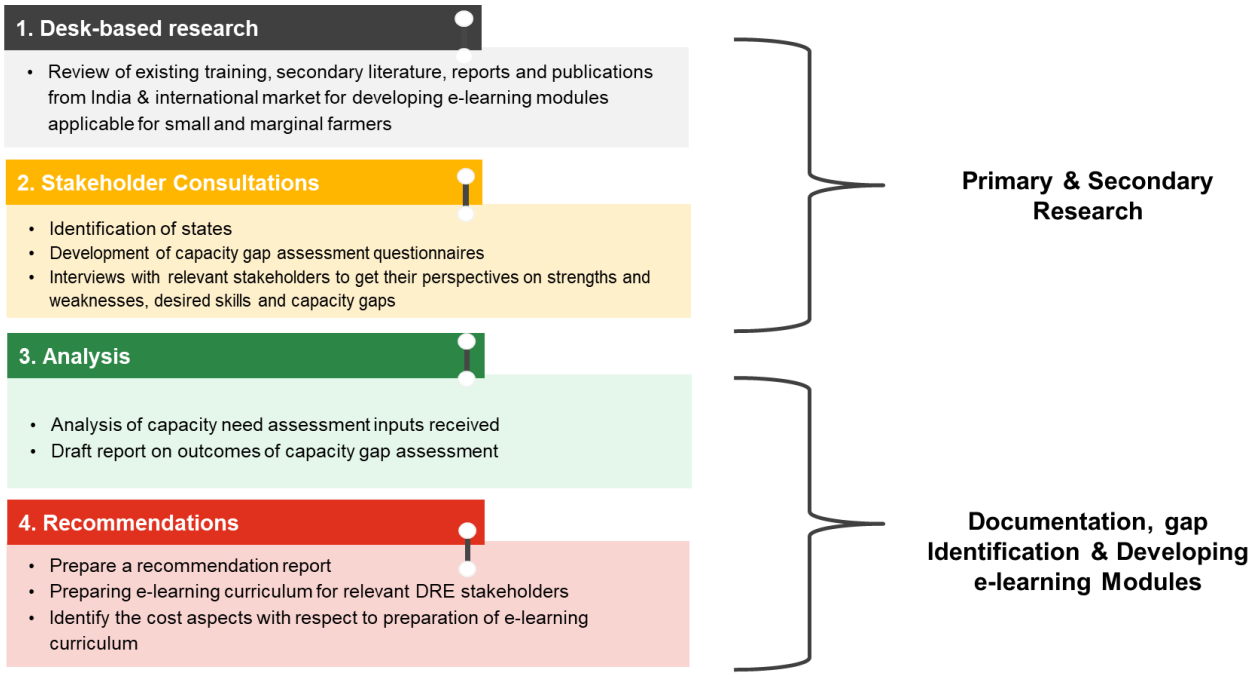

Figure 1: Overall approach to carry out the study

3. Overview of methodological approach for Developing e-Learning Modules

To guide our findings, following steps have been taken:

- **Identification of relevant stakeholders** including, but not limited to, public sector / government organizations / national boards, state nodal agencies and state rural livelihood missions, training institutes, private sector players, community level organizations, rural level entrepreneurs, financial institutions, etc.
- A **review of available and relevant literature** in India and internationally through desk based research (shared in Report 1).
- **Analysis of available information** with training institutes including:
    - Requests for curriculum content to training institutes that are identified to offer relevant trainings / courses / workshops in DRE segment in the three value chains
    - Physical and virtual meetings with knowledge centres / training institutes / community level organizations that offer / provide training services in DRE in the three sectors
- **Interactions with FPOs / NGOs / rural level entrepreneurs** to determine the market needs and identifying the gaps in trainings to guide the future training content development

Overall, the major data collection tools employed during the study include:

Reviewing existing documents
Individual interviews
Focus group discussions
Discussions with steering group and national level boards
Discussions with relevant stakeholders – training institutes, SRLMs / SNAs, SAMETIs, FPOs, FPCs, NGOs, private sector stakeholders

Figure 2: Major data collection tools deployed as part of the study

Based on the above methodologies, relevant data have been collected, analyzed and conclusions are drawn from the findings.

3.1. Desk Research

The team started with reviewing the existing national and international resources / study material available with public and private organizations, training institutes, not for profit organizations, multilateral development organizations in India and outside for decentralized renewable energy across three value chains. The focus, thus far, has also been on identifying the market trajectory for DRE appliances / products / systems most actively been used across the three value chains. The results of this analysis combined will shape the way in identifying the knowledge and the skills required by the market for successful deployment of DRE in agriculture, dairy and fishery sectors.

The output of the desk research informed the team about:

a) Available training material in the DRE segment of agriculture, dairy and fishery sectors

b) Documentation of the available training material with delineation between type of training, focus of the training, target audience, duration, mode, access and key learning objective. This list will be segregated based on different value chains.

3.2. Primary Consultations

The objective of the primary consultations was to gather industry and market feedback around the available training material and the gap that exists within these DRE trainings. This analysis guided the development of a training gap and need assessment report. The feedback gathered from primary consultations has also formed the basis on developing the e-learning material.

The team has, so far, conducted 274 stakeholder consultations with training institutes, national level organizations / boards (such as NFDB, NIRDPR, etc.), SRLMs, KVKs, SAMETIs and SNAs. The questionnaires prepared for each of the sectoral value chains was shared with over 350 stakeholders in India to garner responses around the DRE trainings being imparted by them.

3.3. Roundtable Conferences

The team has conducted three roundtable conferences for agriculture, dairy and fishery value chain each. These roundtable conferences were between 1.5-2 hours each. The roundtable conferences were organized with the objective to identify the gaps within the existing DRE-based training material in the agriculture, dairy and fishery sectors and suggest value additions that can scale up the use of these solutions across the different value chain stages. The broad discussion points of the roundtables included:

- Discussion on available DRE trainings in agriculture, dairy and fishery sectors
- Discussion on required DRE trainings in agriculture, dairy and fishery sectors
- Discussion on gaps in DRE trainings in agriculture, dairy and fishery sectors and how to mitigate the capacity building gaps
- Discussion on designing training modules to address the training needs in the three sectors

The results of the roundtable conferences also aided the team in designing the flow of the suggest training courses based on the requirements identified by the different stakeholder categories.

3.4. Designing Training Modules

The first step in designing a training and development program is to conduct a needs assessment. The assessment begins with a "need" which can be identified in several ways but is generally described as a gap between what is currently in place and what is needed, now and in the future.

The results of the training need assessment and analysis allowed the team to set the training objectives by answering two very basic questions: who, if anyone, needs training and what training is needed. The final phase in the training and development program is evaluation of the program to determine whether the training objectives were met. The evaluation process includes determining training targets and reaction to the training program – how much beneficiary /stakeholders learned and how well the participants transfer the training back on the job.

The quotations on the cost of developing training content has been taken from the companies having experience in developing such content. The list of the companies consulted has been provided in Annexure 1. For obtaining the quotation around designing the training content, the team has consulted design and multimedia companies in India. The list of the companies consulted has been provided in Annexure 2.

4. E-Learning Curriculum for Stakeholders

In today's world, it is crucial to establish a connection between decentralized renewable energy solutions and livelihoods. This connection holds immense importance as it enables the conversion of investments in electricity access and energy usage into increased incomes for communities and businesses, while also fostering local livelihood opportunities and enhancing the well-being of vast rural populations.

Attaining this transformation demands more than just implementing decentralized systems or providing electricity. It necessitates investing in an ecosystem that places people's diverse livelihoods, rather than relying solely on technological solutions, at the forefront of energy access initiatives. This ecosystem should ideally offer customized energy solutions, as well as the necessary financing, skills development, market access and policy support to fully harness the advantages of decentralized renewable energy.

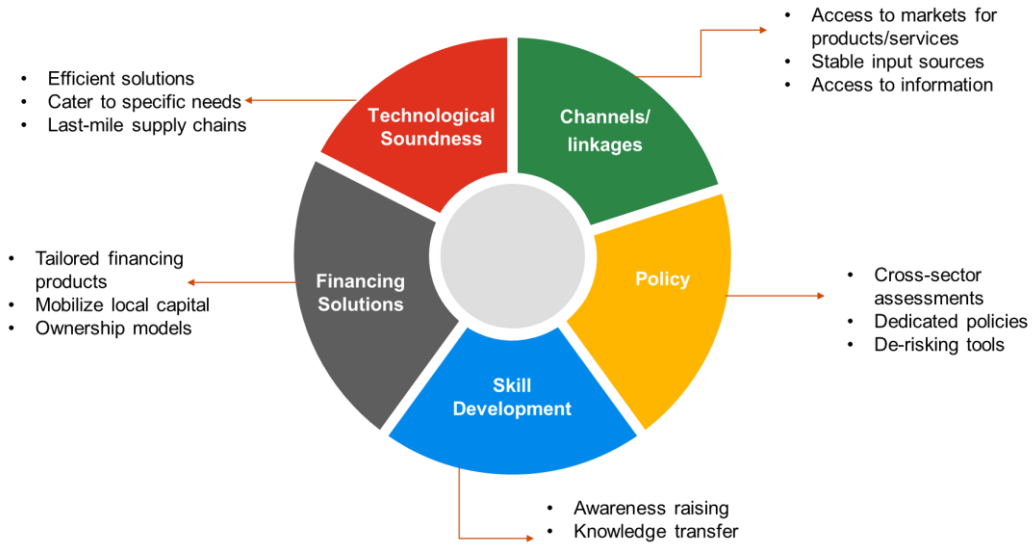

Figure 3: Approach undertaken for developing e-learning training modules

The sustainability of the entire ecosystem is compromised if any of the aforementioned components are missing. Furthermore, there are significant interconnections among these components. For instance, the effectiveness of technology directly impacts overall energy requirements and the feasibility of solutions, which in turn influence the appropriate ownership models and suitable financial products based on cashflows. Successfully establishing such an ecosystem in a specific area necessitates coordinated endeavors among various stakeholders.

The stakeholders involved in developing this ecosystem are widespread. These include:

- **Technology:** vendors, suppliers of equipment, research and development labs, last-mile enterprises and distributors.
- **Financing:** financial institutions like co-operatives, agriculture development banks, rural banks, microfinance, intermediaries in pay-as-you-go systems, banking correspondents; regulatory bodies that oversee and mandate financial policies; government ministries.

- **Backward and forward linkages:** suppliers of raw materials/inputs, e-commerce platforms, aggregators, formal/informal groups for local-level aggregation, private value addition and access to bulk market, various distribution channels via non-governmental organizations, direct to customer, etc.
- **Appropriate skilling:** district-level training institutes, agriculture training centres, skill building non-governmental organizations, grassroot incubators offering mentorship and advice.
- **Conducive policies:** state- or national-level government bodies, apex regulatory bodies, district-level authorities, ministries, etc.
- **End-users:** individuals, enterprises and community organizations.

Keeping these ecosystem tenants in mind, the team has identified the DRE-specific training needs across the agriculture, dairy and fishery value chains and correspondingly, developed e-learning training modules for each stakeholder category. The key training module content based on the identified training needs has been summarized below.

4.1. Agriculture Value Chain

Common Training Content Across DRE systems in Agriculture sector

Based on the training agendas developed for each sector, common training content that cut across all DRE technologies, has been identified for stakeholders such as **farmers and product developers/service providers/rural entrepreneurs. For State Rural Livelihood Missions / State Nodal Agencies / State Government Departments, the training agendas developed are already DRE technology agnostic.** The details of the common training agendas is provided in section 4.2.

Table 1: Common Training Content across DRE systems in agriculture value chain

Training Gap Category	Training Gap	Demand Group of Stakeholders	Training Module Content

Awareness Enhancement	• Less understanding around the use of DRE solutions on the farmland	Farmers / FPOs	• Understanding the link between the introduction of DRE technology and agricultural productivity, livelihoods and food security
			• Environmental and social benefits offered by DRE solutions
			• Protecting DRE systems from theft / robbery
			  ○ Use of solar panel lock
			  ○ Securing solar panels through fences, barbed wires and alarm systems

Technical knowhow	How to carry out the basic operations and maintenance of the system?	Farmers / FPOs	• Solar PV panels
			  ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time
			  ○ Keeping the area around the water source and PV array neat and clean
			  ○ Inspecting PV modules for broken cells and discoloration
			  ○ Using only mild, non-abrasive, non-caustic detergent with deionized water to clean PV modules.
			  ○ Using micro-fiber cloth to clean PV modules.
			• Electrical items
			  ○ Visually checking all conduit and wire insulation for damage
			  ○ Checking for loose, broken, corroded, or burnt wiring connections

Guidance on upscaling business opportunities	**Assessment of parameters for making vendor selection**	Farmers / FPOs	• Work performance experience of vendor to determine its ability to install safe and reliable solar water pumps on farmland
			• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)
			• Availability of quality management plan with the vendor covering:
			  ○ System equipment testing
			  ○ Inspection protocol
			  ○ Design best practices
			  ○ Safety policies

	Securing Supply chain
	• Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. for procuring equipment
	• Raw material requirement and sourcing
	• Determining supplier evaluation criteria
		Service Providers, Product Developers, Rural Entrepreneurs	• Understanding customer need
			  ○ Objective of the customer – what is the specific need?
			  ○ How do they fulfil the present need and what price they are paying?
			  ○ How critical is the need?
			  ○ What is the future growth possibility?
			  ○ Which business model will be the most suitable?
			  ○ What are the objections and clarifications received from the customer?
			• Knowing your own product modalities

			○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee • Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural retailers, local youth, RE mascots, etc. • Deploying effective marketing techniques ○ Word-of-mouth Marketing ○ Leveraging local roadshows / festivals / melas ○ Identifying evangelists / RE mascots who can be distributors ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
Entrepreneurial skill development	**Product branding and marketing** • Use of proper marketing tools • Establishing partnerships with local level organizations such as NGOs, SHGs, FPOs, etc. • After sales customer service	Service Providers, Product Developers, Rural Entrepreneurs	• Targeting a specialized group of end-users with the DRE product • Talent Management ○ Organisational restructuring for a start-up vs veteran ▪ Hiring talent during the initial stage of business ▪ Hiring specialized talent during business scaling up ▪ Identify the need for hiring ground-level staff ○ Defining right processes and organizational structures internally ○ Recognize transition points for enterprises
	Project Management Techniques / Skills • Optimizing the DRE system production process taking into	Service Providers, Product Developers, Rural Entrepreneurs	• Avenues of improving career development for women as rural entrepreneurs • Training women in data collection and data management for RE-based mini-grids

	account the existing technical equipment or to start a new investment
	• Talent management to scale-up the business
			• How to carry out routine operation and maintenance of DRE systems
			  ○ How to repair motors in solar water pumps?
			  ○ How to check wire connections, noise and vibration, bearing temperatures, leaks from the pump housing, leaks from pipe connections, cracks in pipes or hoses, discharge pressure, intake pressure and seal integrity in solar water pumps?

Training of trainers	• What are the opportunities for women to invest in DRE systems at the village level? • Lack of understanding of the potential role of local women as technicians / electricians in routine operation and maintenance of DRE systems	State Government Departments, SRLMs, SNAs	• Understanding of system design, interconnection of battery wires, the safety aspect of the solar PV systems, operation and maintenance and troubleshooting • Understanding of system selection (from the one that is available in the market) from the theoretical design of the PV system. • Appropriate cable sizing and selection of cables from commercially available cable sizes in the market • Electrical demand load analysis • Ensuring efficient energy utilization

	Domain Skills
	• DRE Equipment and specifications of machineries for productive uses
	• Preventive and breakdown maintenance of DRE equipment for productive use
	• Capacitating local trainers to be able to install, assemble, and test solar PV systems and solar water pumping systems
		SRLMs, SNAs	• Ability to read and interpret technical parameters/ documentation
			• Developing ability to disseminate knowledge around:
			  ○ Identifying necessary materials and tools (hand tools, machine tools and workshop equipment)
			  ○ Checking the circuit, equipment, panel as per drawing for functioning
			  ○ Connecting, testing and undertake maintenance and disposal of solar batteries
			  ○ Connecting and testing solar panel, charge controller, battery bank and inverter

	Soft skills
	• Confidence building
	• Delivering effective trainings
		SRLMs, SNAs	• Developing interpersonal skills including:
			  ○ Developing networking skills
			  ○ Confidence building
			  ○ Training delivery skills Pitching for a product
			  ○ How to convert new customers for the product

			○ Efficient educational techniques that can be used to further improve the effectiveness of training ○ Gathering effective feedback from trainees
Financial aspects	• Lack of information around sources of funding available • No preliminary information on documentation required to avail loans from banks and other financial institutions	Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	• Basics of obtaining funding from financial sources: ○ List of documents required ○ Eligibility criteria ○ Cost economics of DRE solutions • Financial advantages, potential cost savings, and overall return on investment associated with the adoption of DRE solutions
Policy guidance	• Lack on information around government schemes, incentives and subsidies available for DRE solutions • Lack of understanding around availing benefits under the schemes, incentives and subsidies available for DRE solutions • Lack of information around the implementing agency to approach for information about the scheme / policy • Documentation required to be submitted to avail scheme / policy benefits	Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	• Understanding policy framework that supports DRE uptake: ○ Applicable policy schemes, incentives, and subsidies ○ Application process to avail scheme benefits ○ Appropriate channels for acquiring information on scheme guidelines, application process etc.

Specific Training Content for each type of DRE system

Some of the training agendas developed are specific for each technology type. They have been captured in the table below. The details of the common training agendas is provided in section 4.3.

Table 2: DRE system specific training modules developed in agriculture value chain

Training Gap Category	Applicable DRE solution	Training Gap	Demand Group of Stakeholders	Training Module Content

Awareness Enhancement	Solar pumps	Lack of understanding of use of solar water pumps on farmland	Farmers, FPOs	• Understanding the link between the introduction of solar water pumps and agricultural productivity, livelihoods and food security
				• Types of solar water pumps
				  ○ AC / DC
				  ○ Submersible / surface pumps
				• Impact of solar water pumps on irrigation intensity, adoption of multi-cropping patterns and income generation

	Solar dryers	Lack of understanding of use of solar dryers	Farmers, FPOs	• Understanding the link between the introduction of solar dryers and agricultural productivity, livelihoods and food security
				• Types of solar dryers available in the market:
				  ○ Solar box dryer
				  ○ Solar cabinet dryer
				  ○ Solar tunnel dryer
				  ○ Hybrid dryer (solar-biomass cabinet dryer)
				• Crops that can be dried using solar dryer

	Solar dryers	Lack of understanding of environmental and social benefits of solar dryers • Quality and hygiene as opposed to open drying for the case of solar dryers	Farmers, FPOs	• Avoidance of widespread fungal infection resulting from unexpected rains or fog vs destruction of unprotected / open drying of crops • Quality induced market pricing of produce

		• Improved nutritional conditions and hence, better economic value of produce in the market		• Possibility of export of produce due to improved quality meeting quality requirements and testing criteria

	Solar cold storages	Lack of understanding of apt use of solar cold storages	Farmers, FPOs	• Understanding the link between the introduction of solar cold storage and agricultural productivity, livelihoods and food security
				• Types of solar cold storages
				  ○ Solar cold storage with battery storage
				  ○ Solar cold storage with phase change material (PCM) storage
				  ○ Solar cold storage with thermal storage
				• Impact of solar cold storage on irrigation intensity, adoption of multi-cropping patterns and income generation

Technical knowhow	Solar Pumps, Solar mini-grids	**What are the best practices of DRE system installation?:** • Installing DRE equipment in flood plains and its impact on cost of DRE system • Conversion of land back to agricultural uses at the end of the operational life for DRE system installation on farmland	Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	**Installation in floodplains** • Anchoring solar panels to prevent collapse or movement during a flooding event • Flood resistant materials to be used for all DRE system components • Installing solar panels at or above the flood protection grade • Desired tilt of solar panels **Converting land back to agricultural uses after end of life of DRE systems** • Low risk of soil contamination

				• Low chances of harm to crops • Need for resting the ground after decommissioning and removal of DRE systems from farmland • Process of uninstalling solar panels
	Solar cold Storages, solar mini-grids	What are the Dos and Don'ts while working with batteries?	Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	• Location for battery installation • Combining and connecting batteries • Acid spill cleanup material to be readily available • Verifying electrolyte levels (adding distilled water as necessary) • Measuring specific gravity • Setting up battery charge voltage/current limit • Checking indicator LEDs or LCD icons on charge controller • Battery cleaning and maintenance

Guidance on upscaling business opportunities	Solar pumps	**Less understanding technical specification**
		• Which factors decide suitable size of DRE systems?
		• How to select the most suited vendor for installation of DRE systems?
		• Demand stimulation, especially with productive users
			Service Providers, Product Developers, Rural Entrepreneurs	• Size of the array and its dependence on the power needed for the pump
				  ○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate
				  ○ Estimating the irrigation demand
				  ○ Calculating the peak discharge
				  ○ Head requirements
				  ○ Impact on cost of the system
				• Availability of pump sizing tools that can be used

				○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE • Checking the sizing options with the vendor • Case study analysis (examples from different use cases in India) • Carrying out basic operations and maintenance of the system • Dos and Don'ts while working with solar panels • Dos and Don'ts while working with batteries
	Solar dryers	What factors decide the sizing and functioning of solar dryers?	Service Providers, Product Developers, Rural Entrepreneurs	• Optimal capacity of dryer cabinet based on minimum crop capacity to be stored (in kgs / MT) • Ambient temperature to be maintained inside the dryer vs outside • Ensuring moisture control in the dryer to regulate drying time based on the intensity of solar radiation • Requirement of gasket (mechanical seal) to protect the dryer from rain, dust, rodents and inspects
	Solar mini-grids	How to select the right capacity (sizing) of solar mini-grids?	Service Providers, Product Developers, Rural Entrepreneurs	• Selection of site ○ Understanding site demography ○ Understanding electrification status of the village ○ Assessing the ability of the community to spend on alternative source of power

				○ Assessing the load profile and power/ energy requirement of customers in the village • Size of the mini-grid plant ○ Determining the power consumption demand • Sizing the PV Modules ○ Calculating the total Watt peak rating needed for PV Modules. ○ Calculating the number of PV panels for the system ○ Inverter Sizing ○ The input rating of Inverter is never less than the total Watt of Appliances.
	Solar mini-grids	**Crop Productivity** • Does solar panels impact the health of the soil underneath or around them? • Will solar panels on farmland change the microclimate underneath the panels and impact crops? • Is it safe to spray agrochemicals near solar panels?	Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	• Relationship between soil health and solar panels • Benefits of solar panels on soil and crops ○ Cooling effect on crops offered by solar panels ○ Requirement of water / moisture content to crops underneath solar panels ○ Increase in crop yield • Integrating grazing with solar panels for better soil health
	Solar mini-grids	**How to manage risk with installation of solar mini-grids**	Service Providers, Product Developers, Rural Entrepreneurs	• Analysis of Technical and operational risks for RE-based Mini-grids ○ Business Model Risk ○ Market erosion Risk ○ Supply chain risks including resource price variability risk

				○ Environmental and safety risks • Project development and investment risk ○ CAPEX and OPEX forecasting risk ○ Technology selection risk ○ Equity return expectations and risk • Overview of risk management techniques (from risk tolerance to risk avoidance)

4.2. Common Training Content across DRE systems in Agriculture sector

Provided below are the details of the common training across DRE systems in the agriculture sector. Overview of the training gaps and corresponding training agenda are provided in table 1.

Farmers

According to the training gaps identified for farmers in the agriculture sector across all DRE technologies, it is suggested that **85-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Use of DRE solutions on farmland	
5 minutes	• Understanding the link between the introduction of DRE technology and agricultural productivity, livelihoods and food security • Environmental and social benefits offered by DRE solutions
Module 1.2 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable DRE systems on farmland
5 minutes	• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)
5 minutes	• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design, AMC & best practices ○ Safety policies
10 minutes	**Short Assessment on Module 1**
Module 2.1- Financial Aspects	
5 minutes	• Exploring funding options ○ Available credit options or source of funding ○ Eligibility criteria ○ Necessary documentation needed to secure loans from banks and other financial institutions
10 minutes	• Understanding cost economics of DRE systems ○ financial advantages, potential cost savings, and overall return on investment ○ Understanding financial implications of DRE systems over conventional alternatives
Module 2.2- Policy Aspects	
10 minutes	• Understanding policy framework that supports DRE uptake ○ Schemes/policies supporting DRE technologies ○ Implementing agency ○ Benefits of the policies/schemes ○ Necessary documentation for accessing the benefits offered by these policies ○ Application process for availing scheme benefits ○ Appropriate channels for acquiring information and submitting necessary documents
Module 3.1 – Carrying out basic operations and maintenance of the system	
10 minutes	• Solar PV panels

	○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ Using only mild, non-abrasive, non-caustic detergent with deionized water to clean PV modules. ○ Using micro-fiber cloth to clean PV modules.
5 minutes	• Electrical items ○ Visually checking all conduit and wire insulation for damage ○ Checking for loose, broken, corroded, or burnt wiring connections
Module 3.2 – Protecting DRE systems on farmland	
5 minutes	• Protecting DRE systems from theft / robbery ○ Use of solar panel lock ○ Securing solar panels through fences, barbed wires and alarm systems
10 minutes	**Short Assessment on Module 2 and 3**

Service Providers / Product Developers / Rural Entrepreneurs

According to the training gaps identified for service providers/product developers/rural entrepreneurs in the agriculture sector across all DRE technologies, it is suggested that **75-minute long self-paced e-learning training program could be developed**.

Module 1.1 –Marketing and Branding	
10 minutes	• Understanding customer need: ○ Objective of the customer – what is the specific need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
10 minutes	• Knowing the product modalities: ○ After sales service ○ Can O&M and troubleshooting be managed locally? ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural retailers, local youth, RE mascots, etc.
5 minutes	• Deploying effective marketing techniques ○ Word-of-mouth Marketing ○ Leveraging local roadshows / festivals / melas ○ Identifying evangelists / RE mascots who can be distributors
10 minutes	**Short Assessment on Module 1**

Module 2.1- Financial Aspects	

5 minutes	• Exploring funding avenues
	  ○ Available credit options or source of funding
	  ○ Eligibility criteria
	  ○ Necessary documentation needed to secure loans from banks and other financial institutions

10 minutes	• Understanding cost economics of DRE systems
	  ○ financial advantages, potential cost savings, and overall return on investment
	  ○ assessing the payback period
	  ○ projecting income based on business activities
	• Understanding financial implications of DRE systems over conventional alternatives

Module 2.2- Policy Aspects	

10 minutes	• Understanding policy framework that supports DRE uptake
	  ○ Schemes/policies supporting DRE technologies
	  ○ Implementing agency
	  ○ Benefits of the policies/schemes
	  ○ Necessary documentation for accessing the benefits offered by these policies
	  ○ Application process for availing scheme benefits
	  ○ Appropriate channels for acquiring information and submitting necessary documents

10 minutes	**Short Assessment on Module 2**

State Rural Livelihood Missions / State Nodal Agencies / State Government Departments

State Government Departments

The key training needs for this group of stakeholders is on awareness enhancement around the developing inclusive partnerships at the state level to establish linkages between DRE applications and income generation avenues for both farmers and private sector entrepreneurs. Module-wise detailed agenda for this category of stakeholders has been provided below. **It is suggested this could be a 50-minutes long self-paced training program.**

Module 1.1 – Creating public awareness to promote adoption of DRE livelihood applications in agriculture sector	

5 minutes	• Understanding the possibility of livelihood opportunities provided by DRE applications mentioned below in agriculture value chain
	  ○ Solar water pumps
	  ○ Solar cold storages
	  ○ Solar dryers
	  ○ RE-based mini-grids
	• Avenues of adoption of DRE livelihood technologies among women and other marginalized groups such as Scheduled Caste and Scheduled Tribes

10 minutes	• Conducting demand assessment to map the needs of farmers with appropriate fit to DRE livelihood applications in agriculture value chain • Identifying focus areas for the introduction of DRE applications in agriculture sector in the State

5 minutes	• Engaging on platforms for enhancing awareness about DRE applications
	  ○ Local livelihood summits
	  ○ Town-halls
	  ○ Supporting demonstration of such technologies at trade fairs and exhibitions

Module 1.2 – Identifying state level organizations for scaling-up adoption of DRE applications	

5 minutes	• Promoting self-help groups and local level organizations to implement DRE solutions on farmlands
	  ○ Designating SRLMs / SNAs as coordinating agencies for:
	  ▪ Training SHG women for providing after-sales and repair service at the local level
	  ▪ Facilitating in creating DRE-specific green jobs for women
	• SRLMs / SNAs as nodal agencies for supporting the effective implementation of DRE-based livelihood promotion in the agriculture sector in the state

15 minutes	• Establishing tie ups with academic institutions and foundations in the state for facilitating R&D in the DRE sector across the agriculture value chain
	  ○ Clearly setting the objectives of the partnership:
	  ▪ Identifying innovative DRE applications on farmland which could be cost-effective
	  ▪ Providing test-bedding sites such as labs and testing centres to safely trial their ideas and innovations by product developers
	  ▪ Business acceleration support, including strategic advisory and networking sessions for product developers, service providers and farmers
	  ▪ Establishing the linkage between DRE applicable and income security & livelihood enhancement for farmers
	• Serving as a knowledge portal for DRE resources including policy best practices, data, and analysis tools and share the same with product developers. Service providers and rural entrepreneurs in the state

10 minutes	**Short Assessment on Module 1**

SRLMs / SNAs

The key training needs for this group of stakeholders is training of trainers who can be capacitated to deliver trainings to the farmers on different technical and financial aspects of DRE solutions in agriculture value chain. Module-wise detailed agenda for this category of stakeholders has been provided below. **It is suggested this could be a 55-minutes long self-paced training program.**

Module 1.1 – Development of domain skills	

15 minutes	• Ability to read and interpret technical parameters/ documentation
	• Developing ability to disseminate knowledge around:
	  ○ Identifying necessary materials and tools (hand tools, machine tools and workshop equipment)
	  ○ Checking the circuit, equipment, panel as per drawing for functioning
	  ○ Connecting, testing and undertake maintenance and disposal of solar batteries
	  ○ Connecting and testing solar panel, charge controller, battery bank and inverter

10 minutes	• Technical aspects: ○ Basic principles of direct current and alternating current ○ Measurements of physical quantitates, converter and inverter circuits ○ Electrical installation of the solar systems ○ Installation area and construction
Module 1.2 –Development of soft skills of trainers	
20 minutes	• Developing interpersonal skills including: ○ Developing networking skills ○ Confidence building ○ Training delivery skills Pitching for a product ○ How to convert new customers for the product ○ Efficient educational techniques that can be used to further improve the effectiveness of training ○ Gathering effective feedback from trainees
10 minutes	**Short Assessment on Module 1**

4.3. Specific Training Content for each type of DRE system Content of e-learning material for Different Stakeholders

Provided below are the details of the common training across DRE systems in the agriculture sector. Overview of the training gaps and corresponding training agenda are provided in table 2.

Farmers

Solar Water Pumps

Level 1

The key DRE-specific training gaps identified for the farmers in the agriculture value chain include the need for awareness enhancement, technical know-how of the DRE systems and guidance around the business models. Module-wise detailed agenda for the training program for each measured DRE technology is presented below:

According to the training gaps identified for farmers in the agriculture sector, for solar water pumps training at Level 1, it is suggested that **120-minutes long self-paced e-learning training program could be developed**.

Module 1.1 – Use of solar water pumps on farmland	

5 minutes	• Understanding the link between the introduction of solar water pumps and agricultural productivity, livelihoods and food security
	• Types of solar water pumps
	  ○ AC / DC
	  ○ Submersible / surface pumps
	• Impact of solar water pumps on irrigation intensity, adoption of multi-cropping patterns and income generation

5 minutes	• Environmental and social benefits offered by solar water pump solutions • Ease of shifting from diesel-based pumps to solar based water pumps
Module 1.2 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable solar water pumps on farmland
5 minutes	• Vendor's understanding of structural requirements (e.g., weight, wind, solar radiation, etc.)

5 minutes	• Availability of quality management plan with the vendor covering:
	  ○ System equipment testing
	  ○ Inspection protocol
	  ○ Design, AMC & best practices
	  ○ Safety policies

10 minutes	**Short Assessment on Module 1**
Module 2.1 – Effective installation of solar water pumps on flood plains	
10 minutes	• Flood resistant materials to be used for solar water pump components • Impact on insurance costs
5 minutes	• Anchoring solar panels to prevent collapse or movement during a flooding event Installing solar panels at or above the flood protection grade • Desired tilt of solar panels

Module 2.2 – Protecting solar water pump systems on farmland	

5 minutes	• Protecting solar water pumps from theft / robbery
	  ○ Use of solar panel lock
	  ○ Use of fence / barbed wires
	  ○ Use of pop rivets / blind rivets / to enhance security
	  ○ Gluing, Welding or Sealing the Panels / linking racks
	  ○ Use of alarm

Module 2.2 – Sizing of solar water pumps	

10 minutes	• Size of the array and its dependence on the power needed for the pump
	  ○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate
	  ○ Estimating the irrigation demand
	  ○ Calculating the peak discharge
	  ○ Head requirements
	  ○ Impact on cost of the system

5 minutes	• Availability of pump sizing tools that can be used
	  ○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE
	  ○ Checking the sizing options with the vendor

5 minutes	• Case study analysis (examples from different use cases in India)
10 minutes	**Short Assessment on Module 2**
Module 3.1 – Crop productivity after solar PV installation on farmland	

10 minutes	• Relationship between soil health and solar panels
	• Benefits of solar panels on soil and crops
	  ○ Cooling effect on crops offered by solar panels
	  ○ Requirement of water / moisture content to crops underneath solar panels
	  ○ Increase in crop yield

5 minutes	Integrating grazing with solar panels for better soil health
Module 3.2 – Converting land back to agricultural uses after end of life of solar water pumps	
5 minutes	• Checking soil contamination and harm to crops, if any
5 minutes	• Decommissioning and removing the solar water pump from the farmland
10 minutes	**Short Assessment on Module 3**

Level 2

At this level, specific technical parameters to be considered for installing and maintaining solar water pumps on farmlands are considered for developing training modules. It is suggested **that 55-minute long self-paced e-learning training program could be developed**.

Module 1.1 – Water demand assessment for selecting a solar water pump	

10 minutes	• Estimating daily water demand in each month based on end application
	  ○ Considering variation of water demand based on end application
	  ○ Considering water supply needs in the future

10 minutes	• Water distribution requirement assessment
	  ○ Considering existing storage facility for short-term and long-term storage
	  ○ Considering the water delivery points based on application and purpose

	○ Avoiding more joints and elbows in pipelines ○ Selecting an appropriate and effective distribution system for irrigation purpose
Module 1.2 – Carrying out basic operations and maintenance of the system	
15 minutes	• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Inspecting PV modules for broken cells and discoloration ○ Using water with hardness less than 75ppm to clean the PV modules before and after solar time ○ Using microfiber cloth to remove stubborn dirt and rinsing with plenty of water
10 minutes	• Electrical items ○ Visually checking all conduit and wire insulation for damage ○ Checking for loose, broken, corroded, or burnt wiring connections
10 minutes	**Short Assessment on Module 1**

Solar Dryers

Level 1

According to the training gaps identified for farmers in the agriculture sector, for solar dryers training at Level 1, it is suggested that **105-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Use of DRE solutions	
10 minutes	• Understanding the link between the introduction of solar dryers and agricultural productivity, livelihoods and food security • Types of solar dryers available in the market: ○ Solar box dryer ○ Solar cabinet dryer ○ Solar tunnel dryer ○ Hybrid dryer (solar-biomass cabinet dryer) • Crops that can be dried using solar dryer
5 minutes	• Quality induced market pricing of produce ○ Possibility of export of produce due to improved quality meeting quality requirements and testing criteria
5 minutes	• Environmental and social benefits offered by solar dryers: ○ Avoidance of widespread fungal infection resulting from unexpected rains or fog vs destruction of unprotected / open drying of crops
Module 1.2 – Assessment of parameters for making vendor selection	
10 minutes	• Evaluate the vendor's work performance history using sources such as IREAP • Assess and compare various available choices, and determine its ability to install safe and reliable solar dryers
5 minutes	• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)

5 minutes	• Availability of quality management plan with the vendor covering:
	  ○ System equipment testing
	  ○ Inspection protocol
	  ○ Design best practices
	  ○ Safety policies

10 minutes	**Short Assessment on Module 1**
Module 2.1 –Understanding the performance parameters of solar dryers	
5 minutes	• Understanding the key components of a solar dryer – solar panels, cover, design, air flow, stand, absorber tray, etc.)

5 minutes	• Moisture removal rate of solar dryers
	• Baseline moisture content of fruits and vegetables
	  ○ Typically around 70-85%
	• Moisture content after solar drying
	  ○ Typically around 5-15%

5 minutes	• What is the right drying efficiency • What should be the drying rate
Module 2.2 – Sizing and functioning of solar dryers	
5 minutes	• Optimal capacity of dryer cabinet based on minimum crop capacity to be stored (in kgs / MT)
10 minutes	• Ambient temperature to be maintained inside the dryer vs outside • Ensuring moisture control in the dryer to regulate drying time based on the intensity of solar radiation
5 minutes	• Requirement of gasket (mechanical seal) to protect the dryer from rain, dust, rodents and inspects
Module 2.3 – Protecting DRE systems on farmland	

10 minutes	• Protecting solar dryers from theft / robbery
	  ○ Use of solar panel lock
	  ○ Use of fence / barbed wires
	  ○ Use of pop rivets / blind rivets / to enhance security
	  ○ Gluing, Welding or Sealing the Panels / linking racks
	  ○ Use of alarm

10 minutes	**Short Assessment on Module 2**

Level 2

At this level, specific parameters to be considered for installing and maintaining solar dryers on farmlands are considered for developing training modules. It is suggested that **40-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Carrying out basic operations and maintenance of the system	

15 minutes	• Solar PV panels
	  ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time
	  ○ Inspecting PV modules for broken cells and discoloration
	  ○ Using water with hardness less than 75ppm to clean the PV modules before and after solar time

	○ Using microfiber cloth to remove stubborn dirt and rinsing with plenty of water
15 minutes	• System components ○ Cleaning of drying surface ○ Cleaning the UV sheet (where applicable) and tray with a clean dump cloth ○ Cleaning the mesh after every use ○ Performing visual checks of the condition of the dryer components ○ Checking the doors are close tightly ○ Checking that the trays are not torn on the mesh ○ Checking that the mesh liners are not blocked
10 minutes	**Short Assessment on Module 1**

Solar Cold Storage

Level 1

According to the training gaps identified for farmers in the agriculture sector, for solar cold storages training at Level 1, it is suggested that **55-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Use of solar cold storage solutions on farmland	
5 minutes	• Understanding the link between the introduction of solar cold storage and agricultural productivity, livelihoods and food security • Types of solar cold storages ○ Solar cold storage with battery storage ○ Solar cold storage with phase change material (PCM) storage ○ Solar cold storage with thermal storage • Impact of solar cold storage on irrigation intensity, adoption of multi-cropping patterns and income generation
10 minutes	• Environmental and social benefits offered by solar cold storage solutions • Case study analysis
Module 2.1 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable solar cold storage on farmland
5 minutes	• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)
5 minutes	• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies
Module 2.1 – Protecting solar cold storage systems on farmland	
10 minutes	• Dos and Don'ts while working with batteries ○ Location for battery installation ○ Combining and connecting batteries ○ Acid spill cleanup material to be readily available ○ Verifying electrolyte levels (adding distilled water as necessary) ○ Measuring specific gravity

	○ Setting up battery charge voltage/current limit ○ Checking indicator LEDs or LCD icons on charge controller ○ Battery cleaning and maintenance
5 minutes	• Protecting solar cold storage systems from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm
10 minutes	**Short Assessment on Module 1**

Level 2

At this level, specific parameters to be considered for installing and maintaining solar cold storages on farmlands are considered for developing training modules. It is suggested that **0-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Carrying out basic operations and maintenance of the system	
15 minutes	• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Inspecting PV modules for broken cells and discoloration ○ Using water with hardness less than 75ppm to clean the PV modules before and after solar time ○ Using microfiber cloth to remove stubborn dirt and rinsing with plenty of water
15 minutes	• Electrical items ○ Cleaning – daily basis (spillage should be immediately cleaned) ○ Neatly organizing products as per the cooling temperature requirement ○ Checking evaporator for ice build-up and defrost function is working ○ Checking compressors for unexpected vibration and oil leakage ○ Checking if door is air tight and if there is any leakage, cracks or wear and tear in the door
10 minutes	**Short Assessment on Module 1**

Service Providers / Product Developers / Rural Entrepreneurs

Solar Water Pumps

At this level, specific parameters to be considered for developing training modules are presented below. It is suggested that **65-minute long self-paced e-learning training program could be developed**.

Module 1.1 – Sizing of solar water pumps	
20 minutes	• Size of the array and its dependence on the power needed for the pump ○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate ○ Estimating the irrigation demand

	○ Calculating the peak discharge ○ Head requirements ○ Impact on cost of the system
5 minutes	• Availability of pump sizing tools that can be used ○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE ○ Checking the sizing options with the vendor
Module 1.2 – Solar Water Pump Marketing and Branding	
10 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally? ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural retailers, local youth, RE mascots, etc.
5 minutes	• Deploying effective marketing techniques ○ Word-of-mouth Marketing ○ Leveraging local roadshows / festivals / melas ○ Identifying evangelists / RE mascots who can be distributors
10 minutes	**Short Assessment on Module 1**

Solar Dryers

At this level, specific parameters to be considered for developing training modules are presented below. It is suggested that **60-minute long self-paced e-learning training program could be developed**.

Module 1.1 – Designing a solar dryer	
10 minutes	• Types of solar dryers ○ Solar box dryer ○ Solar cabinet dryer ○ Solar tunnel dryer ○ Hybrid dryer (solar-biomass cabinet dryer) • Understanding the key parts of solar dryers ○ Solar collector

	○ Drying chamber ○ Absorber ○ Ventilation holes ○ Any other key part depending on the type of solar dryer
10 minutes	• Understanding the parameters for assessing the performance of solar dryers ○ Maintaining the temperature inside the drying chamber (typically 55–60° with under load conditions, 65–70° in an overload condition) ○ Material to be used for absorber plate ○ Width of hole in solar dryers ○ Calculating efficiency of solar dryers based on airflow rate
Module 1.2 – Solar dryers Marketing and Branding	
10 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural retailers, local youth, RE mascots, etc.
5 minutes	• Deploying effective marketing techniques ○ Word-of-mouth Marketing ○ Leveraging local roadshows / festivals / melas ○ Identifying evangelists / RE mascots who can be distributors
10 minutes	**Short Assessment on Module 1**

Solar Cold Storage

According to the training gaps identified for farmers in the agriculture sector, for RE-based mini-grids training at Level 1, it is suggested that **55-minute long self-paced e-learning training program could be developed**.

Module 1.1 – Designing a solar cold storage	
20 minutes	• PV system sizing and design for cold storage

	○ Knowing the exact purpose and cooling requirement of the cold storage by potential ○ Assessment of cooling load and auxiliary electricity demand ○ Solar resource assessment (including 'no sun' equivalent days) ○ System configuration ○ Calculate storage and autonomy requirement – Thermal (PCM) or Battery ○ PV array sizing, selection of compressor driver / inverter and BOS component design
Module 1.2 – Solar cold storage Marketing and Branding	
10 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing
10 minutes	**Short Assessment on Module 1**

RE-based Mini-Grids

Level 1

According to the training gaps identified for farmers in the agriculture sector, for RE-based mini-grids training at Level 1, it is suggested that **110-minute long self-paced e-learning training program could be developed**.

Module 1.1 – Use of RE-based mini grids	
5 minutes	• Understanding the link between the introduction of DRE-based agricultural equipment powered by RE mini grid and agricultural productivity, livelihoods and food security
5 minutes	• Environmental and social benefits offered by RE-based mini-grids

10 minutes	• Agricultural equipment that can be powered using DRE solutions
	  ○ Explaining its cost-effectiveness and reliability
	  ○ Ease of shifting from diesel-based agriculture equipment to DRE-based agriculture equipment
	• Impact of DRE-based agriculture equipment on irrigation intensity, adoption of multi-cropping patterns and income generation

Module 1.2 – Protecting RE mini-grids	

5 minutes	• Dos and Don'ts while working with batteries
	  ○ Location for battery installation
	  ○ Combining and connecting batteries
	  ○ Acid spill cleanup material to be readily available
	  ○ Verifying electrolyte levels (adding distilled water as necessary)
	  ○ Measuring specific gravity
	  ○ Setting up battery charge voltage/current limit
	  ○ Checking indicator LEDs or LCD icons on charge controller
	  ○ Battery cleaning and maintenance

10 minutes	• Protecting RE mini-grid equipment from theft / robbery
	  ○ Use of solar panel lock
	  ○ Use of fence / barbed wires
	  ○ Restricting entry to the premises
	  ○ Use of pop rivets / blind rivets / to enhance security
	  ○ Gluing, Welding or Sealing the Panels / linking racks
	  ○ Use of alarm
	  ○ Installing security cameras on the premises
	  ○ Deploying a full time guard on the premises
	  ○ Obtaining insurance for key system components

10 minutes	**Short Assessment on Module 1**
Module 2.1 – Effective installation of RE-based mini-grids on flood plains	
10 minutes	• Flood resistant materials to be used for all DRE system components • Impact on insurance costs
5 minutes	• Anchoring solar panels to prevent collapse or movement during a flooding event Installing solar panels at or above the flood protection grade • Desired tilt of solar panels
Module 2.2 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable equipment / components of RE-based mini-grid
5 minutes	• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)

5 minutes	• Availability of quality management plan with the vendor covering:
	  ○ System equipment testing
	  ○ Inspection protocol
	  ○ Design best practices
	  ○ Safety policies

Module 3.1 – Crop productivity after solar PV installation on farmland	

10 minutes	• Relationship between soil health and solar panels
	• Benefits of solar panels on soil and crops
	  ○ Cooling effect on crops offered by solar panels
	  ○ Requirement of water / moisture content to crops underneath solar panels
	  ○ Increase in crop yield

5 minutes	Integrating grazing with solar panels for better soil health
Module 3.2 – Converting land back to agricultural uses after end of life of RE-based mini-grids	
5 minutes	• Checking soil contamination and harm to crops, if any
5 minutes	• Decommissioning and removing the RE-based mini-grids from the farmland
10 minutes	**Short Assessment on Modules 2 and 3**

Level 2

At this level, the training agenda is more detailed and centered around sizing of RE-based mini-grids and integration of productive loads. Module-wise detailed agenda for the solar dryer specific training program has been developed. **It is suggested this could be a 100-minutes long self-paced training program.**

Module 1.1 – Sizing of RE-based mini-grids	
15 minutes	• Selection of site ○ Understanding site demography ○ Understanding electrification status of the village ○ Assessing the ability of the community to spend on alternative source of power ○ Assessing the load profile and power/ energy requirement of customers in the village
20 minutes	• Size of the mini-grid plant ○ Determining the power consumption demand ○ Sizing the PV Modules ▪ Calculating the total Watt peak rating needed for PV Modules. ▪ Calculating the number of PV panels for the system ○ Inverter Sizing ▪ The input rating of Inverter is never less than the total Watt of Appliances. ▪ Nominal voltage of inverter ○ Battery sizing ▪ Total Watt hours per day used ▪ Days of autonomy ▪ Nominal voltage of battery
Module 1.2 – Integrating productive loads	
15 minutes	• Commercial activities in the village • Assessing the possibility of integrating: ○ Anchor loads such as telecom towers, large factories, etc. ○ Irrigation and water pumping for farming ○ Small scale businesses- oil millers or rice hullers
Module 1.3 – Risk Management with Use of RE-based Mini-grids	
15 minutes	• Analysis of Technical and operational risks for RE-based Mini-grids ○ Business Model Risk ○ Market erosion Risk ○ Supply chain risks including resource price variability risk ○ Promotion of productive use of electricity and local entrepreneurship ○ Hybridization of solutions, where feasible ○ Environmental and safety risks

20 minutes	• Project development and investment risk
	  ○ CAPEX and OPEX forecasting risk
	  ○ Technology selection risk
	  ○ Equity return expectations and risk

5 minutes	• Overview of risk management techniques (from risk tolerance to risk avoidance)
	  ○ Early recognition of crucial risk driving factors of DRE systems
	  ○ Focused response at early stages to limit risk exposure arising through mini-grid systems
	  ○ Risk insurance such as against transport, weather, theft, fire, etc.

10 minutes	**Short Assessment on Module 1**

4.4. Dairy Value Chain

Common Training Content Across DRE systems in Dairy sector

Based on the training agendas developed for each sector, common training content that cut across all DRE technologies, has been identified for stakeholders such as **farmers and product developers/service providers/rural entrepreneurs. For State Rural Livelihood Missions / State Nodal Agencies / State Government Departments, the training agendas developed are already DRE technology agnostic.** The details of the common training agendas is provided in section 4.5

Table 3: Common Training Content across DRE systems in dairy value chain

Training Gap Category	Training Gap	Demand group of stakeholders	Training module content
Awareness Enhancement	**Less understanding of Dairy Value Chain** • Solar refrigeration units for different types of dairy products. • Types of cold storages	• Farmers • Rural Aggregators • Rural Entrepreneurs	• Introduction to types of refrigerators. • Introduction to type of milk chillers
	Productive Use of measured DRE technology • How long to place product inside the solar refrigerators?	• Farmers	• Process conditions at which milk and dairy products need to be stored in refrigerators
	Securing Supply chain • Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. for procuring equipment • Determining supplier evaluation criteria.	• Product Developers • Rural Entrepreneurs	• For manufacturers, details of production process involved in solar refrigeration-units including sourcing of raw material, assembly, quality control and testing. • For distributors: Identification of distribution channels and logistics involved in transporting DRE systems from manufacturers to end users.

	• Understanding timely dispatch and arrival of milk while utilizing DRE solutions.		

	Product branding and marketing
	• Identifying smallholder farmers that respond to their value propositions.
	• Identifying bankable business models where loan can be availed from the market.
		Service Providers, Product Developers, Rural Entrepreneurs	• Understanding Business models
			  ○ Storage as a service
			  ○ Storage and logistic solution/.
			  ○ Storage co-operatives for facilitating storage and distribution of dairy product within co-operative network
			• Understanding customer need
			  ○ Objective of the customer – what is the specific need?
			  ○ How do they fulfil the present need and what price they are paying?
			  ○ How critical is the need?
			  ○ What is the future growth possibility?
			• Understanding documentation
			• Knowing your own product modalities
			  ○ Specifications, uses and limitations
			  ○ After sales service
			  ○ Can O&M and troubleshooting be managed locally?
			  ○ Guarantee/ warrantee
			• Potential strategic partnerships at the local level
			  ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc.
			  ○ Word-of-mouth Marketing

Entrepreneurial skill development	**Project Management Techniques / Skills** • Optimising the DRE system production process taking into account the existing technical equipment or to start a new investment • Talent management to scale-up the business	Service Providers, Product Developers, Rural Entrepreneurs	• Supply chain understanding and technical equipment required to start a new investment • Site selection, resources availability and initial budget estimation for the implementation of the DRE system • Understanding of tank capacity of solar milk chillers as per the milk storage requirement • Investment analysis under CAPEX and OPEX based business models • Operation & Maintenance of the DRE system
Training of trainers	• What are the opportunities for women to invest in DRE systems at the village level? • Lack of understanding of the potential role of local women as technicians / electricians in routine operation and maintenance of DRE systems	SRLMs/SNAs	• Understanding supply value chain in the dairy sector • Understanding of women role in milk aggregation in the supply value chain • Technical and O&M understanding of the DRE equipment in the dairy value chain • Basic financial profit analysis

	Domain Skills
	• Desired project layout required for the smooth operation
	• Processing and preservation methods involved in the milk and milk products
	• Food safety regulation and standards to be maintained as per the specific processing methods
	• Equipment and specification on machineries
		State Government Departments, SRLMs, SNAs	• Ability to read and interpret technical parameters/ documentation
			• Developing ability to disseminate knowledge around:
			  ○ Identifying necessary materials and tools (hand tools, machine tools and workshop equipment)
			  ○ Checking the circuit, equipment, panel as per drawing for functioning

	• Dairy equipment maintenance – principles of preventive maintenance • Awareness session on cleaning and sanitation of dairy equipment – cleaning agents, methods		○ Connecting, testing and undertake maintenance and disposal of solar batteries • Connecting and testing solar panel, charge controller, battery bank and inverter
	Soft Skills • Efficient educational techniques to further improve the effectiveness of training by local trainers • Importance of soft skills and communication • Training delivery skills	State Government Departments, SRLMs, SNAs	• Developing interpersonal skills including: ○ Developing networking skills ○ Confidence building ○ Training delivery skills Pitching for a product ○ How to convert new customers for the product ○ Efficient educational techniques that can be used to further improve the effectiveness of training ○ Gathering effective feedback from trainees
Financial aspects	• Lack of information around sources of funding available • No preliminary information on documentation required to avail loans from banks and other financial institutions • Lack on information on minimum investment required to start the business	Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	• Capacity development around sources of financing including: ○ List of documents required ○ Eligibility criteria ○ Cost economics of DRE solutions • financial advantages, potential cost savings, and overall return on investment associated with the adoption of DRE solutions • various sources for procuring DRE solutions

Policy	• Lack on information around government schemes, incentives and subsidies available for DRE solutions
	• Lack of understanding around availing benefits under the schemes, incentives and subsidies available for DRE solutions
	• Lack of information around the implementing agency to approach for information about the scheme / policy
	• Documentation required to be submitted to avail scheme / policy benefits
		Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	• Capacity development around policy incentives and subsidies
			  ○ Applicable policy schemes, incentives, and subsidies
			  ○ Details of implementing agency
			  ○ Application process to avail scheme benefits
			• Appropriate channels for acquiring information on scheme guidelines, application process etc.

Specific Training Content for each type of DRE system

Some of the training agendas developed are specific for each technology type. They have been captured in the table below. The details of the common training agendas is provided in section 4.6

Table 4 DRE system specific training modules developed in dairy value chain

Training Topic	Applicable DRE Solution	Gaps in training content	Demand Group of Stakeholders	Training module content
Awareness enhancement	Solar milk Chillers	**Need for understanding economic benefits** • Reduced milk spoilage especially in rural areas where there is no electricity (due to the option of chilling milk)	• Farmers	• Potential case studies demonstrating benefits.

			• Rural aggregators[3]	• Value additions for adapting to DRE systems.
	Solar refrigerators	• Economic benefit in terms of increased milk preservation and potentially, higher revenue / earnings • Possibility of wide varieties of product storage like curd, paneer, butter, etc.	• Farmers • Rural aggregators	
	Solar milking machine	• Possibility of high yield of milk • Time-saving benefit associated with the milking process	• Farmers • FPOs	
Technical aspects	Solar refrigerators, Solar Milk Chillers	**Less understanding of operation and maintenance** • Monitoring system temperature and setting of control panel in a solar refrigerator • Identifying compressor capacity in solar refrigerators and milk chillers • Chilling time duration to be set in the solar milk chillers • Understanding of tank capacity of solar milk chillers and solar refrigerators as per the milk storage requirement	• Farmers • FPOs • Rural Entrepreneurs	• Understanding operational parameters like refrigeration capacity, storage capacity, temperature range etc. • Ensuring safe operation of DRE systems. • Conducting test runs of the system.
Guidance on upscaling business opportunities	Solar Refrigerators, Solar Milk Chillers, Solar Milking machine	**Less understanding of technical specifications** • Selection of suitable size and overall design of the DRE technology based on the business model • Ability to scaling up the business based on market demand	• Product developers and Service Providers	• Understanding key difference between refrigeration units used for agri and dairy applications. • Understanding cost of operation. • Understanding CAPEX and OPEX investments.

[3] Rural aggregators- Rural aggregators are intermediaries or entities operating within rural areas who collect, aggregate, and manage the supply of dairy products from local farmers and then distribute these products to various markets or processing facilities. Their role involves coordinating and streamlining the collection and distribution process to enhance efficiency and market access for dairy products produced by local farmers.

				• Checking the sizing options with the vendor. • Case study analysis (examples from different use cases in India) • Ensuring safe operation of the system and safe operating conditions for the operator.
	Solar Refrigerators	• Understanding of payback period and its relation to cooling rate/size of solar refrigerators and milk quality	• Product developers and Service Providers	• Operational model to support the adoption of solar refrigeration unit by smallholder farmers

4.5. Common Training Content across DRE systems in Dairy sector

Provided below are the details of the common training across DRE systems in the dairy sector. Overview of the training gaps and corresponding training agenda are provided in table 3.

Farmers

According to the training gaps identified for farmers in the dairy sector across all DRE technologies, it is suggested that **75-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Productive use of measured DRE technologies	
10 minutes	• Understanding the link between the introduction of DRE technologies and dairy production and quality of milk • Cooling requirements of different types of dairy products • Understanding rapid chilling that arrests bacteria growth instantly
5 minutes	• Environmental and social benefits offered by DRE systems and dairy production and quality of milk
Module 1.2 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable refrigerators/chillers in villages. • Vendor's understanding of structural requirements (e.g., weight, wind, solar radiation, etc.)

5 minutes	• Availability of quality management plan with the vendor covering:
	  ○ System equipment testing
	  ○ Inspection protocol
	  ○ Design best practices
	  ○ Safety policies
	• Requirements of the latest revision of relevant standards of equipment
	  ○ NEC: National Electric Code
	  ○ IEC: International Electro Technical Commission
	  ○ BIS: Bureau of Indian Standards
	  ○ ISO: International Organization for Standardization

10 minutes	**Short Assessment on Module 1**
Module 2.1 Financial aspects	

5 minutes	• Access to financial and credit services
	  ○ Where to secure loans at lower interest rates?
	  ○ Repayment options
	  ○ Weighing product cost against the value of loan
	  ○ Understanding RoR and payback period
	  ○ Understanding documentation required

Module 2.2 Policy Aspects	

5 minutes	• Understanding policy framework that supports DRE uptake
	  ○ Schemes/policies supporting DRE technologies
	  ○ Performance-based incentives, interest subvention on DRE products
	  ○ Implementing agency
	  ○ Benefits of the policies/schemes
	  ○ Necessary documentation for accessing the benefits offered by these policies
	  ○ Application process for availing scheme benefits

	○ Appropriate channels for acquiring information and submitting necessary documents
Module 3.1 – Ensuring safe operation of DRE systems	
5 minutes	• Dos and Don'ts while working with batteries ○ Location for battery installation ○ Combining and connecting batteries ○ Setting up battery charge voltage/current limit ○ Checking indicator LEDs or LCD icons on charge controller ○ Battery cleaning and maintenance • Safer operating conditions to enhance compressor life
5 minutes	• Protecting DRE systems from theft / robbery ○ Use of solar panel lock ○ Securing solar panels through fences, barbed wires and alarm systems
Module 4.1 – Carrying out basic operations and maintenance of the system	
5 minutes	• Solar PV panels inspection ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration
5 minutes	• Solar PV panels cleaning ○ Cleaning the PV modules ○ Using recommended detergent with deionized water to clean PV modules
10 minutes	• Refrigeration unit ○ Refrigeration unit key components ○ Setting temperature and monitoring through control panel ○ Cleaning the system (condensing unit, defrosting the system, etc.) ○ Battery disposal after use
5 minutes	• Electrical items inspection ○ Checking the refrigeration temperature at locations appropriate for the stored items ○ Inspecting the evaporator for any ice buildup and verifying the functionality of the defrost system ○ Checking compressors for unexpected vibration and oil leakage
10 minutes	**Short Assessment on Module 2 ,3, and 4**

Service Providers / Product Developers / Rural Entrepreneurs

According to the training gaps identified for service providers/product developers/rural entrepreneurs in the dairy sector across all DRE technologies, it is suggested that **80-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Economic Benefits of DRE Systems	
5 minutes	• Understanding Business models ○ Storage co-operatives for facilitating storage and distribution of dairy product within co-operative network ○ Aggregation based business model for group of farmers

5 minutes	Understanding project economics ○ Comparative analysis of profitability of farmers with respect to conventional milk chilling methods ○ Economic benefit using aggregation-based business model
Module 1.2 –Marketing and Branding	
5 minutes	• Understanding customer need: ○ Objective of the customer – what is the specific need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
5 minutes	• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.
10 minutes	• Knowing the product modalities ○ O&M and troubleshooting to be managed locally ○ Availability of spare parts ○ Expected Life of DRE based solution used ○ Guarantee/ warrantee of the key DRE components
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing ○ Local aggregators for awareness
10 minutes	**Short Assessment on Module 1**
Module 2.1 Conducting test runs of DRE systems	
5 minutes	• Testing certificate requirement for PV modules • Cable testing to figure out any corrosion, insulation failure and short circuit current due to any leakage
Module 3.1 Understanding supply chain considerations	
5 minutes	• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Logistics chain
5 minutes	• Raw Material Supplier Assessment ○ Setting clear objectives and vision ○ Assessing identified supplier options ○ Bargaining power ○ Quality & safety ○ Assessing risks ○ Agility including vendor's ability to respond to changes in demand with respect to volume and variety
10 minutes	• Development of Supplier Selection & Ranking System: ○ Organization and operational background ○ Financial strength - market standing and prospects, credit rating, clientele, etc. ○ Product development such as product range, R&D, Quality management, degree of automation, etc. ○ Manufacturing process

	○ Cost competitiveness in the market ○ After-sales support ○ Logistics tie-ups
Module 4.1 Financial Aspects	
5 minutes	• Understanding various funding options accessible for initiating their business within the dairy sector • Understanding documentation for loans, income projection based on business operations, and investment payback duration • Understanding financial implications of DRE systems over conventional alternatives
Module 4.2 Policy Aspects	
5 minutes	• Processes required to avail the benefits facilitated by these schemes. • Schemes/policies supporting DRE technologies • Benefits of the policies/schemes • Performance-based incentives, interest subvention on DRE products • Implementing agency • Necessary documentation for accessing the benefits offered by these policies • Appropriate channels for acquiring information and submitting necessary documents
10 minutes	• **Short Assessment on Module 2, 3 and 4**

State Rural Livelihood Missions / State Nodal Agencies / State Government Departments

State Government Departments

The key training needs for this group of stakeholders is on awareness enhancement around the developing inclusive partnerships at the state level to establish linkages between DRE applications and income generation avenues for both farmers and private sector entrepreneurs. Module-wise detailed agenda for this category of stakeholders has been provided below. **It is suggested this could be a 75-minutes long self-paced training program.**

Module 1.1 – Creating public awareness to promote adoption of DRE livelihood applications in dairy sector	
10 minutes	• Understanding the possibility of livelihood opportunities provided by DRE applications mentioned below in dairy value chain ○ Solar refrigerators ○ Solar milk chillers ○ Solar milking machine • Awareness Enhancement: Benefits of DRE systems in dairy value chain ○ Improved milk quality and impact on milk pricing ○ Minimized energy requirements from the grid or diesel generator ○ Integrating solar energy without the need for net metering or electrical batteries ○ Processing and Value addition of milk
10 minutes	• Conducting demand assessment to map the needs of farmers with appropriate fit to DRE livelihood applications in agriculture value chain

	• Identifying focus areas for the introduction of DRE applications in dairy sector in the State

5 minutes	• Engaging on platforms for enhancing awareness about DRE applications
	  ○ Local livelihood summits
	  ○ Town-halls
	  ○ Supporting demonstration of such technologies at trade fairs and exhibitions

Module 1.2 – Identifying state level organizations for scaling-up adoption of DRE applications	

5 minutes	• Promoting self-help groups and local level organizations to implement DRE solutions on farmlands
	  ○ Designating SRLMs / SNAs as coordinating agencies for:
	  ▪ Training SHG women for providing after-sales and repair service at the local level
	  ▪ Facilitating in creating DRE-specific green jobs for women
	• SRLMs / SNAs as nodal agencies for supporting the effective implementation of DRE-based livelihood promotion in the dairy sector in the state

15 minutes	• Establishing tie ups with academic institutions and foundations in the state for facilitating R&D in the DRE sector across the dairy value chain
	  ○ Clearly setting the objectives of the partnership:
	  ▪ Identifying innovative DRE applications on farmland which could be cost-effective
	  ▪ Providing test-bedding sites such as labs and testing centres to safely trial their ideas and innovations by product developers
	  ▪ Business acceleration support, including strategic advisory and networking sessions for product developers, service providers and farmers
	  ▪ Establishing the linkage between DRE applicable and income security & livelihood enhancement for farmers
	• Serving as a knowledge portal for DRE resources including policy best practices, data, and analysis tools and share the same with product developers, service providers and rural entrepreneurs in the state

10 minutes	**Short Assessment on Module 1**

SRLMs / SNAs

The key training needs for this group of stakeholders is training of trainers who can be capacitated to deliver trainings to the farmers on different technical and financial aspects of DRE solutions in agriculture value chain. Module-wise detailed agenda for this category of stakeholders has been provided below. **It is suggested this could be a 55-minutes long self-paced training program.**

Module 1.1 – Development of domain skills	

15 minutes	• Ability to read and interpret technical parameters/ documentation
	• Developing ability to disseminate knowledge around:
	  ○ Identifying necessary materials and tools (hand tools, machine tools and workshop equipment)
	  ○ Checking the circuit, equipment, panel as per drawing for functioning
	  ○ Connecting, testing and undertake maintenance and disposal of solar batteries

	○ Connecting and testing solar panel, charge controller, battery bank and inverter
10 minutes	• Technical aspects: ○ Basic principles of direct current and alternating current ○ Measurements of physical quantitates, converter and inverter circuits ○ Electrical installation of the solar systems ○ Installation area and construction
Module 1.2 –Development of soft skills of trainers	
20 minutes	• Developing interpersonal skills including: ○ Developing networking skills ○ Confidence building ○ Training delivery skills Pitching for a product ○ How to convert new customers for the product ○ Efficient educational techniques that can be used to further improve the effectiveness of training ○ Gathering effective feedback from trainees
10 minutes	**Short Assessment on Module 1**

4.6. Specific Training Content for each type of DRE system Content of e-learning material for Different Stakeholders

Provided below are the details of the common training across DRE systems in the agriculture sector. Overview of the training gaps and corresponding training agenda are provided in table 4.

Farmers

The key DRE-specific training gaps identified for the farmers in the dairy value chain include the need for awareness enhancement, guidance around the business models and need to developing master trainers at local level. Module-wise detailed agenda for the training program for each measured DRE technology is presented below:

Solar Milk Chillers

Level 1

According to the training gaps identified for farmers in the dairy sector, for solar milk chiller training at Level 1, it is suggested that **70 min long self-paced e-learning training program could be developed.**

Module 1.1 – Productive use of measured DRE technologies	
5 minutes	• Understanding the link between the introduction of DRE technologies and dairy production and quality of milk. • Features of solar milk chillers ○ Instant Milk Cooling ○ Simple Design ○ Cooling capacity • Type of Cooling tank: ○ Open Vertical Cylinder Tank ○ Open Horizontal Tank ○ Fully Enclosed Elliptical tank

	○ Fully Enclosed Cylindrical tank
5 minutes	• Cooling requirements of different types of dairy product. • Understanding crash cooling or instant milk cooling to arrests bacteria growth
5 minutes	• Environmental and social benefits offered by solar milk chiller solutions
10 minutes	• **Short Assessment on Module 1**
Module 2.1 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable refrigerators in villages.
5 minutes	• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)
5 minutes	• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies • Requirements of the latest revision of relevant standards of ○ NEC: National Electric Code ○ IEC: International Electro Technical Commission ○ BIS: Bureau of Indian Standards ○ ISO: International Organization for Standardization
10 minutes	• **Short Assessment on Module 2**
Module 3.1 – Understanding Operations	
5 minutes	• Understanding Operational parameters such as ○ Bulk Milk Cooling Tank ○ Condensing Unit ○ Pump ○ Solar PV Panels & battery bank ○ Inverter with variable frequency drive ○ Remote monitoring through SCADA system
Module 3.2 – Ensuring safe operation of solar milk chillers	
5 minutes	• Dos and Don'ts while working with batteries ○ Location for battery installation ○ Keeping the battery away from heat source. ○ Keeping them away from mechanical abuse. ○ Combining and connecting batteries ○ Setting up battery charge voltage/current limit ○ Checking indicator LEDs or LCD icons on charge controller • Battery cleaning and maintenance • Safer operating conditions to enhance compressor life
5 minutes	• Protecting milk chiller systems from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm
10 minutes	• **Short Assessment on Module 3**

Level 2

According to the training gaps identified for farmers in the dairy sector, for solar mil chiller training at Level 2, it is suggested that **55 min long self-paced e-learning training program could be developed**

Module 1.1 – Carrying out basic operations and maintenance of the system	
10 minutes	• Solar PV panels inspection ○ Checking regularly shadow creating objects on the PV array during solar time ○ Periodic visual inspection of the modules ○ Ensure drainage is adequate, roof drains are not clogged ○ Check for corrosion on the outside of enclosures and the racking system ○ Check for cleanliness throughout the site ○ Check for loose hanging wires in the array ○ Check for signs of animal infestation under the array ○ Inspecting PV modules for broken cells and discoloration
10 minutes	• Solar PV panels cleaning ○ Cleaning frequency of the PV modules twice in a month ○ Using water with apt hardness ○ Using only mild, non-abrasive, non-caustic detergent with deionized water ○ Using micro fiber cloth for cleaning ○ Wiping out residual water from module using rubber wiper
5 minutes	• Refrigeration unit ○ Setting temperature and monitoring through control panel. ○ Cleaning and first level O&M of the refrigeration system, etc. ○ Turn power off and allow battery to cool before removing ○ Clean battery with a neutralizing detergent solution on a regular basis
10 minutes	• Electrical items inspection ○ Cleaning – daily basis (spillage should be immediately cleaned) ○ Neatly organizing products as per the cooling temperature requirement ○ Checking evaporator for ice build-up and defrost function is working ○ Checking compressors for unexpected vibration and oil leakage ○ Checking if door is air-tight and if there is any leakage, cracks or wear and tear in the door
10 minutes	• Standard checks of electrical connections ○ Switch off the main power switch and check all startup circuits and control circuits in the cabinet ○ Check whether compressor resistance is normal ○ Check whether the unit is connected to earthing or ground, ○ Check whether the capacity of cable and protector is equal to the unit running demand
10 minutes	**Short Assessment on Module 1**

Solar Refrigerators

Level 1

According to the training gaps identified for farmers in the dairy sector, for solar refrigerators training at Level 1, it is suggested that **70 minutes long self-paced e-learning training program could be developed**.

Module 1.1 – Productive use of solar refrigerators	

5 minutes	• Understanding the link between the introduction of DRE technologies and dairy production and quality of milk.
	• Introduction to Solar refrigeration units.
	  ○ What are solar refrigeration units
	  ○ Advantages of solar refrigeration.
	• Types of solar based refrigeration units
	  ○ Long term/ short term refrigeration methods.
	  ○ Container based/walk in refrigeration units.

5 minutes	Dairy product category and their respective storage needs
	  ○ Cooling requirements of different types of dairy product.
	  ○ Understanding usage of solar refrigeration unit for storing milk, curd, khoya etc.
	  ○ Impact of temperature and humidity on dairy products

5 minutes	• Environmental and social benefits offered by solar refrigeration units
10 minutes	• **Short Assessment on Module 1**
Module 2.1 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable refrigerators on farmland.
5 minutes	• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)

10 minutes	• Availability of quality management plan with the vendor covering:
	  ○ System equipment testing
	  ○ Inspection protocol
	  ○ Design best practices
	  ○ Safety policies
	• Requirements of the latest revision of relevant standards of
	  ○ NEC: National Electric Code
	  ○ IEC: International Electro Technical Commission
	  ○ BIS: Bureau of Indian Standards
	  ○ ISO: International Organization for Standardization

Module 3.1 – Understanding Operational Parameters	
5 minutes	Understanding Operational parameters such as • Refrigeration capacity • Storage capacity • Humidity • Power back up technology • Remote monitoring through (desktop or mobile phone)
Module 3.2 – Ensuring safe operation of Solar refrigeration systems	

5 minutes	• Dos and Don'ts while working with batteries
	  ○ Determining the battery installation site and ensuring a safe distance from heat sources and potential mechanical damage
	  ○ Setting up battery charge voltage/current limit

	○ Checking indicator LEDs or LCD icons on charge controller ○ Battery cleaning and maintenance
5 minutes	• Protecting solar refrigeration systems from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm
10 minutes	• **Short Assessment on Module 2 & 3**

Level 2

According to the training gaps identified for farmers in the agriculture sector, for solar refrigerators training at Level 2, it is suggested that **55 minutes long self-paced e-learning training program could be developed.**

Module 1.1 – Installation and setting up solar refrigerators	
5 minutes	• Site selection and preparation • Electrical and plumbing connections. • Compliance with safety and hygiene standards
Module 1.2 – Carrying out basic operations and maintenance of the system	
5 minutes	• Solar PV panels inspection ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ First level O&M of solar PV panel
10 minutes	• Solar PV panels cleaning ○ Cleaning frequency of the PV modules twice in a month, utilizing water with hardness levels less than 75ppm to clean the PV modules ○ Using only mild, non-abrasive, non-caustic detergent with deionized water ○ Using microfibers cloth to remove stubborn dirt and rinsing with plenty of water
10 minutes	Refrigeration unit • Refrigeration unit key components. • Setting temperature and monitoring through control panel. • Cleaning and first level O&M of the system (condensing unit, defrosting the system, etc.) • Battery disposal after use
15 minutes	• Electrical items inspection ○ Cleaning – daily basis (spillage should be immediately cleaned) ○ Neatly organizing products as per the cooling temperature requirement ○ Checking evaporator for ice build-up and defrost function is working ○ Checking compressors for unexpected vibration and oil leakage ○ Checking if door is air-tight and if there is any leakage, cracks or wear and tear in the door
10 minutes	• **Short Assessment on Module 1**

Solar Milking Machine

Level 1

According to the training gaps identified for farmers in the dairy sector, for solar milking machine training at Level 1, it is suggested that **70 minutes long self-paced e-learning training program could be developed**.

Module 1.1 – Productive use of solar milking machine	

5 minutes	• Understanding the link between the introduction of DRE technologies and dairy production and quality of milk.
	• Introduction to Solar milking machine.
	  ○ What is solar milking machine
	  ○ Advantages of solar milking machine over conventional methods.
	• Components of solar milking machine

5 minutes	• Understanding milking technique • Types of milking system, bucket vs pipeline
5 minutes	• Environmental and social benefits offered by solar milking machine
10 minutes	• **Short Assessment on module 1**
Module 2.1 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable milking machines on dairy farmland.
5 minutes	• Vendor's understanding of structural requirements (e.g. weight, solar radiation, etc.)

10 minutes	• Availability of quality management plan with the vendor covering:
	  ○ System equipment testing
	  ○ Inspection protocol
	  ○ Design best practices
	  ○ Safety policies

Module 3.1 – Understanding Operational Parameters	
5 minutes	Understanding Operational parameters such as • Milking rate(l/hr) • Milking volume(l) • Thermal battery • Power consumption • Solar system capacity (Milking machine, chaff cutter and pressure pump)
Module 3.2 – Operation of solar milking machine	
5 minutes	• Machine operation during battery failure. • Replacement components such as battery, motor and vacuum pumps

5 minutes	• Protecting solar refrigeration systems from theft / robbery
	  ○ Use of solar panel lock
	  ○ Use of fence / barbed wires
	  ○ Use of pop rivets / blind rivets / to enhance security
	  ○ Gluing, Welding or Sealing the Panels / linking racks
	  ○ Use of alarm

10 minutes	• **Short Assessment on module 2 &3**

Level 2

According to the training gaps identified for farmers in the agriculture sector, for solar refrigerators training at Level 2, it is suggested that **40 minutes long self-paced e-learning training program could be developed.**

Module 1.1 – Installation and setting up solar milking machine	
5 minutes	• Site selection and preparation • Electrical and plumbing connections. • Compliance with safety and hygiene standards
Module 1.2 – Carrying out basic operations and maintenance of the system	
5 minutes	• Solar PV panels inspection ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ First level O&M of solar PV panel
10 minutes	Milking unit operation • Milking machine key components • Checking vacuum level before starting milking operation • Cup connection and maintaining the flow rate of milk in the system • Battery disposal after use • Pumping duration after and before use • Cleaning the pumping unit after use • Checking pipelines and interceptor are free from milk or water
10 minutes	**Short Assessment on module 1**

Service Providers / Product Developers / Rural Entrepreneurs

Solar Milk Chillers

Level 1

According to the training gaps identified for service providers/ product developers/rural entrepreneurs in the dairy sector, for solar mil chiller training at Level 1, it is suggested that **60 minutes long self-paced e-learning training program could be developed.**

Module 1.1 – Economic Benefits of solar milk chiller	
10 minutes	• Understanding Business models ○ Storage co-operatives for facilitating storage and distribution of dairy product within co-operative network ○ Self-investment/ RESCO model for milk chiller plant ○ Aggregation based business model for group of farmers
5 minutes	Understanding savings ○ Understanding cost benefit analysis using solar power ○ Understanding energy saving based on future projection
5 minutes	Understanding project economics ○ Comparative analysis of profitability of farmers with respect to conventional milk chilling methods

	○ Cost benefits due to nearby milk collection center and solar milk chiller plant ○ Economic benefit using aggregation-based business model
Module 1.2 – Solar milk chiller (Marketing and Branding)	
10 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need with conventional methods and what price they are paying? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer?
5 minutes	• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ O&M and troubleshooting to be managed locally ○ Availability of spare parts ○ Expected Life of DRE based solution used ○ Guarantee/ warrantee of the key DRE components
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing ○ Local aggregators for awareness
10 minutes	• **Short Assessment on Module 1**

Level 2

According to the training gaps identified for service providers/ product developers/rural entrepreneurs in the dairy sector, for solar milk chiller training at Level 2, it is suggested that **60 minutes long self-paced e-learning training program could be developed**

Module 1.1 – Designing a solar milk chiller	
10 minutes	• PV system sizing /installation ○ Site assessment and feasibility check. ○ No of PV panels required ○ New technology such as mono perc/ bifacial PV module selection for more efficiency ○ Calculate storage and autonomy requirement – Thermal battery or electrical battery ○ PV array sizing, selection of inverter and BOS component design ○ DC and AC cable sizing in line with voltage drop less than 2%
15 minutes	• Design for solar milk chiller ○ Sizing of milk tank and rated volume ○ Thermal Storage with cooling backup and integration with existing infrastructure. ○ Latest generation photovoltaic panels & condensing unit ○ Earthing and lightening protection ○ Assessment of cooling load and auxiliary electricity demand

	○ Control panel: LCD display for monitoring thermal storage and milk temperature with following user controls ▪ Set point temperature control for milk ▪ Auto/Manual cooling switch ▪ Auto/Manual agitator switch
Module 1.2 Conducting test runs of solar milk chiller units	
5 minutes	• Testing thermal Energy Storage (TES) system capacity and Performance. • PV module conforms to IEC 61730- requirements for testing for safety qualification • All PV modules should have STC testing certificate from an NABL accredited test laboratory • Conducting tests like earth continuity tests, insulation, heat run as per relevant standards • Cable testing to figure out any corrosion, insulation failure and short circuit current due to any leakage
10 minutes	• **Short Assessment on module 1**
Module 2.1 Understanding supply chain considerations	
5 minutes	• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Raw material requirement and sourcing ○ Logistics chain ○ Technology reliability trends
10 minutes	• Raw material supplier assessment: ○ Assessing identified supplier options ○ Inventory costs ○ Bargaining power ○ Quality & safety ○ Assessing risks ○ Agility including vendor's ability to respond to changes in demand with respect to volume and variety
10 minutes	• **Short Assessment on module 2**

Solar Refrigerators

Level 1

According to the training gaps identified for service providers/ product developers/rural entrepreneurs in the dairy sector, for solar refrigerators training at Level 1, it is suggested that **60 minutes long self-paced e-learning training program could be developed.**

Module 1.1 – Economic Benefits of solar refrigerators	
10 minutes	• Understanding Business models ○ Storage and logistic solution/. ○ Storage co-operatives for facilitating storage and distribution of dairy product within co-operative network ○ Independent solar refrigeration facility ○ Integrated dairy processing and solar refrigeration facility.
5 minutes	Understanding concept of shelf life. ○ How milk spoilage and rejection % is reduced?

5 minutes	Understanding economics and benefits ○ What are the value additions for using solar refrigerators? ○ How is profitability of farmers improved?
Module 1.2 – Solar refrigeration/ Marketing and Branding	
10 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer?
5 minutes	• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing
10 minutes	• **Short Assessment on module 1**

Level 2

According to the training gaps identified for service providers/ product developers/rural entrepreneurs in the dairy sector, for solar refrigerators training at Level 2, it is suggested that **85-minutes self-paced e-learning training program could be developed.**

Module 1.1 – Designing a solar refrigerator	
15 minutes	• PV system sizing /installation ○ Mounting options for solar panels ○ Site assessment and feasibility check. ○ No of panels required for a solar refrigerator. ○ Power requirement of solar panels. ○ Efficiency of solar PV Panels. ○ Solar resource assessment (including 'no sun' equivalent days) ○ Calculate storage and autonomy requirement – Thermal battery or electrical battery ○ PV array sizing, selection of inverter and BOS component design
10 minutes	• Design for refrigerator ○ Knowing the exact purpose and cooling requirement of the cold storage by potential.

	○ System configuration ○ Backup system and integration with existing infrastructure. ○ Assessment of cooling load and auxiliary electricity demand ○ Identifying compressor capacity suitable for solar refrigerator.
Module 1.2 Conducting test runs of solar refrigeration unit	
5 minutes	• Testing thermal Energy Storage (TES) system capacity and Performance. • Solar Performance Testing- Simulator Based • Testing with produce/ without produce • Conducting tests like earth continuity tests, insulation, heat run as per relevant standards
10 minutes	• **Short Assessment on module 1**
Module 2.1 Understanding supply chain considerations	
5 minutes	• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Raw material requirement and sourcing ○ Logistics chain • Technology reliability trends
10 minutes	• Raw Material Supplier Assessment: ○ Setting clear objectives and vision ○ Assessing identified supplier options ○ Inventory costs ○ Bargaining power ○ Quality & safety ○ Assessing risks
Module 2.2 Quality Assurance and Compliance	
10 minutes	• Understanding the quality standards applicable in solar refrigeration system ○ Offering system warranty ○ Offering solar panel warranty as per national standards ○ Proper use of thermal insulation in refrigerators ○ Applicable technical standards ▪ SPV Safety Qualification for Construction & Testing ▪ Safety code for mechanical refrigeration ▪ Performance Testing and Test Methods for refrigerant compressors
10 minutes	• **Short Assessment on module 2**

Solar Milking Machine

Level 1

According to the training gaps identified for service providers/ product developers/rural entrepreneurs in the dairy sector, for solar refrigerators training at Level 1, it is suggested that **40 minutes long self-paced e-learning training program could be developed.**

Module 1.1 – Economic Benefits of solar milking machine	
5 minutes	Understanding economics and benefits ○ What are the value additions for using solar milking machine? ○ How is profitability of farmers improved?

	○ Understanding quality, hygiene and cows' health while using milking machine
Module 1.2 – Solar milking machine (marketing and branding)	
10 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer?
5 minutes	• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing
10 minutes	• **Short Assessment on module 1**

Level 2

According to the training gaps identified for service providers/ product developers/rural entrepreneurs in the dairy sector, for solar refrigerators training at Level 2, it is suggested that **85-minutes self-paced e-learning training program could be developed.**

Module 1.1 – Designing a solar milking machine	
15 minutes	• PV system sizing /installation ○ Mounting options for solar panels ○ Site assessment and feasibility check. ○ No of panels required for a solar milking machine. ○ Power requirement of solar panels. ○ Calculate storage and autonomy requirement – Thermal battery or electrical battery ○ PV array sizing, selection of inverter and BOS component design
10 minutes	• Design solar milking machine ○ Knowing the exact purpose and assembling the components of milking machine. ○ Understanding vacuum pump power requirements ○ System configuration ○ Backup system and integration with existing infrastructure.

	○ Adjusting vacuum fluctuations in the system
Module 1.2 Conducting test runs of solar milking machine	
5 minutes	• Testing thermal Energy Storage (TES) system capacity and Performance. • Solar Performance Testing- Simulator Based • Testing with produce/ without produce • Conducting tests like earth continuity tests, insulation, as per relevant standards
10 minutes	• **Short Assessment on module 1**
Module 2.1 Understanding supply chain considerations	
5 minutes	• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Raw material requirement and sourcing ○ Logistics chain
10 minutes	• Raw Material Supplier Assessment: ○ Setting clear objectives and vision ○ Assessing identified supplier options ○ Inventory costs ○ Bargaining power ○ Quality & safety ○ Assessing risks
Module 2.2 Quality Assurance and Compliance	
10 minutes	• Understanding the quality standards applicable in solar milking machine ○ Offering system warranty ○ Offering solar panel warranty as per national standards ○ SPV Safety Qualification for Construction & Testing ○ Following ISO Standard 5707- Construction and Performance
10 minutes	• **Short Assessment on module 2**

4.7. Fishery Value Chain

Common Training Content Across DRE systems in Fishery sector

Based on the training agendas developed for each sector, common training content that cut across all DRE technologies, has been identified for stakeholders such as **farmers and product developers/service providers/rural entrepreneurs. For State Rural Livelihood Missions / State Nodal Agencies / State Government Departments, the training agendas developed are already DRE technology agnostic.** The details of the common training agendas is provided in section 4.8

Table 5: Common Training Content across DRE systems in fishery value chain

Training Gap Category	Training Gap	Demand Group of stakeholders	Training Module Content

Awareness Enhancement	**Lack of understanding on use of DRE solutions for inland fish farming**
	• Various DRE solutions available for fish farming for increasing quality and productivity
	• Powering of equipment like pumps and solar aerators with solar panels
	• Protecting DRE systems from theft / stealing / robbery
		• Farmers
		• Rural Entrepreneurs
			• Introduction to the basic fisheries value chain and usage of DRE technologies in the chain
			• Explaining the various reasons of spoilage and methods of fish preservation such as imparting understanding around:
			  ○ Solar dryers
			  ○ Solar aeration
			• Examples of fish farming equipment that can be powered using solar panels
			  ○ Explaining its cost-effectiveness and reliability
			  ○ Ease of using solar-based fish farming equipment
			• Protecting solar panels from robbery

Technical Know-how (such as installation,	**Lack of understanding on sizing and Installation**	Farmers / FPOs	**Installation for inland fish farming** • Sizing of aerators for a particular size of tank/ pond

operations and maintenance)	• Choosing and sizing of aerators and pumps for specific size of inland fish farm • Installing DRE equipment in inland fish farm and its impact on cost of DRE system		• Sizing and choosing solar panels for powering aerators • Installation best practices for better system performance • System testing and commissioning

Guidance on upscaling business opportunities	**Less Understanding of technical specifications**
	• Which factors decide suitable size of solar pumps and solar aerators?
	• How to select the most suited vendor for installation of DRE systems?
	• Demand stimulation, especially with productive users
		• Farmers/FPOs	• Size of the array and its dependence on the power needed for the pump and aerators
			  ○ Water quality, ambient temperature, air requirement, etc.
			  ○ Estimating the cultivation demand
			  ○ Calculating the peak discharge
			  ○ Head requirements
			  ○ Impact on cost of the system
			• Availability of pump sizing tools that can be used
			  ○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE
			• Checking the sizing options with the vendor
			• Case study analysis (examples from different use cases in India)

	Securing Supply chain • Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. for procuring equipment • Raw material requirement and sourcing • Determining supplier evaluation criteria	• Service Providers, Product Developers, Rural Entrepreneurs	• Understanding the equipment required in the solar dryers and aerators • Have better understanding on the decisions from where to procure components or the finished product • Checklist for supplier evaluation criteria • Contact details of key players, manufacturers and distributors supplying

			the equipment and the components of solar pumps, solar dryer and aerators

Entrepreneurial skill development	**Project Management Techniques / Skills**
	• Optimizing the DRE system production process taking into account the existing technical equipment or to start a new investment
	• Talent management to scale-up the business
		• Service Providers, Product Developers, Rural Entrepreneurs	• How to ensure targeted supply
			• Targeting a specialized group of end-users with the DRE product
			• Talent Management
			  ○ Organizational restructuring for a start-up vs veteran
			  ▪ Hiring talent during the initial stage of business
			  ▪ Hiring specialized talent during business scaling up
			  ▪ Identify the need for hiring ground-level staff
			  ○ Defining right processes and organizational structures internally
			• Recognize transition points for enterprises

	Product branding and marketing
	• Use of proper marketing tools
	• After sales customer service
	• Support in development of pitch documents
		• Service Providers, Product Developers, Rural Entrepreneurs	• Market Assessment and Prioritization
			  ○ Understand the market to be serviced and map possible productive uses
			  ○ Assess potential of the identified productive uses
			  ○ Develop a framework for prioritizing among identified productive uses
			• Marketing Techniques and Planning
			  ○ Market Linkages (Backward and Forward Linkages) for the productive use

			○ Develop 4 Ps of Marketing (Product, Price, Place and Promotion) for the rural enterprise • Knowing your own product modalities
Training of trainers	• What are the opportunities for women to invest in DRE systems at the village level? • Lack of understanding of the potential role of local women as technicians / electricians in routine operation and maintenance of DRE systems	• SRLMs/SNAs	• Avenues of improving career development for women as rural entrepreneurs • Training women in data collection and data management for RE-based mini-grids • How to carry out routine operation and maintenance of DRE systems ○ How to repair motors in solar water pumps and aerators? • How to check wire connections, noise and vibration, bearing temperatures, leaks from the pump housing, leaks from pipe connections, cracks in pipes or hoses, discharge pressure, intake pressure and seal integrity in solar water pumps?
	Domain Skills • DRE equipment available within the fishery sector to increase productivity • Choosing the right DRE equipment and its specifications • Preventive and breakdown maintenance of DRE equipment for productive use • Capacitating local trainers to be able to install, assemble, and test solar PV systems and conduct	• State Government Departments, SRLMs, SNAs	• Understanding of system design, interconnection of battery wires, the safety aspect of the solar PV systems, operation and maintenance and troubleshooting • Understanding of system selection (from the one that is available in the market) from the theoretical design of the PV system. • Appropriate cable sizing and selection of cables from commercially available cable sizes in the market

	safety audits as a part of O&M of solar water pumping systems and solar aerators		• Electrical demand load analysis • Ensuring efficient energy utilization
	Training of local technicians • DRE application-based problems such as system design considerations, safety checks, fault identification	• State Government Departments, SRLMs, SNAs	• Ability to read and interpret technical parameters/ documentation • Identify necessary materials and tools (hand tools, machine tools and workshop equipment) • Check the circuit, equipment, panel as per drawing for functioning • Identifying and rectifying faults/ defects • Connect, test, undertake maintenance and disposal of solar batteries • Connect and test solar panel, charge controller, battery bank and inverter

	Soft Skills
	• Importance of soft skills and communication
	• Training delivery skills
		• State Government Departments, SRLMs, SNAs	• Developing interpersonal skills including:
			  ○ Pitching for a product
			  ○ How to convert new customers for the product
			• Efficient educational technologies and techniques to further improve the effectiveness of training

Financial aspects	• Lack of information around sources of funding available
	• No preliminary information on documentation required to avail loans from banks and other financial institutions
	• Lack on information on minimum investment required to start the business
		• Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	• Capacity development around sources of financing including:
			  ○ List of documents required
			  ○ Eligibility criteria
			  ○ Cost economics of DRE solutions
			• financial advantages, potential cost savings, and overall return on investment associated with the adoption of DRE solutions

			• various sources for procuring DRE solutions

Policy aspects	• Lack on information around government schemes, incentives and subsidies available for DRE solutions
	• Lack of understanding around availing benefits under the schemes, incentives and subsidies available for DRE solutions
	• Lack of information around the implementing agency to approach for information about the scheme / policy
	Documentation required to be submitted to avail scheme / policy benefits
		• Farmers, FPOs, Service Providers, Product Developers, Rural Entrepreneurs	• Capacity development around policy incentives and subsidies
			  ○ Applicable policy schemes, incentives, and subsidies
			  ○ Details of implementing agency
			  ○ Application process to avail scheme benefits
			• Appropriate channels for acquiring information on scheme guidelines, application process etc.

Specific Training Content for each type of DRE system

Some of the training agendas developed are specific for each technology type. They have been captured in the table below. The details of the common training agendas is provided in section 4.9.

Table 6 DRE system specific training modules developed in fishery value chain

Training Topic	Applicable DRE solution	Gaps in training content	Demand Group of Stakeholders	Training Module Content
Awareness enhancement	Solar aerators	**Less Understanding of environmental and social benefits of solar aerators** • Maintaining and improving the water quality, preventing the water from stagnating, leading	• Farmers • FPOs	• Benefits of solar aeration • Types of solar aerators and their usage and capacity requirement in different water bodies

		to fewer algae, nuisance bacteria, and mosquitoes • Improved oxygen level and hence keeping the fish healthy for better economic value		• Case study analysis / survey results to support the case of solar aeration
	Solar dryers	**Less Understanding of environmental and social benefits of solar dryers** • Quality and hygiene as opposed to open drying • Improved nutritional conditions and hence, better economic value of produce in the market	• Farmers • FPOs	• Quality induced market pricing of produce • Possibility of expert of produce due to improved quality meeting quality requirements and testing criteria • Benefits of solar drying – avoidance of widespread fungal infection resulting from unexpected environmental conditions • Case study analysis / survey results to support the case of solar drying
	Solar cold storage	**Less Understanding of environmental and social of solar cold storages** • Enhanced food security during periods of low catch or market fluctuations • Reduced post-harvest losses in terms of better product quality	• Farmers • FPOs • Rural entrepreneurs	• Benefits of solar cold storage • Case study analysis / survey results to support the case of solar cold storage
Guidance on upscaling business opportunities	Solar aerators	**Less understanding of technical specifications** • Sizing of aerators for specific sizes of inland fish farm	• Product developers and service providers	• Operational model to support the adoption of solar aerators by smallholder fish farmers • service-based operational models, which offer the benefits of

		• Understanding the different types of aerators and their implications on energy consumption		equipment usage to fish farmers without the upfront capital cost

Entrepreneurial skill development	Solar dryers, solar pumps and solar cold storage	• Limited understanding of multi-seasonal uses of DRE technologies in fisheries to reduce the payback period
		• Return on investment, net savings of end users with respect to DRE solutions
			• Farmers
			• FPOs
				• Understanding multiple uses of DRE technologies in fisheries and its cost-benefits.
				• Business Planning: Preparation of Business Plan
				  ○ Need and utility of a Business Plan for a rural enterprise
				  ○ Components of a Business Plan
				  ○ Guidelines for preparing a Business Plan
				  ○ Calculating ROI, Net savings

4.8. Common Training Content across DRE systems in Fishery sector

Provided below are the details of the common training across DRE systems in the fishery sector. Overview of the training gaps and corresponding training agenda are provided in table 5.

Farmers

According to the training gaps identified for farmers in the fishery sector, it is suggested that **50-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Use of DRE systems in fishery value chain	
5 minutes	• Understanding the link between the introduction of DRE system and fish farming • Environmental and social benefits offered by DRE systems over conventional systems
Module 2.1 Financial Aspects	
5 minutes	• Assessing the financial viability of DRE technologies • Understanding payback period and annual operating costs • Affordable financial and credit facilities • Potential sources of funding
Module 2.2 Policy Aspects	
5 minutes	• Understanding DRE centric schemes, incentives, and subsidies • Process to avail the benefits of the scheme • Eligibility to participate in the scheme • Implementing agency • Necessary documentation for accessing the benefits offered by these policies • Appropriate channels for acquiring information and submitting necessary documents
10 minutes	**Short Assessment on Module 1 & 2**
Module 3.1 - Business Model Guidance	

10 minutes	• Understanding business models
	  ○ Different business models available in the market (e.g., capex model, EMI model, etc.)
	  ○ Investment required for buying and running the DRE systems in fisheries sector
	  ○ Knowledge dissemination on bankable business models where loan can be availed from the market
	• Understanding project benefits
	  ○ Awareness about payback period and ROI calculation
	  ○ Net savings of end users with respect to DRE solutions in fisheries sector

Module 4.1 – Carrying out basic operations and maintenance of the system	

10 minutes	• Solar PV panels
	  ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time
	  ○ Keeping the area around the water source and PV array neat and clean
	  ○ Inspecting PV modules for broken cells and discoloration

	○ Using recommended detergent with deionized water to clean PV modules ○ Using micro-fiber cloth to clean PV modules
Module 4.2 – Protecting DRE systems	
5 minutes	• Protecting DRE systems from theft / robbery ○ Use of solar panel lock ○ Securing solar panels through fences, barbed wires and alarm systems
10 minutes	**Short Assessment on Module 3 & 4**

Service Providers / Product Developers / Rural Entrepreneurs

According to the training gaps identified for service providers/product developers/rural entrepreneurs in the fishery sector, it is suggested that **55-minute self-paced e-learning training program could be developed**.

Module 1.1 – Marketing and Branding	
5 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ What is the future growth possibility? ○ Which business model will be the most suitable?
5 minutes	• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.
10 minutes	• Knowing the product modalities ○ Specifications, uses and limitations ○ O&M and troubleshooting to be managed locally ○ Availability of spare parts ○ Expected Life of DRE based solution used ○ Guarantee/ warrantee of the key DRE components
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing ○ Local aggregators for awareness
Module 1.2 - Institutional Structure	
10 minutes	• Types of legal structures that can be adopted by rural enterprise • Relevance of each of the structure for rural enterprise • Advantages and disadvantages of different structures
10 minutes	• **Short Assessment on Module 1**
Module 2.1 Financial Aspects	
5 minutes	• Evaluating payback period • Sources of funding • Documentation required for availing loans • Income projection based on business operations
Module 2.2 Policy Aspects	
5 minutes	• Understanding schemes, incentives, and subsidies for availing DRE solutions • Eligibility to participate in the scheme • Deadlines and validity of the scheme

	• Implementing agency • Necessary documentation for accessing the benefits offered by these policies • Appropriate channels for acquiring information and submitting necessary documents
10 minutes	• **Short Assessment on Module 2**

State Rural Livelihood Missions / State Nodal Agencies / State Government Departments

State Government Departments

The key training needs for this group of stakeholders is on awareness enhancement around the developing inclusive partnerships at the state level to establish linkages between DRE applications and income generation avenues for both farmers and private sector entrepreneurs. Module-wise detailed agenda for this category of stakeholders has been provided below. **It is suggested this could be a 50-minutes long self-paced training program.**

Module 1.1 – Creating public awareness to promote adoption of DRE livelihood applications in fisheries sector	

5 minutes	• Understanding the possibility of livelihood opportunities provided by DRE applications mentioned below in fisheries value chain
	  ○ Solar water pumps
	  ○ Solar cold storages
	  ○ Solar dryers
	  ○ Solar aerators
	• Avenues of adoption of DRE livelihood technologies among women and other marginalized groups such as Scheduled Caste and Scheduled Tribes

10 minutes	• Conducting demand assessment to map the needs of fish farmers with appropriate fit to DRE livelihood applications in fisheries value chain • Identifying focus areas for the introduction of DRE applications in fisheries sector in the State

5 minutes	• Engaging on platforms for enhancing awareness about DRE applications
	  ○ Local livelihood discussions
	  ○ Town-halls
	  ○ Supporting demonstration of such technologies at exhibitions

Module 1.2 – Identifying state level organizations for scaling-up adoption of DRE applications	

5 minutes	• Promoting self-help groups and local level organizations to implement DRE solutions on farmlands
	  ○ Designating SRLMs / SNAs as coordinating agencies for:
	  ▪ Training SHG women for providing after-sales and repair service at the local level
	  ▪ Facilitating in creating DRE-specific green jobs for women
	• SRLMs / SNAs as nodal agencies for supporting the effective implementation of DRE-based livelihood promotion in the fisheries sector in the state

15 minutes	• Establishing tie ups with academic institutions and foundations in the state for facilitating R&D in the DRE sector across the fisheries value chain
	  ○ Clearly setting the objectives of the partnership:
	  ▪ Identifying innovative DRE applications on farmland which could be cost-effective

	▪ Providing test-bedding sites such as labs and testing centres to safely trial their ideas and innovations by product developers ▪ Business acceleration support, including strategic advisory and networking sessions for product developers, service providers and farmers ▪ Establishing the linkage between DRE applicable and income security & livelihood enhancement for fish farmers • Serving as a knowledge portal for DRE resources including policy best practices, data, and analysis tools and share the same with product developers. Service providers and rural entrepreneurs in the state
10 minutes	• **Short Assessment on Module 1**

SRLMs / SNAs

The key training needs for this group of stakeholders is training of trainers who can be capacitated to deliver trainings to the farmers on different technical and financial aspects of DRE solutions in agriculture value chain. Module-wise detailed agenda for this category of stakeholders has been provided below. **It is suggested this could be a 55-minutes long self-paced training program.**

Module 1.1 – Development of domain skills	
15 minutes	• Ability to read and interpret technical parameters/ documentation • Developing ability to disseminate knowledge around: o Identifying necessary materials and tools (hand tools, machine tools and workshop equipment) o Checking the circuit, equipment, panel as per drawing for functioning o Connecting, testing and undertake maintenance and disposal of solar batteries o Connecting and testing solar panel, charge controller, battery bank and inverter
10 minutes	• Technical aspects: o Basic principles of direct current and alternating current o Measurements of physical quantitates, converter and inverter circuits o Electrical installation of the solar systems o Installation area and construction
Module 1.2 –Development of soft skills of trainers	
20 minutes	• Developing interpersonal skills including: o Developing networking skills o Confidence building o Training delivery skills Pitching for a product o How to convert new customers for the product o Efficient educational techniques that can be used to further improve the effectiveness of training o Gathering effective feedback from trainees
10 minutes	• **Short Assessment on Module 1**

4.9. Specific Training Content for each type of DRE system Content of e-learning material for Different Stakeholders

Provided below are the details of the common training across DRE systems in the fishery sector. Overview of the training gaps and corresponding training agenda are provided in table 6.

Farmers

The key DRE-specific training gaps identified for the farmers in the fisheries value chain include the need for awareness enhancement, technical know-how of the DRE systems and guidance around the business models. Module-wise detailed agenda for the training program for each measured DRE technology is presented below:

Solar Aerators

Level 1

According to the training gaps identified for farmers in the fisheries sector, for solar aerators training at Level 1, it is suggested that **a 80-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Use of solar aerators for fishponds	

5 minutes	• Understanding the link between the introduction of solar aerators and fish cultivation
	  ○ Increasing the dissolved oxygen levels in the fish farm
	  ○ Increasing the productivity
	  ○ Improving the produce quality
	  ○ Reducing the formation of algae, unwanted bacteria etc. Introduction to solar aerators and its uses in fish farming and cultivation
	• Types of solar aerators
	  ○ Vertical Pump Aerators
	  ○ Pump Sprayers Aerators
	  ○ Propeller-aspirator pumps
	  ○ Paddle wheel aerators
	  ○ Diffused-air systems

5 minutes	• Environmental and social benefits offered by solar powered aerators over conventional aerators

5 minutes	• Fish breeding after solar PV installation on ponds
	  ○ Benefits of solar panels on
	  ▪ water quality
	  ▪ presence of algae, phosphorus and unwanted bacteria
	  ▪ removal of foul odors from a pond

Module 1.2 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable solar aerators
5 minutes	• Vendor's understanding of structural requirements (e.g., weight, wind, solar radiation, etc.)

10 minutes	• Availability of quality management plan with the vendor covering:
	  ○ System equipment testing
	  ○ Inspection protocol
	  ○ Design best practices

	○ Safety policies
10 minutes	• **Short Assessment on Module 1**
Module 2.1 – Sizing of solar aerators	
10 minutes	• Proper aeration system selection is based on several factors including the following: ○ Fish tank/ pond size ○ Fish tank/ pond depth ○ Power source availability ○ Aeration type (i.e., emergency or continuous) ○ Aerator efficiency ○ Water quality, ambient temperature, air requirement, etc. ○ Impact on cost of the system • Case study analysis (examples from different use cases in India)
Module 3.1 - Business Model Guidance	
10 minutes	• Understanding business models ○ Different business models available in the market (e.g., capex model, EMI model, etc.) ○ Investment required for buying and running the aerators powered from solar ○ Need for community ownership model practices ○ Knowledge dissemination on bankable business models where loan can be availed from the market • Understanding project benefits ○ Awareness about payback period and ROI calculation ○ Net savings of end users with respect to DRE solutions
Module 4.1 – Protecting solar aerator	
5 minutes	• Protecting solar aerators from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm
10 minutes	• **Short Assessment on Module 2,3 and 4**

Level 2

At this level, specific technical parameters to be considered for installing and maintaining solar aerators on fishponds are considered for developing training modules. It is suggested that **a 40-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – System sizing and installation	
15 minutes	○ Sizing of solar powered aerators ○ Selection of aeration system ○ Technical Assessment including power requirement by aerators ○ Optimization of aerators requirement and load assessment ○ Solar panel sizing for powering the aerators ○ Selection of site and site assessment ○ No of panels required for a solar aerator. ○ Power requirement of solar panels.

	○ Efficiency of solar PV Panels. ○ PV array sizing, selection of inverter and BOS component design
Module 1.2 – Carrying out basic operations and maintenance of the system	
15 minutes	• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Inspecting PV modules for broken cells and discoloration ○ Using water with hardness less than 75ppm to clean the PV modules before and after solar time ○ Using microfiber cloth to remove stubborn dirt and rinsing with plenty of water
10 minutes	• System components ○ Cleaning of drying surface ○ Cleaning the UV sheet (where applicable) and tray with a clean dump cloth ○ Cleaning the mesh after every use ○ Performing visual checks of the condition of the aerator components ○ Checking that the trays are not torn on the mesh ○ Checking that the mesh liners are not blocked
10 minutes	• **Short Assessment on Module 1**

Solar Dryers

Level 1

According to the training gaps identified for farmers in the fishery sector, for solar dryers training at Level 1, it is suggested that **80-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Understanding basics of solar dryer and it's uses	
10 minutes	• Introduction to the basic fisheries value chain • Types of solar dryers available in the market: ○ direct drying (solar box dryer) ○ indirect drying (solar cabinet dryer) ○ mixed mode drying (solar tunnel dryer) ○ hybrid drying (hybrid solar cabinet dryer) • Explaining the usage of solar dryer in the fisheries value chain
10 minutes	• Moisture content in the various sea produce and the type of solar dryer suitable basis the composition • Understanding the key parts of solar dryers ○ Solar collector ○ Drying chamber ○ Absorber ○ Ventilation holes ○ Any other key part depending on the type of solar dryer
Module 1.2 – Assessment of parameters for making vendor selection	
10 minutes	• The services and technologies being offered by vendor • Understanding of the aftersales service and O&M support provided by the vendor

	• Work performance experience of vendor to determine its ability to install safe and reliable solar dryers • Vendor's understanding of structural requirements (e.g., weight, wind, solar radiation, etc.)
10 minutes	• **Short Assessment on Module 1**
Module 2.1 –Understanding the performance parameters of solar dryers	
5 minutes	• Understanding the key components of a solar dryer – solar panels, cover, design, air flow, stand, absorber tray, etc.)

5 minutes	• Moisture removal rate of solar dryers
	• Baseline moisture content of sea foods
	  ○ More than 75% (Ex. Shrimp has moisture >80%, fishes>75%)
	• Moisture content after solar drying
	  ○ Typically, around 10-15%

5 minutes	• What is the right drying efficiency? • What should be the drying rate
Module 2.2 – Understanding the business models for use of solar dryers	
10 minutes	• Introduction to different business models for solar dryers • Major Schemes covering subsidy and providing incentives for solar dryers • Investment required for buying and running the solar dryers • Introduction to the cost benefit analysis, RoI and payback period • Ways of financing the solar dryers
Module 2.3– Protecting DRE systems	

5 minutes	• Protecting solar dryers from theft / robbery
	  ○ Use of solar panel lock
	  ○ Use of fence / barbed wires
	  ○ Use of pop rivets / blind rivets / to enhance security
	  ○ Gluing, Welding or Sealing the Panels / linking racks
	  ○ Use of alarm

10 minutes	• **Short Assessment on Module 2**

Level 2

At this level, specific technical parameters to be considered for installing and maintaining solar dryers on fish-ponds are considered for developing training modules. It is suggested that **a 40-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Fabrication of Solar Dryer	

15 minutes	• Understanding solar dryer components
	  ○ Type of glass used and it's placement
	  ○ Types of material for stand
	  ○ Understanding of different designs of solar dryers
	  ○ Placement of solar dryer for maximum radiation

10 minutes	• System components
	  ○ Cleaning of drying surface
	  ○ Cleaning the UV sheet (where applicable) and tray with a clean dump cloth
	  ○ Cleaning the mesh after every use
	  ○ Performing visual checks of the condition of the dryer components
	  ○ Checking that the trays are not torn on the mesh

	○ Checking that the mesh liners are not blocked ○
5 minutes	• O&M of solar dryer ○ Frequency of O&M ○ Role of vendor selection for claiming warranty
10 minutes	• **Short Assessment on Module 1**

Solar Cold Storage

Level 1

According to the training gaps identified for farmers in the fishery sector, for solar cold storage training at Level 1, it is suggested that **80-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Use of solar cold storage solutions for inland fish farming	
5 minutes	• Understanding the link between the introduction of solar cold storage and productivity, livelihoods and food security • Types of solar cold storages ○ Solar cold storage with battery storage ○ Solar cold storage with phase change material (PCM) storage ○ Solar cold storage with thermal storage
5 minutes	• Environmental and social benefits offered by solar cold storage solutions
Module 1.2 – Assessment of parameters for making vendor selection	
5 minutes	• Work performance experience of vendor to determine its ability to install safe and reliable solar cold storage
5 minutes	• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)
5 minutes	• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies
5 minutes	• **Short Assessment on Module 1**
Module 2.1 – Installation of solar cold storages	
15 minutes	• Pre-installation ○ Site preparation document/ design (kind of civil work required) ○ Understanding the BoM and the components of the cold storage ○ Installation best practices • During Installation ○ Understand the roles of tech vendors and other technical support ○ Understand the warranties given and how & when they can be availed ○ Dos and don'ts ○ Safety components and explaining what needs to be done in these cases (fire, thunder storm, overcast, flood, etc.) • Post Installation ○ Capturing problems and mitigation plan

	○ Regular maintenance guide of the system (cleaning, regular check-ups, etc.)- daily, weekly, monthly
Module 2.2 - Business Model Guidance	
15 minutes	• Understanding business models ○ Different business models available in the market (e.g., capex model, EMI model, etc.) ○ Need for community ownership model practices ○ Knowledge dissemination on bankable business models where loan can be availed from the market • Understanding project benefits ○ Awareness about payback period and ROI calculation • Net savings of end users with respect to DRE solutions
Module 3.1– Protecting solar cold storage systems	
5 minutes	• Dos and Don'ts while working with batteries ○ Location for battery installation ○ Combining and connecting batteries ○ Acid spill cleanup material to be readily available ○ Verifying electrolyte levels (adding distilled water as necessary) ○ Setting up battery charge voltage/current limit ○ Checking indicator LEDs or LCD icons on charge controller
5 minutes	• Protecting solar cold storage systems from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm
10 minutes	• **Short Assessment on Module 2 & 3**

Level 2

At this level, specific parameters to be considered for solar dryers on fishponds are considered for developing training modules. It is suggested that **a 55-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Solar Cold Storage Sizing and Installation	
15 minutes	• Site selection and preparation • Electrical and plumbing connections. • Compliance with safety and hygiene standards • Installation best practices- pictorial representation of the components and on other best practices in visual format • Quality of installation: earthing, Thunder arrestor (where is it installed), MMS quality and panel placement and tilt angle, and site preparation • Documents (warranty card, bills, service records, other FAQs and documents on site videos, posters, etc.)
Module 1.2 – Carrying out basic operations and maintenance of the system	
15 minutes	• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Inspecting PV modules for broken cells and discoloration

	○ Using water with hardness less than 75ppm to clean the PV modules before and after solar time ○ Using microfiber cloth to remove stubborn dirt and rinsing with plenty of water
15 minutes	• Electrical items ○ Cleaning – daily basis (spillage should be immediately cleaned) ○ Checking the cold room temperature at locations appropriate for the stored items ○ Checking evaporator for ice build-up and defrost function is working ○ Checking compressors for unexpected vibration and oil leakage ○ Checking if door is airtight and if there is any leakage, cracks or wear and tear in the door
10 minutes	• **Short Assessment on Module 1**

Solar Water Pumps

Level 1

According to the training gaps identified for farmers in the fishery sector, for solar water pumps training at Level 1, it is suggested that **75 minutes long self-paced e-learning training program could be developed**.

Module 1.1 – Use of solar water pumps on fish farms	
5 minutes	• Understanding the link between the introduction of solar water pumps and productivity and livelihood development • Types of solar water pumps ○ AC / DC ○ Submersible / surface pumps ○ High volume of water pumping requirement in aquaculture
5 minutes	• Economic, environmental and social benefits offered by solar water pump solutions vs diesel pumps ○ Cost-effective offered by solar water pumps in the long-run and in terms of reduced production cost ○ Growth potential and profitability options ○ Ease of shifting from diesel-based pumps to solar based water pumps
5 minutes	• **Short Assessment on Module 1**
Module 2.1 – Effective installation of solar water pumps in hilly areas	
15 minutes	• Whether to use a submersible pump where the water is collected in the collection tank or a surface pump where water is directly used to fill the pond ○ Maximum pump head ○ Discharge rate • Deciding the capacity of storage tank based on the desired number of days of autonomy • Impact on insurance costs
5 minutes	• Anchoring solar panels to prevent collapse or movement in hilly areas • Desired tilt of solar panels
Module 2.2 – Sizing of solar water pumps	
10 minutes	• Size of the array and its dependence on the power needed for the pump

	○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate ○ Estimating the irrigation demand ○ Calculating the peak discharge ○ Head requirements ○ Impact on cost of the system
5 minutes	• Availability of pump sizing tools that can be used ○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE ○ Checking the sizing options with the vendor
5 minutes	• Case study analysis (examples from different use cases in India)
Module 3.1 – Business model guidance	
10 minutes	• Existing business models in the market based on the value proposition of supplying water to smallholder farmers for fish production and breeding ○ Capex model ○ Water as a service model ○ Lease to own model / staggered payment model • Parameters to assess suitability of existing business models in the farmers' context ○ Analysis of potential gains and benefits to farmers from each model ○ Suitability mapping (biophysical factors, water availability, infrastructure, etc.) ○ Economic sustainability ▪ Productivity analysis (fish, shrimp, prawns, etc.) ▪ Return on investment ▪ Payback period
10 minutes	• **Short Assessment on Module 2 & 3**

Level 2

At this level, specific technical parameters to be considered for installing and maintaining solar water pumps for fishing sector are considered for developing training modules. It is suggested that **50-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Water demand assessment for selecting a solar water pump	
10 minutes	• Estimating daily water demand in each month based on end application ○ Considering variation of water demand based on end application ○ Considering water supply needs in the future
10 minutes	• Water distribution requirement assessment ○ Considering existing storage facility for short-term and long-term storage ○ Considering the water delivery points based on application and purpose ○ Avoiding more joints and elbows in pipelines ○ Selecting an appropriate and effective distribution system for fish farming, aquaculture purposes, etc.
Module 1.2 – Carrying out basic operations and maintenance of the system	
15 minutes	• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Inspecting PV modules for broken cells and discoloration

	○ Using water with hardness less than 75ppm to clean the PV modules before and after solar time ○ Using microfiber cloth to remove stubborn dirt and rinsing with plenty of water
5 minutes	• Electrical items ○ Visually checking all conduit and wire insulation for damage ○ Checking for loose, broken, corroded, or burnt wiring connections
10 minutes	• **Short Assessment on Module 1**

Service Providers / Product Developers / Rural Entrepreneurs

Solar Aerators

Level 1

According to the training gaps identified for service providers/ product developers/rural entrepreneurs in the fishery sector, for solar aerators training at Level 1, it is suggested that **70 minutes long self-paced e-learning training program could be developed.**

Module 1.1 – Economic Benefits of solar aerators	
10 minutes	• Understanding Business models ○ Investment required for buying and running the aerators powered from solar ○ Self-investment/ RESCO model for solar aerators ○ Aggregation based business model for group of farmers/ women self-help groups
5 minutes	Understanding savings ○ Understanding cost benefit analysis using solar power ○ Understanding energy saving based on future projection
5 minutes	Understanding project economics ○ Comparative analysis of profitability with respect to conventional sources ○ Breakeven Analysis of the rural enterprise to understand profitability ○ Estimation of NPV and IRR and financial viability of the project
Module 1.2 – Marketing and Branding	
10 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need with conventional methods and what price they are paying? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer?
5 minutes	• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ O&M and troubleshooting to be managed locally ○ Availability of spare parts ○ Expected Life of DRE based solution used

	○ Guarantee/ warrantee of the key DRE components
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing ○ Local aggregators for awareness
Module 1.3 - Institutional Structure	
10 minutes	• Types of legal structures that can be adopted by rural enterprise • Relevance of each of the structure for rural enterprise • Advantages and disadvantages of different structures
10 minutes	• **Short Assessment on Module 1**

Level 2

According to the training gaps identified for service providers/ product developers/rural entrepreneurs in the fishery sector, for solar aerators training at Level 2, it is suggested that **55 minutes long self-paced e-learning training program could be developed**

Module 1.1 – Designing a solar powered aerator	
10 minutes	• PV system sizing /installation ○ Site assessment and feasibility check. ○ No of PV panels required ○ New technology such as mono perc/ bifacial PV module selection for more efficiency ○ Calculate battery energy storage and autonomy requirement – Thermal battery or electrical battery ○ PV array sizing, selection of inverter and BOS component design ○ DC and AC cable sizing in line with voltage drop less than 2%
Module 1.2 Understanding supply chain considerations	
5 minutes	• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Raw material requirement and sourcing ○ Logistics chain ○ Technology reliability trends
10 minutes	• Supplier Assessment: ○ Setting clear objectives and vision ○ Assessing identified supplier options ○ Inventory costs ○ Bargaining power ○ Quality & safety ○ Assessing risks ○ Agility including vendor's ability to respond to changes in demand with respect to volume and variety
10 minutes	• Development of Supplier Selection & Ranking System: ○ Organization and operational background ○ Financial strength - market standing and prospects, credit rating, clientele, etc. ○ Product development such as product range, R&D, Quality management, degree of automation, etc.

	○ Manufacturing process ○ Cost competitiveness in the market ○ After-sales support ○ Logistics tie-ups
Module 2.1 Market Assessment and Prioritization	
10 minutes	• Understand the market to be serviced and map possible geographies • Assess potential of the identified productive uses • Market Linkages (Backward and Forward Linkages) for the productive use • Develop 4 Ps of Marketing (Product, Price, Place and Promotion) for the rural enterprise • Developing a Marketing Strategy • Need and utility of a Business Plan for a rural enterprise • Components of a Business Plan and Guidelines for preparing a Business Plan
10 minutes	• **Short Assessment on Module 1 & 2**

Solar Dryers

Level 1

According to the training gaps identified for service providers in the fisheries sector, for solar dryers training at Level 1, it is suggested that **70-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Understanding basics of solar dryer and it's market	
10 mins	• Introduction to the basic fisheries value chain • Types of solar dryers available in the market: ○ direct drying (solar box dryer) ○ indirect drying (solar cabinet dryer) ○ mixed mode drying (solar tunnel dryer) ○ hybrid drying (hybrid solar cabinet dryer) • Explaining the usage of solar dryer in the fisheries value chain
Module 1.2 –Economic benefits of solar dryers	
10 minutes	• Understanding Business models ○ Investment required for buying and running the solar dryers ○ Aggregation based business model for group of farmers/ women self-help groups
5 minutes	Understanding savings ○ Understanding cost benefit analysis using solar power ○ Understanding energy saving based on future projection
10 minutes	**Short Assessment on module 1**
Module 2.1 – Marketing and Branding	
10 minutes	• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need with conventional methods and what price they are paying? ○ What is the future growth possibility? ○ Which business model will be the most suitable? • What are the objections and clarifications received from the customer?

5 minutes	• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.

10 minutes	• Knowing your own product modalities
	  ○ Specifications, uses and limitations
	  ○ O&M and troubleshooting to be managed locally
	  ○ Availability of spare parts
	  ○ Expected Life of DRE based solution used
	  ○ Guarantee/ warrantee of the key DRE components

10 minutes	• **Short Assessment on module 2**

Level 2

At this level, specific technical parameters to be considered for installing and maintaining solar dryers on fish-ponds are considered for developing training modules. It is suggested that **a 40-minute-long self-paced e-learning training program could be developed**.

Module 1.1 Market Assessment and Prioritization	
10 minutes	• Understand the market to be serviced and map possible geographies • Assess potential of the identified productive uses • Market Linkages (Backward and Forward Linkages) for the productive use • Need and development of Marketing Strategy • Need and utility of a Business Plan for a rural enterprise • Components of a Business Plan and Guidelines for preparing a Business Plan
Module 1.2 - Communication skills	

10 minutes	• Developing interpersonal skills:
	  ○ Effective communication
	  ○ Pitching for a product
	  ○ How to convert new customers for the product
	• Efficient educational technologies and techniques to further improve the effectiveness of training
	• Capacitating local trainers to be able to install, assemble, and test solar PV systems

Module 2.1 – Business Models and Financing of Solar Dryers	

10 minutes	• Understanding Business models
	  ○ Investment required for buying and running the solar dryers
	  ○ Aggregation based business model for group of farmers/ women self-help groups
	• Understanding project economics
	  ○ Comparative analysis of profitability with respect to conventional sources
	  ○ Breakeven Analysis of the rural enterprise to understand profitability
	  ○ Estimation of NPV and IRR and financial viability of the project

10 minutes	• **Short Assessment on module 1 &2**

Solar Cold Storage

Level 1

According to the training gaps identified for farmers in the fishery sector, for solar cold storage training at Level 1, it is suggested that **45-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Designing a solar cold storage	
15 minutes	• PV system sizing and design for cold storage ○ Knowing the exact purpose and cooling requirement of the cold storage by potential ○ Assessment of cooling load and auxiliary electricity demand ○ Solar resource assessment (including 'no sun' equivalent days) ○ System configuration ○ Calculate storage and autonomy requirement – Thermal (PCM) or Battery ○ PV array sizing, selection of compressor driver / inverter and BOS component design
Module 1.2 – Economic Benefits of solar cold storage	
10 minutes	• Understanding Business models ○ Investment required for buying and running the aerators powered from solar ○ Self-investment/ RESCO model for solar aerators • Aggregation based business model for group of farmers/ women self-help groups
5 minutes	• Understanding savings • Understanding cost benefit analysis using solar power • Understanding energy saving based on future projection
5 minutes	• Understanding project economics ○ Comparative analysis of profitability with respect to conventional sources ○ Breakeven Analysis of the rural enterprise to understand profitability ○ Estimation of NPV and IRR and financial viability of the project
10 minutes	• **Short Assessment on module 1**

Level 2

Based on the specific training gaps identified, for level2, the following training modules have been developed. It is suggested that **a 40-minute-long self-paced e-learning training program could be developed**.

Module 1.1 Market Assessment and Prioritization	
10 minutes	• Understand the market to be serviced and map possible geographies • Assess potential of the identified productive uses • Market Linkages (Backward and Forward Linkages) for the productive use • Develop 4 Ps of Marketing (Product, Price, Place and Promotion) for the rural enterprise • Developing a Marketing Strategy • Need and utility of a Business Plan for a rural enterprise • Components of a Business Plan and Guidelines for preparing a Business Plan
Module 1.2 - Communication skills	
10 minutes	• Developing interpersonal skills: ○ Effective communication

	○ Pitching for a product ○ How to convert new customers for the product • Efficient educational technologies and techniques to further improve the effectiveness of training
Module 1.3 – Solar Cold Storage Branding	
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally? ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee
10 minutes	• **Short Assessment on module 1**

Solar Water Pumps

Level 1

At this level, specific parameters to be considered for serving the market for solar pumps and business scale up in the fishing sector are considered for developing training modules. It is suggested that **70-minute-long self-paced e-learning training program could be developed**.

Module 1.1 – Sizing of solar water pumps	
10 minutes	• Size of the array and its dependence on the power needed for the pump ○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate ○ Estimating the irrigation demand ○ Calculating the peak discharge ○ Head requirements ○ Impact on cost of the system
5 minutes	• Availability of pump sizing tools that can be used ○ Examples of pump sizing tools available e.g., SIP Sizing Tool by MNRE ○ Checking the sizing options with the vendor
Module 2.1 – Serving the market needs	
10 minutes	• Prioritize solar pumps in areas where: ○ Farmers lack energy access for fish farming ○ Avoiding areas where groundwater tables are low or declining • Prioritizing support for pump sizes that meet small and marginal farmers' needs, avoiding both oversizing and under-sizing
5 minutes	• Address barriers to participation: ○ Promoting ownership models, such as community and entrepreneurship models ○ Building demand for pumps through education, awareness, and engagement ○ Enhancing water use efficiency by bundling solar pumps with other fish farming practices
Module 2.2 – Solar Water Pump Marketing and Branding	
10 minutes	• Understanding customer need

	○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
10 minutes	• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally? ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee
5 minutes	• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural retailers, local youth, RE mascots, etc.
5 minutes	• Deploying effective marketing techniques ○ Word-of-mouth Marketing ○ Leveraging local roadshows / festivals / melas ○ Identifying evangelists / RE mascots who can be distributors
10 minutes	• **Short Assessment on module 1 & 2**

5. Assessment of Duration and Cost for Common e-learning Training Modules

The paramount focus of designing the training courses has been to provide an avenue for the different stakeholders to carry out self-paced learning with the access to e-learning training material. To facilitate sustainable e-learning of the identified stakeholders, a combination of one or more of the following modes of self-paced trainings has been suggested:

- Descriptive presentations
- Scenario-based presentations
- Interactive story-based / case study videos
- Informative videos
- Doodle videos – Description
- Audio-visual clips – Description (Voice-over)

A brief description of the aforementioned modes of self -paced trainings is shown below

Descriptive presentations: A descriptive presentation refers to a type of communication or visual representation that aims to provide a detailed and comprehensive explanation or portrayal of a subject, topic, data set, or concept. It makes use of visual aids such as charts, graphs, and images to enhance understanding. Descriptive presentations are characterized by their emphasis on detailed and informative content, which distinguishes them from other types of presentations.

Scenario-based presentations: A scenario-based presentation is a type of presentation that is structured around the presentation of scenarios or hypothetical situations to convey information, engage the audience, or facilitate learning. In this type of presentation, scenarios or fictional situations are used as the primary means of presenting information, demonstrating concepts, or guiding decision-making.

Interactive story-based / case study videos: Interactive story-based case study videos are multimedia presentations that combine storytelling, real-life case studies, and interactive elements to engage the audience and facilitate learning or problem-solving. These videos are designed to provide a rich and immersive experience for viewers by presenting a narrative-driven exploration of a specific case or scenario. The core of these videos is a compelling narrative or story that unfolds as the video progresses. The case study is presented in detail, allowing viewers to analyze the situation and consider various options.

Informative videos: Informative videos are audiovisual content created with the primary purpose of providing viewers with knowledge, facts, insights, or explanations about a specific subject, topic, concept, event, or issue. These videos are designed to educate, inform, and raise awareness by presenting information in a clear, engaging, and easily digestible manner. Here, the content is delivered in a video format, which can include a combination of live-action scenes, animations, graphics, and voiceovers.

Doodle videos: Doodle videos, also known as whiteboard animation videos or sketch videos, are a type of animated video where drawings or illustrations are used to convey a message. These videos typically feature a "doodler" who draws images, diagrams, or text elements in real-time or in a time-lapse fashion, while a voiceover narration or music complements the visuals to convey a message, tell a story, or explain a concept.

Audio-visual clips: Audiovisual clips, often abbreviated as AV clips, refer to short segments of multimedia content that combine both audio and visual elements. These clips can encompass various types of media, including video, animation, music, spoken narration, and sound effects, and they are designed to communicate a message to an audience through a combination of sight and sound. AV clips are typically relatively short in duration, ranging from a few seconds to a few minutes.

Based on the common training agenda developed stakeholder-wise for each sector, duration and overall cost for content development and designing the training program has been identified. The same has been presented below:

5.1. Agriculture Sector

Farmers

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 3,15,000 – 4,20,000.**

Table 7: Duration and Cost for common e-learning Training Modules for farmers in agriculture sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Use of DRE solutions on farmland				
• Understanding the link between the introduction of DRE technology and agricultural productivity, livelihoods and food security • Environmental and social benefits offered by DRE solutions.	5 minutes	Video	INR 3,50,000 – 4,00,000	INR 40,000 – 50,000
Module 1.2 – Assessment of parameters for making vendor selection				
Work performance experience of vendor to determine its ability to install safe and reliable DRE systems on farmland	5 minutes	Audio-visual		INR 20,000 – 30,000
Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Video		INR 40,000 – 50,000
Availability of quality management plan with the vendor covering: • System equipment testing • Inspection protocol • Design best practices • Safety policies	5 minutes	Presentation		INR 15,000 – 20,000
Module – 2.1 Financial Aspects				
• Exploring funding options ○ Available credit options or source of funding ○ Eligibility criteria	5 minutes	Audio-visual		INR 20,000-30,000

○ Necessary documentation needed to secure loans from banks and other financial institutions				
• Understanding cost economics of DRE systems ○ financial advantages, potential cost savings, and overall return on investment ○ Understanding financial implications of DRE systems over conventional alternatives	10 minutes	Presentation		INR 30,000-40,000
Module 2.2 – Policy Aspects				
Understanding policy framework that supports DRE uptake ○ Schemes/policies supporting DRE technologies ○ Implementing agency ○ Benefits of the policies/schemes ○ Necessary documentation for accessing the benefits offered by these policies ○ Application process for availing scheme benefits ○ Appropriate channels for acquiring information and submitting necessary documents stands	10 minutes	Presentation		INR 30,000-40,000
Module 3.1 – Carrying out basic operations and maintenance of the system				
• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ Using only mild, non-abrasive, non-caustic detergent with deionized water to clean PV modules. ○ Using micro-fiber cloth to clean PV modules	10 minutes	Presentation		INR 60,000 – 80,000
• Electrical items ○ Visually checking all conduit and wire insulation for damage. ○ Checking for loose, broken, corroded, or burnt wiring connections	5 minutes	Video		INR 40,000 – 50,000
Module 3.2 – Protecting DRE systems on farmland				

• Protecting DRE systems from theft / robbery ○ Use of solar panel lock. ○ Securing solar panels through fences, barbed wires and alarm systems	5 minutes	Video		INR 40,000 – 50,000
TOTAL COST			**INR 3,50,000 – 4,00,000**	**INR 3,15,000 – 4,20,000**

Service Providers / Product Developers / Rural Entrepreneurs

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,50,000 – 3,30,000.**

Table 8: Duration and Cost for common e-learning Training Modules for Service providers/product developers/rural entrepreneur in agriculture sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 –Marketing and Branding				
• Understanding customer need ○ Objective of the customer – what is the specific need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 30,000 – 40,000
• Knowing your own product modalities ○ After sales service ○ Can O&M and troubleshooting be managed locally? ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee	10 minutes	Video		INR 80,000 – 100,000
• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural	5 minutes	Audio visual		INR 20,000 – 30,000

retailers, local youth, RE mascots, etc.				

• Deploying effective marketing techniques
  ○ Word-of-mouth Marketing
  ○ Leveraging local roadshows / festivals / melas
  ○ Identifying evangelists / RE mascots who can be distributors
	5 minutes	Video		INR 40,000 – 50,000

Module 2.1 Financial Aspects				
• Exploring funding avenues • Available credit options or source of funding • Eligibility criteria • Necessary documentation needed to secure loans from banks and other financial institutions	5 minutes	Audio visual		INR 20,000 – 30,000

• Understanding cost economics of DRE systems
  ○ financial advantages, potential cost savings, and overall return on investment
  ○ assessing the payback period
  ○ projecting income based on business activities
• Understanding financial implications of DRE systems over conventional alternatives
	10 minutes	Presentation		INR 30,000 – 40,000

Module 2.2 Policy Aspects				

• Understanding policy framework that supports DRE uptake
  ○ Schemes/policies supporting DRE technologies
  ○ Implementing agency
  ○ Benefits of the policies/schemes
  ○ Necessary documentation for accessing the benefits offered by these policies
  ○ Application process for availing scheme benefits
  ○ Appropriate channels for acquiring information and submitting necessary documents
	10 minutes	Presentation		INR 30,000 – 40,000

TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,50,000 – 3,30,000**

State Rural Livelihood Missions / State Nodal Agencies / State Government Departments

State Government Departments

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,75,000 – 4,00,000 and cost of designing the training is INR 2,35,000 – 3,10,000.**

Table 9: Duration and Cost for Common e-learning Training Modules for State Government Departments in agriculture sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Creating public awareness to promote adoption of DRE livelihood applications in agriculture sector				

• Understanding the possibility of livelihood opportunities provided by DRE applications mentioned below in agriculture value chain
  ○ Solar water pumps
  ○ Solar cold storages
  ○ Solar dryers
  ○ RE-based mini-grids
• Avenues of adoption of DRE livelihood technologies among women and other marginalized groups such as Scheduled Caste and Scheduled Tribes
	5 minutes	Video	INR 3,75,000 – 4,00,000	INR 40,000 – 50,000

• Conducting demand assessment to map the needs of farmers with appropriate fit to DRE livelihood applications in agriculture value chain • Identifying focus areas for the introduction of DRE applications in agriculture sector in the State	10 minutes	Presentation		INR 60,000 – 80,000

• Engaging on platforms for enhancing awareness about DRE applications
  ○ Local livelihood summits
  ○ Town-halls
  ○ Supporting demonstration of such technologies at trade fairs and exhibitions
	5 minutes	Audio-visual		INR 20,000 – 30,000

Module 1.2 – Identifying state level organizations for scaling-up adoption of DRE applications				
• Promoting self-help groups and local level organizations to implement DRE solutions on farmlands	5 minutes	Video		INR 40,000 – 50,000

○ Designating SRLMs / SNAs as coordinating agencies for: ▪ Training SHG women for providing after-sales and repair service at the local level ▪ Facilitating in creating DRE-specific green jobs for women ○ SRLMs / SNAs as nodal agencies for supporting the effective implementation of DRE-based livelihood promotion in the agriculture sector in the state				
Establishing tie ups with academic institutions and foundations in the state for facilitating R&D in the DRE sector across the agriculture value chain • Clearly setting the objectives of the partnership: ○ Identifying innovative DRE applications on farmland which could be cost-effective ○ Providing test-bedding sites such as labs and testing centres to safely trial their ideas and innovations by product developers ○ Business acceleration support, including strategic advisory and networking sessions for product developers, service providers and farmers ○ Establishing the linkage between DRE applicable and income security & livelihood enhancement for farmers • Serving as a knowledge portal for DRE resources including policy best practices, data, and analysis tools and share the same with product developers. Service providers and rural entrepreneurs in the state	15 minutes	Presentation		INR 75,000 – 1,00,000
TOTAL COST			**INR 3,75,000 – 4,00,000**	**INR 2,35,000 – 3,10,000**

SRLMs / SNAs

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 1,95,000 – 2,50,000.**

Table 10: Duration and Cost for Common e-learning Training Modules for State Rural Livelihood Missions / State Nodal Agencies in agriculture sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Development of domain skills				
• Ability to read and interpret technical parameters/ documentation • Developing ability to disseminate knowledge around: ○ Identifying necessary materials and tools (hand tools, machine tools and workshop equipment) ○ Checking the circuit, equipment, panel as per drawing for functioning ○ Connecting, testing and undertake maintenance and disposal of solar batteries ○ Connecting and testing solar panel, charge controller, battery bank and inverter	15 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 1,00,000 – 120,000
• Technical aspects: ○ Basic principles of direct current and alternating current ○ Measurements of physical quantitates, converter and inverter circuits ○ Electrical installation of the solar systems ○ Installation area and construction	10 minutes	Presentation		
• **Module 1.2 –Development of soft skills of trainers**				
• Developing interpersonal skills including: ○ Developing networking skills ○ Confidence building ○ Training delivery skills Pitching for a product ○ How to convert new customers for the product	20 minutes	Presentation and audio visual		• Presentation: INR 75,000 – 1,00,000 • Audio-visual: INR 20,000 – 30,000

○ Efficient educational techniques that can be used to further improve the effectiveness of training ○ Gathering effective feedback from trainees				
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 1,95,000 – 2,50,000**

5.2. Dairy Sector

Farmers

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 4,40,000 – 5,20,000.**

Table 11: Duration and Cost for common e-learning Training Modules for farmers in dairy sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Productive use of measured DRE technologies				
• Understanding the link between the introduction of DRE technologies and dairy production and quality of milk • Cooling requirements of different types of dairy products • Understanding rapid chilling that arrests bacteria growth instantly	10 minutes	Presentation	INR 4,50,000 – 5,00,000	INR 60,000 – 80,000
• Environmental and social benefits offered by DRE systems and dairy production and quality of milk	5 minutes	Audio visual		INR 20,000 – 30,000
Module 1.2 – Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and reliable refrigerators/chillers in villages. • Vendor's understanding of structural requirements (e.g., weight, wind, solar radiation, etc.)	5 minutes	Audio-visual		INR 20,000 – 30,000
• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies	5 minutes	Presentation		INR 30,000 – 40,000

• Requirements of the latest revision of relevant standards of equipment				
Module 2.1 Financial Aspects				
• Access to financial and credit services ○ Where to secure loans at lower interest rates? ○ Repayment options ○ Weighing product cost against the value of loan ○ Understanding RoR and payback period ○ Understanding documentation required	10 minutes	Presentation		INR 60,000 – 80,000
Module 2.2 Policy Aspects				
• Understanding policy framework that supports DRE uptake ○ Schemes/policies supporting DRE technologies ○ Performance-based incentives, interest subvention on DRE products ○ Implementing agency ○ Benefits of the policies/schemes ○ Necessary documentation for accessing the benefits offered by these policies ○ Application process for availing scheme benefits ○ Appropriate channels for acquiring information and submitting necessary documents	10 minutes	Audio Visual		INR 40,000 – 60,000
Module 3.1 – Ensuring safe operation of DRE systems				
• Dos and Don'ts while working with batteries ○ Location for battery installation ○ Combining and connecting batteries ○ Setting up battery charge voltage/current limit ○ Checking indicator LEDs or LCD icons on charge controller ○ Battery cleaning and maintenance ○ Battery cleaning and maintenance	5 minutes	Presentation		INR 30,000 – 40,000

• Safer operating conditions to enhance compressor life				

• Protecting DRE systems from theft / robbery
  ○ Use of solar panel lock
  ○ Securing solar panels through fences, barbed wires and alarm systems
	5 minutes	Video		INR 40,000 – 50,000

Module 4.1 – Carrying out basic operations and maintenance of the systems				

• Solar PV panels inspection
  ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time
  ○ Keeping the area around the water source and PV array neat and clean
  ○ Inspecting PV modules for broken cells and discoloration
	5 minutes	Presentation		INR 60,000-80,000

• Solar PV panels cleaning
  ○ Cleaning the PV modules
  ○ Using recommended detergent with deionized water to clean PV modules
	5 minutes	Presentation		

• Refrigeration unit
  ○ Refrigeration unit key components
  ○ Setting temperature and monitoring through control panel
  ○ Cleaning the system (condensing unit, defrosting the system, etc.)
  ○ Battery disposal after use
	10 minutes	Presentation		INR 60,000-80,000

• Electrical items inspection
  ○ Checking the refrigeration temperature at locations appropriate for the stored items
  ○ Inspecting the evaporator for any ice buildup and verifying the functionality of the defrost system
  ○ Checking compressors for unexpected vibration and oil leakage
	5 minutes	Audio-visual		INR 20,000-30,000

TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 4,40,000 – 5,20,000**

Service Providers / Product Developers / Rural Entrepreneurs

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 4,40,000 – 5,90,000**

Table 12: Duration and Cost for common e-learning Training Modules for Service providers/product developers/rural entrepreneur in dairy sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Economic Benefits of DRE Systems				
• Understanding Business models ○ Storage co-operatives for facilitating storage and distribution of dairy product within co-operative network ○ Aggregation based business model for group of farmers	5 minutes	Audio-visual	INR 4,50,000 – 5,00,000	INR 20,000 – 30,000
Understanding project economics ○ Comparative analysis of profitability of farmers with respect to conventional milk chilling methods ○ Economic benefit using aggregation-based business model	10 minutes	Presentation		INR 60,000 – 80,000
Module 1.2 –Marketing and Branding				
• Understanding customer need: ○ Objective of the customer – what is the specific need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.	5 minutes	Presentation		INR 60,000 – 80,000
• Understanding documentation • Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.	5 minutes	Presentation		
• Knowing the product modalities ○ O&M and troubleshooting to be managed locally ○ Availability of spare parts ○ Expected Life of DRE based solution used	10 minutes	Presentation		INR 60,000 – 80,000

○ Guarantee/ warrantee of the key DRE components				
• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing ○ Local aggregators for awareness	5 minutes	Video		INR 40,000 – 50,000
Module 2.1 Conducting test runs of DRE systems				
• Testing certificate requirement for PV modules • Cable testing to figure out any corrosion, insulation failure and short circuit current due to any leakage	5 minutes	Audio-visual		INR 20,000 – 30,000
Module 3.1 – Understanding supply chain considerations				
• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Logistics chain	5 minutes	Presentation		INR 30,000 – 40,000

• Supplier Assessment:
  ○ Setting clear objectives and vision
  ○ Assessing identified supplier options
  ○ Bargaining power
  ○ Quality & safety
  ○ Assessing risks
  ○ Agility including vendor's ability to respond to changes in demand with respect to volume and variety
	5 minutes	Presentation		

• Development of Supplier Selection & Ranking System:
  ○ Organization and operational background
  ○ Financial strength - market standing and prospects, credit rating, clientele, etc.
  ○ Product development such as product range, R&D, Quality management, degree of automation, etc.
  ○ Manufacturing process
  ○ Cost competitiveness in the market
  ○ After-sales
  ○ Logistics tie-ups
	10 minutes	Presentation		INR 60,000 – 80,000

Module 4.1 Financial Aspects				
• Understanding various funding options accessible for initiating their business within the dairy sector • Understanding documentation for loans, income projection based on business operations, and investment payback duration • Understanding financial implications of DRE systems over conventional alternatives	5 Minutes	Presentation		INR 30,000 – 40,000
Module 4.2 Policy Aspects				

• Processes required to avail the benefits facilitated by these schemes. • Schemes/policies supporting DRE technologies • Benefits of the policies/schemes • Performance-based incentives, interest subvention on DRE products • Implementing agency • Necessary documentation for accessing the benefits offered by these policies • Appropriate channels for acquiring information and submitting necessary documents	10 minutes	Presentation		INR 60,000 – 80,000
TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 4,40,000 – 5,90,000**

State Rural Livelihood Missions / State Nodal Agencies / State Government Departments

State Government Departments

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 3,40,000 – 4,60,000.**

Table 13: Duration and Cost for Common e-learning Training Modules for State Government Departments in dairy sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Creating public awareness to promote adoption of DRE livelihood applications in dairy sector				

• Understanding the possibility of livelihood opportunities provided by DRE applications mentioned below in dairy value chain
  ○ Solar refrigerators
  ○ Solar milk chillers
• Awareness Enhancement: Benefits of DRE systems in dairy value chain
  ○ Improved milk quality and impact on milk pricing
  ○ Minimized energy requirements from the grid or diesel generator
	10 minutes	Video	INR 4,50,000 – 5,00,000	INR 80,000 – 100,000

○ Integrating solar energy without the need for net metering or electrical batteries ○ Processing and Value addition of milk				
• Conducting demand assessment to map the needs of farmers with appropriate fit to DRE livelihood applications in dairy value chain • Delivering more field official for on ground visit to understand famers mind set on DRE technology • Identifying focus areas for the introduction of DRE applications in dairy sector in a State • Scoping entrepreneurship development in dairy industry in line with DRE solutions	10 minutes	Presentation		INR 60,000 – 80,000
• Engaging on platforms for enhancing awareness about DRE applications ○ Local livelihood summits ○ Town-halls ○ Leveraging FPO's group meeting ○ Organize DRE specific knowledge sharing campaign at village level in the dairy value chain ○ Supporting demonstration of such technologies at trade fairs and exhibitions	5 minutes	Doodle video		INR 1,00,000 – 1,50,000
Module 1.2 – Identifying state level organizations for scaling-up adoption of DRE applications				
• Promoting self-help groups and local level organizations to implement DRE solutions on farmlands ○ Designating SRLMs / SNAs as coordinating agencies for: ▪ Training SHG women for providing after-sales and repair service at the local level ▪ Facilitating in creating DRE-specific green jobs for women • SRLMs / SNAs as nodal agencies for supporting the effective implementation of DRE-based livelihood promotion in the dairy sector in the state • Encouraging Gram Panchayat members to demonstrate DRE	5 minutes	Video		INR 40,000 – 50,000

technology-based solution to the field level farmers				

• Establishing tie ups with academic institutions and foundations in the state for facilitating R&D in the DRE sector across the dairy value chain
• Clearly setting the objectives of the partnership:
  ○ Identifying innovative DRE applications on farmland which could be cost-effective
  ○ Providing test-bedding sites such as labs and testing centres to safely trial their ideas and innovations by product developers
  ○ Business acceleration support, including strategic advisory and networking sessions for product developers, service providers and farmers
  ○ Establishing the linkage between DRE applicable and income security & livelihood enhancement for farmers
• Serving as a knowledge portal for DRE resources
	15 minutes	Presentation		INR 60,000 – 80,000

TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 3,40,000 – 4,60,000**

SRLMs / SNAs

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 1,95,000 – 2,50,000.**

Table 14: Duration and Cost for Common e-learning Training Modules for SRLMs / SNAs in dairy sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Development of domain skills				
• Ability to read and interpret technical parameters/ documentation • Developing ability to disseminate knowledge around: ○ Identifying necessary materials and tools (hand	15 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 1,00,000 – 1,20,000

tools, machine tools and workshop equipment) ○ Checking the circuit, equipment, panel as per drawing for functioning ○ Connecting, testing and undertake maintenance and disposal of solar batteries ○ Connecting and testing solar panel, charge controller, battery bank and inverter				
• Technical aspects: ○ Basic principles of direct current and alternating current ○ Measurements of physical quantitates, converter and inverter circuits ○ Electrical installation of the solar systems ○ Installation area and construction	10 minutes	Presentation		
Module 1.2 –Development of soft skills of trainers				
• Developing interpersonal skills including: ○ Developing networking skills ○ Confidence building ○ Training delivery skills Pitching for a product ○ How to convert new customers for the product ○ Efficient educational techniques that can be used to further improve the effectiveness of training ○ Gathering effective feedback from trainees	20 minutes	Presentation and audio visual		• Presentation: INR 75,000 – 1,00,000 • Audio-visual: INR 20,000 – 30,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 1,95,000 – 2,50,000**

5.3. Fishery Sector

Farmers

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,70,000-3,70,000.**

Table 15: Duration and Cost for common e-learning Training Modules for farmers in fishery sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Use of DRE systems in fishery value chain				
• Understanding the link between the introduction of DRE system and fish farming • Environmental and social benefits offered by DRE systems over conventional systems	5 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 30,000 – 40,000
Module 2.1- Financial aspects				
• Assessing the financial viability of DRE technologies • Understanding payback period and annual operating costs • Affordable financial and credit facilities • Potential sources of funding	10 minutes	Presentation		INR 60,000 – 80,000
Module 2.2- Policy aspects				
• Understanding DRE centric schemes, incentives, and subsidies • Process to avail the benefits of the scheme • Eligibility to participate in the scheme • Implementing agency • Necessary documentation for accessing the benefits offered by these policies • Appropriate channels for acquiring information and submitting necessary documents	10 minutes	Audio-visual		INR 40,000 – 60,000
Module 3.1 - Business Model Guidance				

• Understanding business models
  ○ Different business models available in the market (e.g., capex model, EMI model, etc.)
  ○ Investment required for buying and running the DRE systems in fisheries sector
  ○ Knowledge dissemination on bankable business models where loan can be availed from the market
• Understanding project benefits
  ○ Awareness about payback period and ROI calculation
	10 minutes	Presentation		INR 60,000 – 80,000

○ Net savings of end users with respect to DRE solutions in fisheries sector				
Module 3.2 – Carrying out basic operations and maintenance of the system				
• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ Using recommended detergent with deionized water to clean PV modules ○ Using micro-fiber cloth to clean PV modules	10 minutes	Presentation		INR 60,000 – 80,000
Module 4.1 – Protecting DRE systems				
• Protecting DRE systems from theft / robbery ○ Use of solar panel lock • Securing solar panels through fences, barbed wires and alarm systems	5 minutes	Audio-visual		INR 20,000 – 30,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,70,000-3,70,000**

Service Providers / Product Developers / Rural Entrepreneurs

Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training INR 2,90,000-3,90,000.**

Table 16: Duration and Cost for common e-learning Training Modules for Service providers/product developers/rural entrepreneur in fishery sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Marketing and Branding				
• Understanding customer need ○ Objective of the customer – what is the specific need? ○ What is the future growth possibility?	5 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000-80,000

○ Which business model will be the most suitable?				
• Understanding documentation • Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.	5 minutes	Presentation		
• Knowing the product modalities ○ Specifications, uses and limitations ○ O&M and troubleshooting to be managed locally ○ Availability of spare parts ○ Expected Life of DRE based solution used ○ Guarantee/ warrantee of the key DRE components	10 minutes	Audio-visual		INR 40,000 – 60,000
• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing ○ Local aggregators for awareness	5 minutes	Video		INR 40,000 – 50,000
Module 1.2 - Institutional Structure				
• Types of legal structures that can be adopted by rural enterprise • Relevance of each of the structure for rural enterprise • Advantages and disadvantages of different structures	10 minutes	Presentation		INR 60,000-80,000
Module 2.1 Financial Aspects				
• Evaluating payback period • Sources of funding • Documentation required for availing loans • Income projection based on business operations	5 minutes	Presentation		INR 30,000 – 40,000
Module 2.2 Policy Aspects				
• Understanding schemes, incentives, and subsidies for availing DRE solutions • Eligibility to participate in the scheme • Deadlines and validity of the scheme • Implementing agency • Necessary documentation for accessing the benefits offered by these policies	10 minutes	Presentation		INR 60,000-80,000

• Appropriate channels for acquiring information and submitting necessary documents				
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,90,000-3,90,000**

State Rural Livelihood Missions / State Nodal Agencies / State Government Departments

State Government Departments

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 3,15,000 – 4,30,000.**

Table 17: Duration and Cost for Common e-learning Training Modules for State Government Departments in fishery sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Creating public awareness to promote adoption of DRE livelihood applications in agriculture sector				

• Understanding the possibility of livelihood opportunities provided by DRE applications mentioned below in fishery value chain
  ○ Solar water pumps
  ○ Solar cold storages
  ○ Solar dryers
  ○ Solar aerators
• Avenues of adoption of DRE livelihood technologies among women and other marginalized groups such as Scheduled Caste and Scheduled Tribes
	5 minutes	Video	INR 3,50,000 – 4,00,000	INR 40,000 – 50,000

• Conducting demand assessment to map the needs of farmers with appropriate fit to DRE livelihood applications in agriculture value chain • Identifying focus areas for the introduction of DRE applications in agriculture sector in the State	10 minutes	Presentation		INR 60,000 – 80,000

• Engaging on platforms for enhancing awareness about DRE applications
  ○ Local livelihood summits
  ○ Town-halls
	5 minutes	Doodle video		INR 1,00,000 – 1,50,000

○ Supporting demonstration of such technologies at trade fairs and exhibitions				
Module 1.2 – Identifying state level organizations for scaling-up adoption of DRE applications				
• Promoting self-help groups and local level organizations to implement DRE solutions on farmlands ○ Designating SRLMs / SNAs as coordinating agencies for: ▪ Training SHG women for providing after-sales and repair service at the local level ▪ Facilitating in creating DRE-specific green jobs for women ○ SRLMs / SNAs as nodal agencies for supporting the effective implementation of DRE-based livelihood promotion in the agriculture sector in the state	5 minutes	Video		INR 40,000 – 50,000
• Establishing tie ups with academic institutions and foundations in the state for facilitating R&D in the DRE sector across the agriculture value chain • Clearly setting the objectives of the partnership: ○ Identifying innovative DRE applications on farmland which could be cost-effective ○ Providing test-bedding sites such as labs and testing centres to safely trial their ideas and innovations by product developers ○ Business acceleration support, including strategic advisory and networking sessions for product developers, service providers and farmers ○ Establishing the linkage between DRE applicable and income security & livelihood enhancement for farmers • Serving as a knowledge portal for DRE resources including policy best practices, data, and analysis tools and share the same with product	15 minutes	Presentation		INR 75,000 – 1,00,000

developers. Service providers and rural entrepreneurs in the state				
TOTAL COST			**INR 3,50,000 – 4,00,000**	**INR 3,15,000 – 4,30,000**

SRLMs / SNAs

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,20,000 – 2,70,000.**

Table 18: Duration and Cost for Common e-learning Training Modules for SRLMs / SNAs in fishery sector

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training[4]
Module 1.1 – Development of domain skills				

• Ability to read and interpret technical parameters/ documentation
• Developing ability to disseminate knowledge around:
  ○ Identifying necessary materials and tools (hand tools, machine tools and workshop equipment)
  ○ Checking the circuit, equipment, panel as per drawing for functioning
  ○ Connecting, testing and undertake maintenance and disposal of solar batteries
  ○ Connecting and testing solar panel, charge controller, battery bank and inverter
	15 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 1,20,000 – 1,40,000

• Technical aspects:
  ○ Basic principles of direct current and alternating current
  ○ Measurements of physical quantitates, converter and inverter circuits
  ○ Electrical installation of the solar systems
  ○ Installation area and construction
	10 minutes	Presentation		

[4] Cost provided for video content for up to 3-min doodle videos and full day video filming (8 hours); 2D, audio text, visual, info graphics, and voice-over

Module 1.2 –Development of soft skills of trainers				
• Developing interpersonal skills including: ○ Developing networking skills ○ Confidence building ○ Training delivery skills Pitching for a product ○ How to convert new customers for the product ○ Efficient educational techniques that can be used to further improve the effectiveness of training ○ Gathering effective feedback from trainees	20 minutes	Presentation and audio visual		• Presentation: INR 80,000 – 1,00,000 • Audio-visual: INR 20,000 – 30,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,20,000 – 2,70,000**

6. Assessment of Duration and Cost for Specific e-learning Training Modules

Based on the training agendas developed for each sector, duration and overall cost for content development and designing the training program has been identified. The same has been presented below:

6.1. Agriculture Sector

Farmers

Solar Water Pumps

Level 1

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 4,35,000 – 5,90,000.**

Table 19: Duration and Cost for specific e-learning Training Modules for solar water pumps for farmers in agriculture sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Use of solar water pumps on farmland				

• Types of solar water pumps
  ○ AC / DC
  ○ Submersible / surface pumps
• Understanding the link between the introduction of solar water pumps and agricultural productivity, livelihoods, and food security
• Impact of solar water pumps on irrigation intensity, adoption of multi-cropping patterns and income generation
	5 minutes	Presentation	INR 4,50,000 – 5,00,000	INR 30,000 – 40,000[5]

• Environmental and social benefits offered by solar water pump solutions • Ease of shifting from diesel-based pumps to solar based water pumps	5 minutes	Presentation		
Module 1.2 – Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and reliable solar water pumps on farmland	5 minutes	Audio-visual		INR 20,000 – 30,000
• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Video		INR 40,000 – 50,000

Availability of quality management plan with the vendor covering:
  ○ System equipment testing
  ○ Inspection protocol
  ○ Design best practices
  ○ Safety policies
	5 minutes	Presentation		INR 15,000 – 20,000

Module 2.1 – Effective installation of DRE solutions on flood plains				
• Flood resistant materials to be used for solar water pump components • Impact on insurance costs	10 minutes	Presentations		INR 30,000 – 40,000
• Anchoring solar panels to prevent collapse or movement during a flooding event Installing solar panels at or above the flood protection grade • Desired tilt of solar panels	5 minutes	Doodle video		INR 1,00,000 – 1,50,000
Module 2.2 – Sizing of solar water pumps				

• Size of the array and its dependence on the power needed for the pump
  ○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate
  ○ Estimating the irrigation demand
	10 minutes	Descriptive presentation with key points on system sizing		INR 30,000 – 40,000

[5] Per hour cost for content creation of the Training for presentations

○ Calculating the peak discharge ○ Head requirements ○ Impact on cost of the system				
• Availability of pump sizing tools that can be used ○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE ○ Checking the sizing options with the vendor	5 minutes	Video		INR 80,000 – 100,000
Case study analysis (examples from different use cases in India)	5 minutes	Video		
Module 3.3 – Crop productivity after solar PV installation on farmland				
• Relationship between soil health and solar panels • Benefits of solar panels on soil and crops ○ Cooling effect on crops offered by solar panels ○ Requirement of water / moisture content to crops underneath solar panels ○ Increase in crop yield	10 minutes	Scenario-based Presentation		INR 30,000 – 40,000
• Integrating grazing with solar panels for better soil health	5 minutes			
Module 3.4 – Protecting solar water pump systems on farmland				
• Protecting solar water pumps from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm	5 minutes	Audio-visual		INR 20,000 – 30,000
Module 3.2 – Converting land back to agricultural uses after end of life of solar water pumps				
• Checking soil contamination and harm to crops, if any • Decommissioning and removing the solar water pump from the farmland	5 minutes	Video		INR 40,000 – 50,000
TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 4,35,000 – 5,90,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for**

training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,20,000 – 2,60,000.

Table 20: Duration and Cost for specific e-learning Training Modules for solar water pumps for farmers in agriculture sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Water demand assessment for selecting a solar water pump				
• Estimating daily water demand in each month based on end application ○ Considering variation of water demand based on end application • Considering water supply needs in the future	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000 – 80,000

• Water distribution requirement assessment
  ○ Considering existing storage facility for short-term and long-term storage
  ○ Considering the water delivery points based on application and purpose
  ○ Avoiding more joints and elbows in pipe lines
• Selecting an appropriate and effective distribution system for irrigation purpose
	10 minutes	Video		INR 80,000 – 100,000

Module 1.2 – Carrying out basic operations and maintenance of the system				

• Solar PV panels
  ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time
  ○ Keeping the area around the water source and PV array neat and clean
  ○ Inspecting PV modules for broken cells and discoloration
  ○ Cleaning the PV modules during early morning or late afternoon
  ○ Using water with hardness less than 75ppm to clean the PV modules
  ○ Using only mild, non-abrasive, non-caustic detergent with deionized water
  ○ Using micro fiber cloth to remove stubborn dirt and rinsing with plenty of water
	15 minutes	Presentation		INR 60,000 – 80,000

○ Wiping out residual water from module using rubber wiper				
• Electrical items ○ Visually checking all conduit and wire insulation for damage ○ Checking for loose, broken, corroded, or burnt wiring connections	5 minutes	Audio-visual		INR 20,000 – 30,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,20,000 – 2,60,000**

Solar Dryers

Level 1

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 3,75,000 and cost of designing the training is INR 4,10,000 – 5,40,000.**

Table 21: Duration and Cost for specific e-learning Training Modules for solar dryers for farmers in agriculture sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Designing a solar dryer				
• Types of solar dryers available in the market: ○ Solar box dryer ○ Solar cabinet dryer ○ Solar tunnel dryer ○ Hybrid dryer (solar-biomass cabinet dryer) • Understanding the link between the introduction of solar dryers and agricultural productivity, livelihoods and food security • Crops that can be dried using solar dryer	10 minutes	Presentation	INR 3,50,000 – 3,75,000	INR 60,000 – 80,000
• Quality induced market pricing of produce • Possibility of export of produce due to improved quality meeting quality requirements and testing criteria	5 minutes	Presentation		

• Environmental and social benefits offered by solar water pump solutions: • Avoidance of widespread fungal infection resulting from unexpected rains or fog vs destruction of unprotected / open drying of crops	5 minutes	Video		INR 40,000 – 50,000
Module 1.2 – Protecting DRE systems on farmland				
• Protecting solar dryers from theft / robbery o Use of solar panel lock o Use of fence / barbed wires o Use of pop rivets / blind rivets / to enhance security o Gluing, Welding or Sealing the Panels / linking racks o Use of alarm	5 minutes	Audio visual		INR 20,000 – 30,000
Module 2.1 –Understanding the performance parameters of solar dryers				
• Understanding the key components of a solar dryer – solar panels, cover, design, air flow, stand, absorber tray, etc.)	5 minutes	Video		INR 40,000 – 50,000
• Moisture removal rate of solar dryers • Baseline moisture content of fruits and vegetables o Typically around 70-85% • Moisture content after solar drying o Typically around 5-15%	5 minutes	Presentation		INR 30,000 – 40,000
• What is the right drying efficiency • What should be the drying rate	5 minutes	Video		INR 40,000 – 50,000
Module 2.2 – Sizing and functioning of solar dryers				
• Optimal capacity of dryer cabinet based on minimum crop capacity to be stored (in kgs / MT)	5 minutes	Audio visual		INR 20,000 – 30,000
• Ambient temperature to be maintained inside the dryer vs outside o Ensuring moisture control in the dryer to regulate drying time based on the intensity of solar radiation	10 minutes	Presentation		INR 30,000 – 40,000
• Requirement of gasket (mechanical seal) to protect the dryer from rain, dust, rodents and inspects	5 minutes	Video		INR 40,000 – 50,000
Module 2.3 – Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and reliable solar dryers on farmland	5 minutes	Audio-visual		INR 20,000 – 30,000
• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Video		INR 40,000 – 50,000

• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies	5 minutes	Presentation		INR 30,000 – 40,000
TOTAL COST			**INR 3,50,000 – 3,75,000**	**INR 4,10,000 – 5,40,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 2,75,000 – 3,00,000 and cost of designing the training is INR 1,50,000 – 2,00,000.**

Table 22: Duration and Cost for specific e-learning Training Modules for solar dryers for farmers in agriculture sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Carrying out basic operations and maintenance of the system				
• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ Cleaning the PV modules during early morning or late afternoon ○ Using water with hardness less than 75ppm to clean the PV modules ○ Using only mild, non-abrasive, non-caustic detergent with deionized water ○ Using micro fiber cloth to remove stubborn dirt and rinsing with plenty of water ○ Wiping out residual water from module using rubber wiper	15 minutes	Presentation	INR 2,75,000 – 3,00,000	INR 75,000 – 100,000

• System components ○ Cleaning of drying surface ○ Cleaning the UV sheet (where applicable) and tray with a clean dump cloth ○ Cleaning the mesh after every use ○ Performing visual checks of the condition of the dryer components ○ Checking the doors are close tightly ○ Checking that the trays are not torn on the mesh ○ Checking that the mesh liners are not blocked	15 minutes	Presentation		INR 75,000 – 100,000
TOTAL COST			**INR 2,75,000 – 3,00,000**	**INR 1,50,000 – 2,00,000**

Solar Cold Storages

Level 1

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,95,000 – 4,10,000.**

Table 23: Duration and Cost for specific e-learning Training Modules for solar cold storage for farmers in agriculture sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Use of solar cold storage solutions on farmland				
• Types of solar cold storages ○ Solar cold storage with battery storage ○ Solar cold storage with phase change material (PCM) storage ○ Solar cold storage with thermal storage • Understanding the link between the introduction of solar cold storage and agricultural productivity, livelihoods and food security • Impact of solar cold storage on irrigation intensity, adoption of multi-	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 75,000 – 100,000

cropping patterns and income generation				
• Environmental and social benefits offered by solar cold storage solutions	5 minutes	Presentation		
Module 1.2 – Protecting solar cold storage systems on farmland				

• Dos and Don'ts while working with batteries
  ○ Location for battery installation
  ○ Combining and connecting batteries
  ○ Acid spill cleanup material to be readily available
  ○ Verifying electrolyte levels (adding distilled water as necessary)
  ○ Measuring specific gravity
  ○ Setting up battery charge voltage/current limit
  ○ Checking indicator LEDs or LCD icons on charge controller
• Battery cleaning and maintenance
	5 minutes	Presentation		INR 30,000 – 40,000

• Protecting solar cold storage systems from theft / robbery
  ○ Use of solar panel lock
  ○ Use of fence / barbed wires
  ○ Use of pop rivets / blind rivets / to enhance security
  ○ Gluing, Welding or Sealing the Panels / linking racks
  ○ Use of alarm
	5 minutes	Doodle Video		INR 1,00,000 – 1,50,000

Module 2.1 – Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and reliable solar cold storage on farmland	5 minutes	Audio-visual		INR 20,000 – 30,000
• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Video		INR 40,000 – 50,000

• Availability of quality management plan with the vendor covering:
  ○ System equipment testing
  ○ Inspection protocol
  ○ Design best practices
  ○ Safety policies
	5 minutes	Presentation		INR 30,000 – 40,000

TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,95,000 – 4,10,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 2,75,000 – 3,00,000 and cost of designing the training is INR 1,50,000 – 2,00,000.**

Table 24: Duration and Cost for specific e-learning Training Modules for solar cold storages for farmers in agriculture sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Carrying out basic operations and maintenance of the system				
• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ Cleaning the PV modules during early morning or late afternoon ○ Using water with hardness less than 75ppm to clean the PV modules ○ Using only mild, non-abrasive, non-caustic detergent with deionized water ○ Using micro fiber cloth to remove stubborn dirt and rinsing with plenty of water ○ Wiping out residual water from module using rubber wiper	15 minutes	Presentation	INR 2,75,000 – 3,00,000	INR 75,000 – 1,00,000
• Electrical items ○ Cleaning – daily basis (spillage should be immediately cleaned) ○ Neatly organizing products as per the cooling temperature requirement ○ Checking the cold room temperature at locations appropriate for the stored items	15 minutes	Presentation		INR 75,000 – 1,00,000

○ Checking evaporator for ice build-up and defrost function is working ○ Checking compressors for unexpected vibration and oil leakage ○ Checking if door is air tight and if there is any leakage, cracks or wear and tear in the door ○ Checking if there any damage or cracks to insulation at any place of the cold room ○ Checking proper temperature is maintained when cold room is fully loaded				
TOTAL COST			**INR 2,75,000 – 3,00,000**	**INR 1,50,000 – 2,00,000**

Service Providers / Product Developers / Rural Entrepreneurs

Solar Water Pumps

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 3,20,000 – 4,10,000.**

Table 25: Duration and Cost for specific e-learning Training Modules for solar water pumps for Service Providers / Product Developers / Rural Entrepreneurs in agriculture sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Sizing of solar water pumps				
• Size of the array and its dependence on the power needed for the pump ○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate ○ Estimating the irrigation demand ○ Calculating the peak discharge ○ Head requirements ○ Impact on cost of the system	20 minutes	Descriptive presentation with key points on system sizing	INR 4,50,000 – 5,00,000	INR 1,00,000 – 1,20,000

• Availability of pump sizing tools that can be used
  ○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE
  ○ Checking the sizing options with the vendor
	5 minutes	Video		INR 40,000 – 50,000

Module 1.2 – Solar Water Pump Marketing and Branding				

• Understanding customer need
  ○ Objective of the customer – what is the specific need?
  ○ How do they fulfil the present need and what price they are paying?
  ○ How critical is the need?
  ○ What is the future growth possibility?
  ○ Which business model will be the most suitable?
  ○ What are the objections and clarifications received from the customer?
  ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
	10 minutes	Presentation		INR 60,000 – 80,000

• Knowing your own product modalities
  ○ Specifications, uses and limitations
  ○ After sales service
  ○ Can O&M and troubleshooting be managed locally?
  ○ Availability of spare parts
  ○ Quality vs price
  ○ Value for money
  ○ Expected Life
  ○ Guarantee/ warrantee
	10 minutes	Video		INR 80,000 – 100,000

• Potential strategic partnerships at the local level • Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural retailers, local youth, RE mascots, etc.	5 minutes	Audio-visual		INR 20,000 – 30,000

• Deploying effective marketing techniques
  ○ Word-of-mouth Marketing
  ○ Leveraging local roadshows / festivals / melas
	5 minutes	Audio-visual		INR 20,000 – 30,000

○ Identifying evangelists / RE mascots who can be distributors				
TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 3,20,000 – 4,10,000**

Solar Dryers

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,80,000 – 3,60,000.**

Table 26: Duration and Cost for specific e-learning Training Modules for solar dryers for Service Providers / Product Developers / Rural Entrepreneurs in agriculture sector at Leve 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Designing a solar dryer				
• Types of solar dryers ○ Solar box dryer ○ Solar cabinet dryer ○ Solar tunnel dryer ○ Hybrid dryer (solar-biomass cabinet dryer) • Understanding the key parts of solar dryers ○ Solar collector ○ Drying chamber ○ Absorber ○ Ventilation holes ○ Any other key part depending on the type of solar dryer	10 minutes	Descriptive presentation	INR 3,00,000 – 3,50,000	INR 60,000 – 80,000
• Understanding the parameters for assessing the performance of solar dryers ○ Maintaining the temperature inside the drying chamber (typically 55–60° with under load conditions, 65–70° in an overload condition) ○ Material to be used for absorber plate ○ Width of hole in solar dryers ○ Calculating efficiency of solar dryers based on airflow rate	10 minutes	Video		INR 80,000 – 100,000
Module 1.2 – Solar dryers Marketing and Branding				

• Understanding customer need
  ○ Objective of the customer – what is the specific need?
  ○ How do they fulfil the present need and what price they are paying?
  ○ How critical is the need?
  ○ What is the future growth possibility?
  ○ Which business model will be the most suitable?
  ○ What are the objections and clarifications received from the customer?
  ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.
	10 minutes	Presentation		INR 1,00,000 – 1,20,000

• Knowing your own product modalities
  ○ Specifications, uses and limitations
  ○ After sales service
  ○ Can O&M and troubleshooting be managed locally
  ○ Availability of spare parts
  ○ Quality vs price
  ○ Value for money
  ○ Expected Life
  ○ Guarantee/ warrantee
	10 minutes	Presentation		

• Potential strategic partnerships at the local level • Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural retailers, local youth, RE mascots, etc.	5 minutes	Audio visual		INR 20,000 – 30,000

• Deploying effective marketing techniques
  ○ Word-of-mouth Marketing
  ○ Leveraging local roadshows / festivals / melas
  ○ Identifying evangelists / RE mascots who can be distributors
	5 minutes	Audio-visual		INR 20,000 – 30,000

TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,80,000 – 3,60,000**

Solar Cold Storages

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,20,000 – 2,70,000.**

Table 27: Duration and Cost for specific e-learning Training Modules for solar cold storages for Service Providers / Product Developers / Rural Entrepreneurs in agriculture sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Designing a solar cold storage				
• PV system sizing and design for cold storage ○ Knowing the exact purpose and cooling requirement of the cold storage by potential ○ Assessment of cooling load and auxiliary electricity demand ○ Solar resource assessment (including 'no sun' equivalent days) ○ System configuration ○ Calculate storage and autonomy requirement – Thermal (PCM) or Battery ○ PV array sizing, selection of compressor driver / inverter and BOS component design	20 minutes	Descriptive presentation	INR 3,00,000 – 3,50,000	INR 1,00,000 – 1,20,000
Module 1.2 – Solar cold storage Marketing and Branding				
• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer? ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after	10 minutes	Presentation		INR 1,00,000 – 1,20,000

sales service commitment, etc.				
• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee	10 minutes	Presentation		
• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing	5 minutes	Audio visual		INR 20,000 – 30,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,20,000 – 2,70,000**

RE-based Mini-Grids

Level 1

A total effort estimation of developing training content has been taken as 44 days (2 working months). Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 5,00,000 – 5,50,000 and cost of designing the training is INR 5,50,000 – 7,20,000.**

Table 28: Duration and Cost for specific e-learning Training Modules for RE-based mini-grids for Service Providers / Product Developers / Rural Entrepreneurs in agriculture sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Use of RE-based mini grids				
• Understanding the link between the introduction of DRE-based agricultural equipment powered by RE mini grid and agricultural productivity, livelihoods and food security	5 minutes	Video	INR 5,00,000 – 5,50,000	INR 80,000 – 100,000
• Environmental and social benefits offered by RE-based mini-grids	5 minutes	Video		

• Agricultural equipment that can be powered using DRE solutions
  ○ Explaining its cost-effectiveness and reliability
  ○ Ease of shifting from diesel-based agriculture equipment to DRE-based agriculture equipment
  ○ Impact of DRE-based agriculture equipment on irrigation intensity, adoption of multi-cropping patterns and income generation
	10 minutes	Descriptive presentation		INR 60,000 – 80,000

Module 1.2 – Protecting RE mini-grids				

• Dos and Don'ts while working with batteries
  ○ Location for battery installation
  ○ Combining and connecting batteries
  ○ Acid spill cleanup material to be readily available
  ○ Verifying electrolyte levels (adding distilled water as necessary)
  ○ Measuring specific gravity
  ○ Setting up battery charge voltage/current limit
  ○ Checking indicator LEDs or LCD icons on charge controller
  ○ Battery cleaning and maintenance
	5 minutes	Video		INR 40,000 – 50,000

• Protecting RE mini-grid equipment from theft / robbery
  ○ Use of solar panel lock
  ○ Use of fence / barbed wires
  ○ Restricting entry to the premises
  ○ Use of pop rivets / blind rivets / to enhance security
  ○ Gluing, Welding or Sealing the Panels / linking racks
  ○ Use of alarm
  ○ Installing security cameras on the premises
  ○ Deploying a full time guard on the premises
  ○ Obtaining insurance for key system components
	10 minutes	Presentation		INR 60,000 – 80,000

Module 2.1 – Effective installation of RE-based mini-grids on flood plains				

• Flood resistant materials to be used for all DRE system components • Impact on insurance costs	10 minutes	Scenario-based presentations		INR 60,000 – 80,000
• Anchoring solar panels to prevent collapse or movement during a flooding event Installing solar panels at or above the flood protection grade • Desired tilt of solar panels	5 minutes	Audio-visual		INR 20,000 – 30,000
Module 2.2 – Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and reliable equipment / components of RE-based mini-grid	5 minutes	Audio-visual		INR 20,000 – 30,000
• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Video		INR 40,000 – 50,000
• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies	5 minutes	Presentation		INR 30,000 – 40,000
Module 3.1 – Crop productivity after solar PV installation on farmland				
• Relationship between soil health and solar panels • Benefits of solar panels on soil and crops ○ Cooling effect on crops offered by solar panels ○ Requirement of water / moisture content to crops underneath solar panels • Increase in crop yield	10 minutes	Scenario-based Presentation		INR 60,000 – 80,000
• Integrating grazing with solar panels for better soil health	5 minutes	Presentation		
Module 3.2 – Converting land back to agricultural uses after end of life of RE-based mini-grids				
• Checking soil contamination and harm to crops, if any	5 minutes	Video		INR 40,000 – 50,000
• Decommissioning and removing the RE-based mini-grids from the farmland	5 minutes	Video		INR 40,000 – 50,000
TOTAL COST			**INR 5,00,000 – 5,50,000**	**INR 5,50,000 – 7,20,000**

Level 2

A total effort estimation of developing training content has been taken as 33 days (1.5 working months). Costing inputs have been obtained from training institutes already developing such content. **Total cost**

identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 4,10,000 – 5,30,000.

Table 29: Duration and Cost for specific e-learning Training Modules for RE-based mini-grids for Service Providers / Product Developers / Rural Entrepreneurs in agriculture sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Sizing of RE-based mini-grids				

• Selection of site
  ○ Understanding site demography
  ○ Understanding electrification status of the village
  ○ Assessing the ability of the community to spend on alternative source of power
• Assessing the load profile and power/ energy requirement of customers in the village
	15 minutes	Descriptive presentation	INR 4,50,000 – 5,00,000	INR 60,000 – 80,000

• Size of the mini-grid plant
  ○ Determining the power consumption demand
  ○ Sizing the PV Modules
  ▪ Calculating the total Watt peak rating needed for PV Modules.
  ▪ Calculating the number of PV panels for the system
  ○ Inverter Sizing
  ▪ The input rating of Inverter is never less than the total Watt of Appliances.
  ▪ Nominal voltage of inverter
  ○ Battery sizing
  ▪ Total Watt hours per day used
  ▪ Days of autonomy
  ▪ Nominal voltage of battery
	20 minutes	Descriptive presentation		INR 1,00,000 – 1,20,000

Module 1.2 – Integrating productive loads				
• Commercial activities in the village • Assessing the possibility of integrating:	15 minutes	Presentation		INR 60,000 – 80,000

○ Anchor loads such as telecom towers, large factories, etc. ○ Irrigation and water pumping for farming ○ Small scale businesses- oil millers or rice hullers				
Module 1.3 – Risk Management with Use of RE-based Mini-grids				
• Analysis of Technical and operational risks for RE-based Mini-grids ○ Business Model Risk ○ Market erosion Risk ○ Supply chain risks including resource price variability risk ○ Promotion of productive use of electricity and local entrepreneurship ○ Hybridization of solutions, where feasible • Environmental and safety risks	10 minutes	Audio-visual		INR 40,000 – 60,000
• Project development and investment risk ○ CAPEX and OPEX forecasting risk ○ Technology selection risk ○ Equity return expectations and risk	15 minutes	Video depicting excel calculation		INR 1,20,000 – 1,50,000
• Overview of risk management techniques (from risk tolerance to risk avoidance) ○ Early recognition of crucial risk driving factors of DRE systems ○ Focused response at early stages to limit risk exposure arising through mini-grid systems ○ Risk insurance such as against transport, weather, theft, fire, etc.	5 minutes	Presentation		INR 30,000 – 40,000
TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 4,10,000 – 5,30,000**

6.2. Dairy Sector

Farmers

Solar Milk Chillers

Level 1

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 2,60,000 – 3,50,000.**

Table 30: Duration and Cost for specific e-learning Training Modules for solar milk chillers for farmers in dairy sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Productive use of solar milk chillers				

• Features of solar milk chillers
  ○ Instant Milk Cooling
  ○ Power Backup in milk chillers
  ○ Simple Design
• Type of Cooling tank:
  ○ Open Vertical Cylinder Tank
  ○ Open Horizontal Tank
  ○ Fully Enclosed Elliptical tank
  ○ Fully Enclosed Cylindrical tank
• Understanding the link between the introduction of DRE technologies and dairy production and quality of milk.
	5 minutes	Video	INR 3,50,000 – 4,00,000	INR 40,000 – 50,000

• Cooling requirements of different types of dairy product. • Understanding crash cooling to arrests bacteria growth	5 minutes	Presentation		INR 30,000 – 40,000
• Environmental and social benefits offered by solar milk chiller solutions	5 minutes	Audio visual		INR 20,000 – 30,000
Module 2.1 – Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and	5 minutes	Audio-visual		INR 20,000 – 30,000

reliable refrigerators in villages.				
• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Video		INR 40,000 – 50,000

• Availability of quality management plan with the vendor covering:
  ○ System equipment testing
  ○ Inspection protocol
  ○ Design best practices
  ○ Safety policies
• Requirements of the latest revision of relevant standards of
  ○ NEC: National Electric Code
  ○ IEC: International Electro Technical Commission
  ○ BIS: Bureau of Indian Standards
  ○ ISO: International Organization for Standardization
	10 minutes	Presentation		INR 30,000 – 40,000

Module 3.1 – Understanding Operational parameters				

• Understanding Operational parameters such as
  ○ Bulk Milk Cooling Tank
  ○ Condensing Unit
  ○ Thermal Storage System
  ○ Pump
  ○ Solar PV Panels & battery bank
  ○ Inverter with variable frequency drive
  ○ Remote monitoring through SCADA system
	5 minutes	Presentation		INR 30,000 – 40,000

Module 3.2 – Ensuring safe operation of solar milk chiller				

• Dos and Don'ts while working with batteries
  ○ Location for battery installation
  ○ Keeping the battery away from heat source.
	5 minutes	Presentation		INR 30,000 – 40,000

○ Keeping them away from mechanical abuse. ○ Combining and connecting batteries ○ Setting up battery charge voltage/current limit ○ Checking indicator LEDs or LCD icons on charge controller • Battery cleaning and maintenance • Safer operating conditions to enhance compressor life				
• Protecting milk chiller systems from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm	5 minutes	Audio-visual		INR 20,000 – 30,000
TOTAL COST			**INR 3,50,000 – 4,00,000**	**INR 2,60,000 – 3,50,000**

Level 2

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,80,000-3,70,000.**

Table 31: Duration and Cost for specific e-learning Training Modules for solar milk chillers for farmers in dairy sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Carrying out basic operations and maintenance of the system				
• Solar PV panels inspection ○ Checking regularly shadow creating objects on the PV array during solar time	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000-80,000

○ Periodic visual inspection of the modules ○ Ensure drainage is adequate, roof drains are not clogged ○ Check for corrosion on the outside of enclosures and the racking system ○ Check for cleanliness throughout the site ○ Check for loose hanging wires in the array ○ Check for signs of animal infestation under the array ○ Inspecting PV modules for broken cells and discoloration				
• Solar PV panels cleaning ○ Cleaning frequency of the PV modules twice in a month ○ Using water with apt hardness ○ Using only mild, non-abrasive, non-caustic detergent with deionized water ○ Using micro fiber cloth for cleaning ○ Wiping out residual water from module using rubber wiper	10 minutes	Presentation		INR 60,000-80,000
• Refrigeration unit ○ Setting temperature and monitoring through control panel. ○ Cleaning and first level O&M of the refrigeration system, etc. ○ Turn power off and allow battery to cool before removing ○ Clean battery with a neutralizing detergent solution on a regular basis	5 minutes	Audio-visual		INR 20,000 – 30,000
• Electrical items inspection ○ Cleaning – daily basis ○ Neatly organizing products as per the cooling temperature requirement ○ Checking the temperature at locations appropriate for the stored items ○ Checking evaporator for ice build-up and defrost function is working	10 minutes	Video		INR 80,000-1,00,000

○ Checking compressors for unexpected vibration and oil leakage ○ Checking if door is air-tight and if there is any leakage, cracks or wear and tear in the door ○ Checking proper temperature is maintained when cold room is fully loaded				
• Standard checks of electrical connections ○ Switch off the main power switch and check all startup circuits and control circuits in the cabinet ○ Check whether compressor resistance is normal ○ Check whether the unit is connected to earthing or ground, ○ Check whether the capacity of cable and protector is equal to the unit running demand	10 minutes	Presentation		INR 60,000-80,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,80,000-3,70,000**

Solar Refrigerators

Level 1

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,00,000 – 4,50,000 and cost of designing the training is INR 3,70,000 – 4,70,000.**

Table 32: Duration and Cost for specific e-learning Training Modules for solar refrigerators for farmers in dairy sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Productive use of solar refrigerators				
• Introduction to Solar refrigeration units. ○ What are solar refrigeration units ○ Advantages of solar refrigeration.	5 minutes	Video	INR 4,00,000 – 4,50,000	INR 40,000 – 50,000

• Types of solar based refrigeration units • Understanding the link between the introduction of DRE technologies and dairy production and quality of milk.				
Dairy product category and their respective storage needs ○ Cooling requirements of different types of dairy product. ○ Understanding usage of solar refrigeration unit for storing milk, curd , khoya etc. • Impact of temperature and humidity on dairy products	5 minutes	Presentation		INR 30,000 – 40,000
• Environmental and social benefits offered by solar cold storage solutions	5 minutes	Audio visual		INR 20,000 – 30,000
Module 2.1 – Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and reliable refrigerators in villages.	5 minutes	Audio-visual		INR 20,000 – 30,000
• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Video		INR 40,000 – 50,000
• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies • Requirements of the latest revision of relevant standards of ○ NEC: National Electric Code ○ IEC: International Electro Technical Commission ○ BIS: Bureau of Indian Standards	10 minutes	Presentation		INR 60,000 – 80,000

○ ISO: International Organization for Standardization				
Module 3.1 – Understanding Operational parameters				
• Understanding Operational parameters ○ Refrigeration capacity ○ Storage capacity ○ Humidity ○ Power back up technology ○ Remote monitoring through (desktop or mobile phone)	5 minutes	Presentation		INR 30,000 – 40,000
Module 3.2 – Ensuring safe operation of solar refrigerators				
• Dos and Don'ts while working with batteries ○ Location for battery installation ○ Keeping the battery away from heat source. ○ Keeping them away from mechanical abuse. ○ Combining and connecting batteries ○ Setting up battery charge voltage/current limit ○ Checking indicator LEDs or LCD icons on charge controller ○ Battery cleaning and maintenance	5 minutes	Presentation		INR 30,000 – 40,000
• Protecting solar refrigerators from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm	5 minutes	Doodle Video		INR 1,00,000 – 1,50,000
TOTAL COST			**INR 4,00,000 – 4,50,000**	**INR 3,70,000 – 4,70,000**

Level 2

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,80,000-3,60,000.**

Table 33: Duration and Cost for specific e-learning Training Modules for solar refrigerators for farmers in dairy sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training[6]
Module 1.1 – Installation and setting up solar refrigerators				
• Site selection and preparation • Electrical and plumbing connections. • Compliance with safety and hygiene standards	5 minutes	Video	INR 3,00,000 – 3,50,000	INR 40,000-50,000
Module 1.2 – Carrying out basic operations and maintenance of the system				
• Solar PV panels inspection ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ First level O&M of solar PV panel	5 minutes	Video		INR 40,000-50,000
• Solar PV panels cleaning ○ Cleaning the PV modules during early morning or late afternoon ○ Using water with apt hardness Using only mild, non-abrasive, non-caustic detergent with deionized water ○ Using micro fiber cloth to remove stubborn dirt and rinsing with plenty of water ○ Wiping out residual water from module using rubber wiper	10 minutes	Presentation		INR 60,000-80,000
• Refrigeration unit ○ Refrigeration unit key components.	10 minutes	Presentation		INR 60,000-80,000

[6] Cost provided for video content for up to 3-min doodle videos and full day video filming (8 hours); 2D, audio text, visual, info graphics, and voice-over

○ Setting temperature and monitoring through control panel. ○ Cleaning and first level O&M of the system (condensing unit, defrosting the system, etc.) ○ Battery disposal after use				
• Electrical items inspection ○ Cleaning – daily basis ○ Neatly organizing products as per the cooling temperature requirement ○ Checking the temperature at locations appropriate for the stored items ○ Checking evaporator for ice build-up and defrost function is working ○ Checking compressors for unexpected vibration and oil leakage ○ Checking if door is air-tight and if there is any leakage, cracks or wear and tear in the door ○ Checking proper temperature is maintained when cold room is fully loaded	10 minutes	Video		INR 80,000-1,00,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,80,000-3,60,000**

Solar Milking Machine

Level 1

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 3,30,000 – 4,30,000.**

Table 34 Duration and Cost for specific e-learning Training Modules for solar milking machine for farmers in dairy sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing

				the training[7]
Module 1.1 – Productive use of solar milking machine				
• Understanding the link between the introduction of DRE technologies and dairy production and quality of milk. • Introduction to Solar milking machine. • What is solar milking machine • Advantages of solar milking machine over conventional methods. • Components of solar milking machine	5 minutes	Video	INR 3,50,000 – 4,00,000	INR 40,000-50,000
• Understanding milking technique • Types of milking system, bucket vs pipeline	5 minutes	Presentation		INR 60,000 – 80,000
• Environmental and social benefits offered by solar milking machine	5 minutes	Presentation		
Module 2.1 – Assessment of parameters for making vendor selection				
Work performance experience of vendor to determine its ability to install safe and reliable milking machines on dairy farmland.	5 minutes	Video		INR 40,000-50,000
Vendor's understanding of structural requirements (e.g. weight, solar radiation, etc.)	5 minutes	Presentation		INR 30,000-40,000
• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies	10 minutes	Presentation		INR 60,000-80,000
Module 3.1 – Understanding Operational Parameters				
Understanding Operational parameters such as • Milking rate(l/hr) • Milking volume(l) • Thermal battery • Power consumption • Solar system capacity (Milking machine, chaff cutter and pressure pump)	5 minutes	Presentation		INR 30,000-40,000
Module 3.2 – Operation of solar milking machine				
• Machine operation during battery failure. • Replacement components such as battery, motor and vacuum pumps	5 minutes	Presentation		INR 30,000-40,000

[7] Cost provided for video content for up to 3-min doodle videos and full day video filming (8 hours); 2D, audio text, visual, info graphics, and voice-over

• Protecting solar refrigeration systems from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm	5 minutes	Video		INR 40,000-50,000
TOTAL COST			**INR 3,50,000 – 4,00,000**	**INR 3,30,000-4,30,000**

Level 2

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 2,50,000 – 3,00,000 and cost of designing the training is INR 1,30,000 – 1,70,000.**

Table 35 Duration and Cost for specific e-learning Training Modules for solar milking machine for farmers in dairy sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training[8]
Module 1.1 – Installation and setting up solar milking machine				
• Site selection and preparation • Electrical and plumbing connections. • Compliance with safety and hygiene standards	5 minutes	Presentation	INR 2,50,000 – 3,00,000	INR 30,000-40,000
Module 2.1 – Carrying out basic operations and maintenance of the system				
• Solar PV panels inspection ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ First level O&M of solar PV panel	5 minutes	Video		INR 40,000-50,000
Milking unit operation • Milking machine key components	10 minutes	Presentation		INR 60,000-80,000

[8] Cost provided for video content for up to 3-min doodle videos and full day video filming (8 hours); 2D, audio text, visual, info graphics, and voice-over

• Checking vacuum level before starting milking operation • Cup connection and maintaining the flow rate of milk in the system • Battery disposal after use • Pumping duration after and before use • Cleaning the pumping unit after use • Checking pipelines and interceptor are free from milk or water				
TOTAL COST			**INR 2,50,000 – 3,00,000**	**INR 1,30,000-1,70,000**

Service Providers / Product Developers / Rural Entrepreneurs

Solar Milk Chillers

Level 1

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 3,05,000 – 4,00,000.**

Table 36: Duration and Cost for specific e-learning Training Modules for solar milk chillers for Service Providers / Product Developers / Rural Entrepreneurs in dairy sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Economic Benefits of solar milk chiller				

• Understanding Business models
  ○ Storage co-operatives for facilitating storage and distribution of dairy product within co-operative network
  ○ Self-investment/ RESCO model for milk chiller plant
  ○ Aggregation based business model for group of farmers
	10 minutes	Presentation	INR 3,50,000 – 4,00,000	INR 75,000 – 1,00,000

• Understanding savings
  ○ Understanding cost benefit analysis using solar power
  ○ Understanding energy saving based on future projection
	5 minutes	Presentation		

• Understanding project economics	5 minutes	Presentation		INR 30,000 – 40,000

○ Comparative analysis of profitability of farmers with respect to conventional milk chilling methods ○ Cost benefits due to nearby milk collection center and solar milk chiller plant ○ Economic benefit using aggregation-based business model				
Module 1.2 – Solar milk chiller/ Marketing and Branding				
• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need with conventional methods and what price they are paying? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer?	10 minutes	Presentation		INR 60,000 – 80,000
• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.	5 minutes	Video		INR 40,000 – 50,000
• Knowing your own product modalities ○ Specifications, uses and limitations ○ O&M and troubleshooting to be managed locally ○ Availability of spare parts ○ Expected Life of DRE based solution used ○ Guarantee/ warrantee of the key DRE components	10 minutes	Presentation		INR 60,000 – 80,000
• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing	5 minutes	Video		INR 40,000 – 50,000

○ Local aggregators for awareness				
TOTAL COST			**INR 3,50,000 – 4,00,000**	**INR 3,05,000 – 4,00,000**

Level 2

A total effort estimation of developing training content has been taken as one working month (22 days). Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 2,60,000 – 3,30,000.**

Table 37: Duration and Cost for specific e-learning Training Modules for solar Deep milk chillers for Service Providers / Product Developers / Rural Entrepreneurs in dairy sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Designing a solar milk chiller				
• PV system sizing /installation ○ Site assessment and feasibility check. ○ No of PV panels required ○ 25 Year simulation results from secondary software and estimation of best- and worst-case scenarios based on weather data and user profiles ○ New technology such as mono perc/ bifacial PV module selection for more efficiency ○ Calculate storage and autonomy requirement – Thermal battery or electrical battery ○ PV array sizing, selection of inverter and BOS component design ○ DC and AC cable sizing in line with voltage drop less than 2%	10 minutes	Descriptive presentation	INR 3,50,000 – 4,00,000	INR 60,000 – 80,000
• Design for solar milk chiller ○ Sizing of milk tank and rated volume ○ Thermal Storage with cooling backup and integration with existing infrastructure. ○ Latest generation photovoltaic panels & condensing unit	15 minutes	Descriptive presentation		INR 60,000 – 80,000

○ Knowing the exact purpose and cooling requirement of the cold storage by potential. ○ Earthing and lightening protection ○ Compressor (Rated cooling at 5ºC evaporating and 40ºC condensing temperatures) ○ Assessment of cooling load and auxiliary electricity demand ○ Control panel : LCD display for monitoring thermal storage and milk temperature with following user controls ▪ Set point temperature control for milk ▪ Auto/Manual cooling switch ▪ Auto/Manual agitator switch				
Module 1.2 Conducting test runs of solar milk chiller units				
• Testing thermal Energy Storage (TES) system capacity and Performance. • PV module conforms to IEC 61730-requirements for testing for safety qualification • All PV modules should have STC testing certificate from an NABL accredited test laboratory • Conducting tests like earth continuity tests, insulation, heat run as per relevant standards • Cable testing to figure out any corrosion, insulation failure and short circuit current due to any leakage	5 minutes	Video		INR 40,000 – 50,000
Module 2.1 Understanding supply chain considerations				
• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Raw material requirement and sourcing ○ Logistics chain ○ Technology reliability trends	5 minutes	Presentation		INR 1,00,000 – 1,20,000

• Supplier Assessment: ○ Setting clear objectives and vision ○ Assessing identified supplier options ○ Inventory costs ○ Bargaining power ○ Quality & safety ○ Assessing risks ○ Agility including vendor's ability to respond to changes in demand with respect to volume and variety	10 minutes			
• Development of Supplier Selection & Ranking System: ○ Organization and operational background ○ Financial strength - market standing and prospects, credit rating, clientele, etc. ○ Product development such as product range, R&D, Quality management, degree of automation, etc. ○ Manufacturing process ○ Cost competitiveness in the market ○ After-sales support ○ Logistics tie-ups	10 minutes			
TOTAL COST			**INR 3,50,000 – 4,00,000**	**INR 2,60,000 – 3,30,000**

Solar Refrigerators

Level 1

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,90,000 – 3,80,000.**

Table 38: Duration and Cost for specific e-learning Training Modules for solar refrigerators for Service Providers / Product Developers / Rural Entrepreneurs in dairy sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Economic Benefits of solar refrigerators				
• Understanding Business models ○ Storage as a service ○ Storage and logistic solution/.	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000 – 80,000

○ Storage co-operatives for facilitating storage and distribution of dairy product within co-operative network ○ Independent solar refrigeration facility ○ Integrated dairy processing and solar refrigeration facility.				
• Understanding concept of shelf life. • How milk spoilage and rejection % is reduced?	5 minutes	Presentation		
Understanding economics and benefits ○ What are the value additions for using solar refrigerators? ○ How is profitability of farmers improved?	5 minutes	Presentation		INR 30,000 – 40,000
Module 1.2 – Solar refrigeration/ Marketing and Branding				
• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer?	10 minutes	Presentation		INR 60,000 – 80,000
• Understanding documentation ○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.	5 minutes	Video		INR 40,000 – 50,000
• Knowing your own product modalities	10 minutes	Presentation		INR 60,000 – 80,000

○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee				
• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing	5 minutes	Video		INR 40,000 – 50,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,90,000 – 3,80,000**

Level 2

A total effort estimation of developing training content has been taken as one working month (22 days). Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,00,000 – 4,50,000 and cost of designing the training is INR 3,35,000 – 4,30,000.**

Table 39: Duration and Cost** for specific e-learning **Training Modules for solar refrigerators for Service Providers / Product Developers / Rural Entrepreneurs in dairy sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Designing a solar refrigerators				
• PV system sizing /installation ○ Mounting options for solar panels ○ Site assessment and feasibility check. ○ No of panels required for a solar refrigerator ○ Year simulations and estimation of best- and worst-case scenarios based on weather data and user profiles ○ Power requirement of solar panels.	15 minutes	Descriptive presentation	INR 4,00,000 – 4,50,000	INR 75,000 – 1,00,000

○ Efficiency of solar PV Panels. ○ Solar resource assessment (including 'no sun' equivalent days) ○ Calculate storage and autonomy requirement – Thermal battery or electrical battery ○ PV array sizing, selection of inverter and BOS component design				
• Design for refrigerator ○ Knowing the exact purpose and cooling requirement of the cold storage by potential. ○ System configuration ○ Backup system and integration with existing infrastructure. ○ Assessment of cooling load and auxiliary electricity demand ○ Identifying compressor capacity suitable for solar refrigerator	10 minutes	Presentation		INR 60,000 – 80,000
Module 1.2 Conducting test runs of solar refrigeration units				
• Testing thermal Energy Storage (TES) system capacity and Performance. • Solar Performance Testing- Simulator Based • Testing with produce/ without produce • Conducting tests like earth continuity tests, insulation, heat run as per relevant standards	5 minutes	Video		INR 40,000 – 50,000
Module 2.1 Understanding supply chain considerations				
• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Raw material requirement and sourcing ○ Logistics chain ○ Technology reliability trends	5 minutes			

• Supplier Assessment: ○ Setting clear objectives and vision ○ Assessing identified supplier options ○ Inventory costs ○ Bargaining power ○ Quality & safety ○ Assessing risks ○ Agility including vendor's ability to respond to changes in demand with respect to volume and variety	10 minutes	Presentation		INR 1,00,000 – 1,20,000
• Development of Supplier Selection & Ranking System: ○ Organization and operational background ○ Financial strength - market standing and prospects, credit rating, clientele, etc. ○ Product development such as product range, R&D, Quality management, degree of automation, etc. ○ Manufacturing process ○ Cost competitiveness in the market ○ After-sales support ○ Logistics tie-ups	10 minutes			
Module 2.2 Quality Assurance and Compliance				
• Understanding the quality standards applicable in solar refrigeration sector: ○ Offering system warranty ○ Offering solar panel warranty as per national standards ○ Proper use of thermal insulation in refrigerators ○ Applicable technical standards	10 minutes	Presentation		INR 60,000 – 80,000
TOTAL COST			**INR 4,00,000 – 4,50,000**	**INR 3,35,000 – 4,30,000**

Solar Milking Machine

Level 1

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,00,000 – 2,70,000.**

Table 40 Duration and Cost for specific e-learning Training Modules for solar milking machine for Service Providers / Product Developers / Rural Entrepreneurs in dairy sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training[9]
Module 1.1 – Economic Benefits of solar milking machine				
Understanding economics and benefits ○ What are the value additions for using solar milking machine? ○ How is profitability of farmers improved? ○ Understanding quality, hygiene and cows' health while using milking machine	5 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 30,000-40,000
Module 1.2 – Solar milking machine (marketing and branding)				
• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer?	10 minutes	Presentation		INR 60,000-80,000
• Understanding documentation • Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.	5 minutes	Presentation		INR 30,000-40,000
• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life • Guarantee/ warrantee	10 minutes	Presentation		INR 60,000-80,000

[9] Cost provided for video content for up to 3-min doodle videos and full day video filming (8 hours); 2D, audio text, visual, info graphics, and voice-over

• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. • Word-of-mouth Marketing	5 minutes	Audio-visual		INR 20,000-30,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,00,000-2,70,000**

Level 2

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 3,35,000 – 4,40,000.**

Table 41: Duration and Cost for specific e-learning Training Modules for solar milking machine for Service Providers / Product Developers / Rural Entrepreneurs in dairy sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training[10]
Module 1.1 – Designing a solar milking machine				

• PV system sizing /installation
  ○ Mounting options for solar panels
  ○ Site assessment and feasibility check.
  ○ No of panels required for a solar milking machine.
  ○ Power requirement of solar panels.
  ○ Calculate storage and autonomy requirement – Thermal battery or electrical battery
  ○ PV array sizing, selection of inverter and BOS component design
	15 minutes	Presentation	INR 3,50,000 – 4,00,000	INR 75,000-1,00,000

• Design solar milking machine ○ Knowing the exact purpose and assembling the components of milking machine.	10 minutes	Video		INR 80,000 – 1,00,000

[10] Cost provided for video content for up to 3-min doodle videos and full day video filming (8 hours); 2D, audio text, visual, info graphics, and voice-over

○ Understanding vacuum pump power requirements ○ System configuration ○ Backup system and integration with existing infrastructure. ○ Adjusting vacuum fluctuations in the system				
Module 1.2 Conducting test runs of solar milking machine				
• Testing thermal Energy Storage (TES) system capacity and Performance. • Solar Performance Testing- Simulator Based • Testing with produce/ without produce • Conducting tests like earth continuity tests, insulation, as per relevant standards	5 minutes	Presentation		INR 30,000-40,000
Module 2.1 Understanding supply chain considerations				
• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Raw material requirement and sourcing ○ Logistics chain	5 minutes	Presentation		INR 30,000-40,000
• Raw Material Supplier Assessment: ○ Setting clear objectives and vision ○ Assessing identified supplier options ○ Inventory costs ○ Bargaining power ○ Quality & safety ○ Assessing risks	10 minutes	Presentation		INR 60,000-80,000
Module 2.2 Quality Assurance and Compliance				
• Understanding the quality standards applicable in solar milking machine ○ Offering system warranty ○ Offering solar panel warranty as per national standards ○ SPV Safety Qualification for Construction & Testing	10 minutes	Presentation		INR 60,000-80,000

○ Following ISO Standard 5707- Construction and Performance				
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 3,35,000-4,40,000**

6.3. Fishery Sector

Farmers

Solar Aerators

Level 1

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,00,000 – 4,50,000 and cost of designing the training is INR 3,70,000 – 4,80,000.**

Table 42: Duration and Cost for specific e-learning Training Modules for solar aerators for farmers in fishery sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Use of solar aerators for fishponds				
• Introduction to solar aerators and its uses in fish farming and cultivation • Types of solar aerators ○ Vertical Pump Aerators ○ Pump Sprayers Aerators ○ Propeller-aspirator pumps ○ Paddle wheel aerators ○ Diffused-air systems • Understanding the link between the introduction of solar aerators and fish cultivation ○ Increasing the dissolved oxygen levels in the fish farm ○ Increasing the productivity ○ Improving the produce quality ○ Reducing the formation of algae, unwanted bacteria etc.	5 minutes	Video	INR 4,00,000 – 4,50,000	INR 40,000 – 50,000
• Environmental and social benefits offered by solar powered aerators over conventional aerators	5 minutes	Presentation		INR 30,000-40,000

• Fish breeding after solar PV installation on ponds
  ○ Benefits of solar panels on
  ▪ water quality
  ▪ presence of algae, phosphorus and unwanted bacteria
  ○ Removal of foul odors from a pond
	5 minutes	Video		INR 40,000 – 50,000

Module 1.2 –Protecting solar aerator				

• Protecting solar aerators from theft / robbery
  ○ Use of solar panel lock
  ○ Use of fence / barbed wires
  ○ Use of pop rivets / blind rivets / to enhance security
  ○ Gluing, Welding or Sealing the Panels / linking racks
  ○ Use of alarm
	5 minutes	Video		INR 40,000 – 50,000

Module 2.1 – Sizing of solar aerators				

• Proper aeration system selection is based on several factors including the following:
  ○ Fish tank/ pond size
  ○ Fish tank/ pond depth
  ○ Power source availability
  ○ Aeration type (i.e., emergency or continuous)
  ○ Aerator efficiency
  ○ Water quality, ambient temperature, air requirement, etc.
  ○ Impact on cost of the system
• Case study analysis (examples from different use cases in India)
	10 minutes	Presentation		INR 60,000-80,000

Module 2.2 - Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and reliable solar aerators	5 minutes	Video		INR 40,000 – 50,000
• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Presentation		INR 60,000-INR 80,000

• Availability of quality management plan with the vendor covering:
  ○ System equipment testing
  ○ Inspection protocol
  ○ Design best practices
  ○ Safety policies
	10 minutes			

Module 3.1 - Business Model Guidance				
• Understanding business models	10 minutes	Presentation		INR 60,000 – 80,000

○ Different business models available in the market (e.g., capex model, EMI model, etc.) ○ Investment required for buying and running the aerators powered from solar ○ Need for community ownership model practices ○ Knowledge dissemination on bankable business models where loan can be availed from the market • Understanding project benefits ○ Awareness about payback period and ROI calculation • Net savings of end users with respect to DRE solutions				
TOTAL COST			**INR 4,00,000 – 4,50,000**	**INR 3,70,000 – 4,80,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,30,000 – 3,00,000.**

Table 43: Duration and Cost for specific e-learning Training Modules for solar aerators for farmers in fishery sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – System sizing and installation				
• Sizing of solar powered aerators • Proper aeration system selection is based on several factors including the following- fish tank/ pond size, fish tank/ pond depth, power source availability, aeration type (i.e., emergency or continuous), aerator efficiency etc. • Technical Assessment including power requirement by aerators ○ Optimization of aerators requirement and load ○ Solar panel sizing for powering the aerators ○ Installation of solar powered aerators	15 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 75,000 – 1,00,000

• Selection of site and assessment
• Mounting options for solar panels
  ○ No of panels required for a solar aerators.
  ○ Power requirement of solar panels.
  ○ Efficiency of solar PV Panels.
  ○ Solar resource assessment (including 'no sun' equivalent days)
• PV array sizing, selection of inverter and BOS component design				

Module 1.2 – Carrying out basic operations and maintenance of the system				

• Solar PV panels
  ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time
  ○ Keeping the area around the water source and PV array neat and clean
  ○ Inspecting PV modules for broken cells and discoloration
  ○ Cleaning the PV modules during early morning or late afternoon
  ○ Using water with hardness less than 75 ppm to clean the PV modules
  ○ Using only mild, non-abrasive, non-caustic detergent with deionized water
  ○ Using microfiber cloth to remove stubborn dirt and rinsing with plenty of water
• Wiping out residual water from module using rubber wiper
	15 minutes	Presentation		INR 75,000 – 1,00,000

• System components
  ○ Cleaning of drying surface
  ○ Cleaning the UV sheet (where applicable) and tray with a clean dump cloth
  ○ Cleaning the mesh after every use
  ○ Performing visual checks of the condition of the aerator components
  ○ Checking that the trays are not torn on the mesh
  ○ Checking that the mesh liners are not blocked
	10 minutes	Video		INR 80,000 – 1,00,000

TOTAL COST	**INR 3,00,000 – 3,50,000**	**INR 2,30,000 – 3,00,000**

Solar Dryer

Level 1

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,00,000 – 4,50,000 and cost of designing the training is INR 3,80,000 – 5,00,000.**

Table 44: Duration and Cost for specific e-learning Training Modules for solar dryer for farmers in fishery sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Understanding basics of solar dryer and it's uses				

• Introduction to the basic fisheries value chain
• Types of solar dryers available in the market:
  ○ direct drying (solar box dryer)
  ○ indirect drying (solar cabinet dryer)
  ○ mixed mode drying (solar tunnel dryer)
  ○ hybrid drying (hybrid solar cabinet dryer)
• Explaining the usage of solar dryer in the fisheries value chain
	10 minutes	Presentation	INR 4,00,000 – 4,50,000	INR 60,000-INR 80,000

• Moisture content in the various sea produce and the type of solar dryer suitable basis the composition
• Understanding the key parts of solar dryers
  ○ Solar collector
  ○ Drying chamber
  ○ Absorber
  ○ Ventilation holes
• Any other key part depending on the type of solar dryer
	10 minutes	Video		INR 80,000 – 1,00,000

Module 1.2 – Protecting DRE systems				

• Protecting solar dryers from theft / robbery
  ○ Use of solar panel lock
  ○ Use of fence / barbed wires
	5 minutes	Video		INR 40,000 – 50,000

○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm				
Module 2.1 –Understanding the performance parameters of solar dryers				
• Understanding the key components of a solar dryer – solar panels, cover, design, air flow, stand, absorber tray, etc.)	5 minutes	Presentation		INR 60,000 – 80,000
• Moisture removal rate of solar dryers • Baseline moisture content of sea foods ○ More than 75% (Ex. Shrimp has moisture >80%, fishes>75%) • Moisture content after solar drying • Typically around 10-15%	5 minutes			
• What is the right drying efficiency? • What should be the drying rate	5 minutes	Audio visual		INR 20,000 – 30,000
Module 2.2 - Assessment of parameters for making vendor selection				
• The services and technologies being offered by vendor • Understanding of the aftersales service and O&M support provided by the vendor • Work performance experience of vendor to determine its ability to install safe and reliable solar dryers • Vendor's understanding of structural requirements (e.g., weight, wind, solar radiation, etc.)	10 minutes	Presentation		INR 60,000 – 80,000
Module 2.3 – Understanding the business models for use of solar dryers				
• Introduction to different business models for solar dryers • Investment required for buying and running the solar dryers • Introduction to the cost benefit analysis, RoI and payback period • Ways of financing the solar dryers	10 minutes	Presentation		INR 60,000 – 80,000
TOTAL COST			**INR 4,00,000 – 4,50,000**	**INR 3,80,000 – 5,00,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 1,60,000 – 2,10,000.**

Table 45: Duration and Cost for specific e-learning Training Modules for solar dryers for farmers in fishery sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Fabrication of solar Dryer				
• Understanding solar dryer components ○ Type of glass used and it's placement ○ Types of material for stand ○ Understanding of different designs of solar dryers ○ Placement of solar dryer for maximum radiation	15 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000 – 80,000
• System components ○ Cleaning of drying surface ○ Cleaning the UV sheet (where applicable) and tray with a clean dump cloth ○ Cleaning the mesh after every use ○ Performing visual checks of the condition of the dryer components ○ Checking that the trays are not torn on the mesh ○ Checking that the mesh liners are not blocked	10 minutes	Video		INR 80,000 – 1,00,000
• O&M of solar dryer ○ Frequency of O&M • Role of vendor selection for claiming warranty	5 minutes	Audio visual		INR 20,000 – 30,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 1,60,000 – 2,10,000**

Solar Cold Storage

Level 1

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 4,60,000 – 6,10,000.**

Table 46: Duration and Cost for specific e-learning Training Modules for solar cold storage for farmers in fishery sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Use of solar cold storage solutions for inland fish farming				

• Types of solar cold storages
  ○ Solar cold storage with battery storage
  ○ Solar cold storage with phase change material (PCM) storage
  ○ Solar cold storage with thermal storage
• Understanding the link between the introduction of solar cold storage and productivity, livelihoods and food security
	5 minutes	Presentation	INR 4,50,000 – 5,00,000	INR 60,000 – 80,000

• Environmental and social benefits offered by solar cold storage solutions	5 minutes	Presentation		
Module 1.2 – Installation of solar cold storages				

• Pre-installation
  ○ Site preparation document/ design (kind of civil work required)
  ○ Understanding the BoM and the components of the cold storage
  ○ Installation best practices
• During Installation
  ○ Understand the roles of tech vendors and other technical support
  ○ Understand the warranties given and how & when they can be availed
  ○ Dos and don'ts
  ○ Safety components and explaining what needs to be done in these cases (fire, thunder storm, overcast, flood, etc.)
• Post Installation
  ○ Capturing problems and mitigation plan
  ○ Regular maintenance guide of the system (cleaning, regular check-ups, etc.)- daily, weekly, monthly
	15 minutes	Presentation		INR 80,000 – 1,00,000

Module 1.3 – Protecting solar cold storage systems				

• Dos and Don'ts while working with batteries ○ Location for battery installation ○ Combining and connecting batteries ○ Acid spill cleanup material to be readily available ○ Verifying electrolyte levels (adding distilled water as necessary) ○ Measuring specific gravity ○ Setting up battery charge voltage/current limit ○ Checking indicator LEDs or LCD icons on charge controller ○ Battery cleaning and maintenance	5 minutes	Presentation		INR 30,000 – 40,000
• Protecting solar cold storage systems from theft / robbery ○ Use of solar panel lock ○ Use of fence / barbed wires ○ Use of pop rivets / blind rivets / to enhance security ○ Gluing, Welding or Sealing the Panels / linking racks ○ Use of alarm	5 minutes	Doodle Video		INR 1,00,000 – 1,50,000
Module 2.1 – Assessment of parameters for making vendor selection				
• Work performance experience of vendor to determine its ability to install safe and reliable solar cold storage	5 minutes	Video		INR 40,000 – 50,000
• Vendor's understanding of structural requirements (e.g. weight, wind, solar radiation, etc.)	5 minutes	Presentation		INR 30,000 – 40,000
• Availability of quality management plan with the vendor covering: ○ System equipment testing ○ Inspection protocol ○ Design best practices ○ Safety policies	5 minutes	Video		INR 40,000 – 50,000
Module 3.1 - Business Model Guidance				
• Understanding business models ○ Different business models available in the market (e.g., capex model, EMI model, etc.) ○ Investment required for buying and running the aerators powered from solar ○ Need for community ownership model practices	15 minutes	Presentation		INR 80,000 – 1,00,000

○ Knowledge dissemination on bankable business models where loan can be availed from the market • Understanding project benefits ○ Awareness about payback period and ROI calculation • Net savings of end users with respect to DRE solutions				
TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 4,60,000 – 6,10,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,60,000 – 3,30,000.**

Table 47: Duration and Cost for specific e-learning Training Modules for solar cold storages for farmers in fishery sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Solar Cold Storage Sizing and Installation				
• Site selection and preparation • Compliance with safety and hygiene standards • Understanding components of the cold storage • Installation best practices- pictorial representation of the components and on other best practices in visual format	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000 – 80,000
• Dos and don'ts- before storage, what happens during overcast, door operating best practice, storage best practice, pre-cooling, cleaning, etc. • Understand and check the BoM and quality of material received • Documents (warranty card, bills, service records, other FAQs and documents on site videos, posters, etc.)	5 minutes	Video		INR 40,000 – 50,000
Module 1.2 – Carrying out basic operations and maintenance of the system				

• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time ○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ Cleaning the PV modules during early morning or late afternoon ○ Using water with hardness less than 75ppm to clean the PV modules ○ Using only mild, non-abrasive, non-caustic detergent with deionized water ○ Using micro fiber cloth to remove stubborn dirt and rinsing with plenty of water ○ Wiping out residual water from module using rubber wiper	15 minutes	Presentation		INR 80,000 – 1,00,000
• Electrical items ○ Cleaning – daily basis ○ Neatly organizing products as per the cooling temperature requirement ○ Checking the cold room temperature at locations appropriate for the stored items ○ Checking evaporator for ice build-up and defrost function is working ○ Checking compressors for unexpected vibration and oil leakage ○ Checking if door is air tight and if there is any leakage, cracks or wear and tear in the door ○ Checking if there any damage or cracks to insulation at any place of the cold room ○ Checking proper temperature is maintained when cold room is fully loaded	15 minutes	Presentation		INR 80,000 – 1,00,000

TOTAL COST	INR 3,00,000 – 3,50,000	INR 2,60,000 – 3,30,000

Solar Water Pumps

Level 1

A total effort estimation of developing training content has been taken as 10 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 4,80,000 – 6,30,000.**

Table 48: Duration and Cost for specific e-learning Training Modules for solar pumps for farmers in fishery sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Use of solar water pumps on fish farms				

• Types of solar water pumps
  ○ AC / DC
  ○ Submersible / surface pumps
• Understanding the link between the introduction of solar water pumps and productivity and livelihood development
• High volume of water pumping requirement in aquaculture
	5 minutes	Video	INR 4,50,000 – 5,00,000	INR 80,000 – 1,00,000

• Economic, environmental and social benefits offered by solar water pump solutions vs diesel pumps
  ○ Cost-effective offered by solar water pumps in the long-run and in terms of reduced production cost
  ○ Growth potential and profitability options
  ○ Ease of shifting from diesel-based pumps to solar based water pumps
	5 minutes	Video		

Module 2.1 – Effective installation of solar water pumps in hilly areas				

• Whether to use a submersible pump where the water is collected in the collection tank or a surface pump where water is directly used to fill the pond
  ○ Maximum pump head
  ○ Discharge rate
	15 minutes	Scenario-based presentations		INR 80,000 – 1,00,000

• Deciding the capacity of storage tank based on the desired number of days of autonomy • Impact on insurance costs				
• Anchoring solar panels to prevent collapse or movement in hilly areas • Desired tilt of solar panels	5 minute	Doodle video		INR 1,00,000 – 1,50,000
Module 2.2 – Sizing of solar water pumps				
• Size of the array and its dependence on the power needed for the pump ○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate ○ Estimating the irrigation demand ○ Calculating the peak discharge ○ Head requirements ○ Impact on cost of the system	10 minutes	Descriptive presentation with key points on system sizing		INR 60,000 – 80,000
• Availability of pump sizing tools that can be used ○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE ○ Checking the sizing options with the vendor	5 minutes	Video		INR 80,000 – 1,00,000
Case study analysis (examples from different use cases in India)	5 minutes	Video		
Module 3.1 – Business model guidance				
• Existing business models in the market based on the value proposition of supplying water to smallholder farmers for fish production and breeding ○ Capex model ○ Water as a service model ○ Lease to own model / staggered payment model • Parameters to assess suitability of existing business models in the farmers' context ○ Analysis of potential gains and benefits to farmers from each model ○ Suitability mapping (biophysical factors, water availability, infrastructure, etc.) ○ Economic sustainability	10 minutes	Video		INR 80,000 – 100,000

▪ Productivity analysis (fish, shrimp, prawns, etc.) ▪ Return on investment ▪ Payback period				
TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 4,80,000 – 6,30,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 3,20,000 – 4,30,000.**

Table 49: Duration and Cost for specific e-learning Training Modules for solar water pumps for farmers in fishery sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Water demand assessment for selecting a solar water pump				
• Estimating daily water demand in each month based on end application ○ Considering variation of water demand based on end application ○ Considering water supply needs in the future	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000 – 80,000
• Water distribution requirement assessment ○ Considering existing storage facility for short-term and long-term storage ○ Considering the water delivery points based on application and purpose ○ Avoiding more joints and elbows in pipe lines ○ Selecting an appropriate and effective distribution system for fish farming, aquaculture purposes, etc.	10 minutes	Video		INR 80,000 – 100,000
Module 1.2 – Carrying out basic operations and maintenance of the system				
• Solar PV panels ○ Checking regularly that no object or tree/ bush cast shadows on the PV array during solar time	15 minutes	Presentation		INR 80,000 – 1,00,000

○ Keeping the area around the water source and PV array neat and clean ○ Inspecting PV modules for broken cells and discoloration ○ Cleaning the PV modules during early morning or late afternoon ○ Using water with hardness less than 75ppm to clean the PV modules ○ Using only mild, non-abrasive, non-caustic detergent with deionized water ○ Using micro fiber cloth to remove stubborn dirt and rinsing with plenty of water ○ Wiping out residual water from module using rubber wiper				
• Electrical items ○ Visually checking all conduit and wire insulation for damage ○ Checking for loose, broken, corroded, or burnt wiring connections	5 minutes	Doodle Video		INR 1,00,000 – 1,50,000
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 3,20,000 – 4,30,000**

Service Providers / Product Developers / Rural Entrepreneurs

Solar Aerators

Level 1

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,00,000 – 4,50,000 and cost of designing the training is INR 3,60,000 – 4,80,000.**

Table 50: Duration and Cost for specific e-learning Training Modules for solar aerators for Service Providers / Product Developers / Rural Entrepreneurs in fishery sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Economic Benefits of solar aerators				

• Understanding Business models
  ○ Investment required for buying and running the aerators powered from solar
  ○ Self-investment/ RESCO model for solar aerators
  ○ Aggregation based business model for group of farmers/ women self-help groups
	10 minutes	Presentation	INR 4,00,000 – 4,50,000	INR 60,000 – 80,000

Understanding savings • Understanding cost benefit analysis using solar power • Understanding energy saving based on future projection	5 minutes	Presentation		INR 60,000 – 80,000

Understanding project economics
  ○ Comparative analysis of profitability with respect to conventional sources
  ○ Breakeven Analysis of the rural enterprise to understand profitability
  ○ Estimation of NPV and IRR and financial viability of the project
	5 minutes	Presentation		

Module 1.2 – Marketing and Branding				

• Understanding customer need
  ○ Objective of the customer – what is the specific need?
  ○ How do they fulfil the present need with conventional methods and what price they are paying?
  ○ What is the future growth possibility?
  ○ Which business model will be the most suitable?
• What are the objections and clarifications received from the customer?
	10 minutes	Presentation		INR 60,000 – 80,000

• Understanding documentation • Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.	5 minutes	Video		INR 40,000 – 50,000

• Knowing your own product modalities
  ○ Specifications, uses and limitations
  ○ O&M and troubleshooting to be managed locally
  ○ Availability of spare parts
	10 minutes	Presentation		INR 60,000 – 80,000

○ Expected Life of DRE based solution used ○ Guarantee/ warrantee of the key DRE components				
• Potential strategic partnerships at the local level ○ Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, etc. ○ Word-of-mouth Marketing ○ Local aggregators for awareness	5 minutes	Audio visual		INR 20,000 – 30,000
Module 1.3 - Institutional Structure				
○ Types of legal structures that can be adopted by rural enterprise ○ Relevance of each of the structure for rural enterprise ○ Advantages and disadvantages of different structures	10 minutes	Presentation		INR 60,000 – 80,000
TOTAL COST			**INR 4,00,000 – 4,50,000**	**INR 3,60,000 – 4,80,000**

Level 2

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 2,80,000 – 3,70,000.**

Table 51: Duration and Cost for specific e-learning Training Modules for solar aerators for Service Providers / Product Developers / Rural Entrepreneurs in fishery sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 2.1 – Designing a solar powered aerator				
• PV system sizing /installation ○ Site assessment and feasibility check. ○ No of PV panels required ○ 25 Year simulation results from secondary software and estimation of best- and worst-case scenarios based on weather data and user profiles	10 minutes	Descriptive Presentation	INR 3,50,000 – 4,00,000	INR 60,000 – 80,000

○ New technology such as mono perc/ bifacial PV module selection for more efficiency ○ Calculate battery energy storage and autonomy requirement – Thermal battery or electrical battery ○ PV array sizing, selection of inverter and BOS component design ○ DC and AC cable sizing in line with voltage drop less than 2%				
Module 2.2 Understanding supply chain considerations				
• Analysis of critical supply chain components: ○ Assessing market conditions and determining business needs ○ Identifying major players such as component manufacturers, assemblers, distributors, retailers, etc. ○ Raw material requirement and sourcing ○ Logistics chain ○ Technology reliability trends	5 minutes	Video		INR 40,000 – 50,000

• Supplier Assessment:
  ○ Setting clear objectives and vision
  ○ Assessing identified supplier options
  ○ Inventory costs
  ○ Bargaining power
  ○ Quality & safety
  ○ Assessing risks
• Agility including vendor's ability to respond to changes in demand with respect to volume and variety
	10 minutes	Presentation		INR 60,000 – 80,000

• Development of Supplier Selection & Ranking System:
  ○ Organization and operational background
  ○ Financial strength - market standing and prospects, credit rating, clientele, etc.
  ○ Product development such as product range, R&D, Quality management, degree of automation, etc.
  ○ Manufacturing process
  ○ Cost competitiveness in the market
  ○ After-sales support
  ○ Logistics tie-ups
	10 minutes	Presentation		INR 60,000 – 80,000

Module 2.3 Market Assessment and Prioritization				
• Understand the market to be serviced and map possible geographies • Assess potential of the identified productive uses • Market Linkages (Backward and Forward Linkages) for the productive use • Develop 4 Ps of Marketing (Product, Price, Place and Promotion) for the rural enterprise • Developing a Marketing Strategy • Need and utility of a Business Plan for a rural enterprise • Components of a Business Plan and Guidelines for preparing a Business Plan	10 minutes	Scenario Presentation		INR 60,000 – 80,000
TOTAL COST			**INR 3,50,000 – 4,00,000**	**INR 2,80,000 – 3,70,000**

Solar Dryers

Level 1

A total effort estimation of developing training content has been taken as 22 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,50,000 – 4,00,000 and cost of designing the training is INR 3,20,000 – 4,20,000.**

Table 52: Duration and Cost for specific e-learning Training Modules for solar dryers for Service Providers / Product Developers / Rural Entrepreneurs in fishery sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Understanding basics of solar dryer and its market				

• Introduction to the basic fisheries value chain
• Types of solar dryers available in the market:
  ○ direct drying (solar box dryer)
  ○ indirect drying (solar cabinet dryer)
  ○ mixed mode drying (solar tunnel dryer)
  ○ hybrid drying (hybrid solar cabinet dryer)
  ○ Explaining the usage of solar dryer in the fisheries value chain
	10 minutes	Presentation	INR 3,50,000 – 4,00,000	INR 60,000 – 80,000

Module 1.2 –Business Models				
• Understanding Business models ○ Investment required for buying and running the solar dryers • Aggregation based business model for group of farmers/ women self-help groups	10 minutes	Presentation		INR 60,000 – 80,000
Understanding savings • Understanding cost benefit analysis using solar power • Understanding energy saving based on future projection	5 minutes	Video		INR 40,000 – 50,000
Module 1.3 – Marketing and Branding				
• Understanding customer need ○ Objective of the customer – what is the specific need?	10 minutes	Presentation		INR 60,000 – 80,000

○ How do they fulfil the present need with conventional methods and what price they are paying? ○ What is the future growth possibility? ○ Which business model will be the most suitable? • What are the objections and clarifications received from the customer?				
• Understanding documentation • Customer Assurance through product/ system documentations / handbooks, warranty & guarantee information etc.	5 minutes	Video		INR 40,000 – 50,000
• Knowing your own product modalities ○ Specifications, uses and limitations ○ O&M and troubleshooting to be managed locally ○ Availability of spare parts ○ Expected Life of DRE based solution used ○ Guarantee/ warrantee of the key DRE components	10 minutes	Presentation		INR 60,000 – 80,000
TOTAL COST			**INR 3,50,000 – 4,00,000**	**INR 3,20,000 – 4,20,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,00,000 – 2,60,000.**

Table 53: Duration and Cost for specific e-learning Training Modules for solar dryers for Service Providers / Product Developers / Rural Entrepreneurs in fishery sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 Market Assessment and Prioritization				

• Understand the market to be serviced and map possible geographies • Assess potential of the identified productive uses • Market Linkages (Backward and Forward Linkages) for the productive use • Need and development of Marketing Strategy • Need and utility of a Business Plan for a rural enterprise • Components of a Business Plan and Guidelines for preparing a Business Plan	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000 – 80,000
Module 1.2 – Improving Communication skills				

• Developing interpersonal skills:
  ○ Effective communication
  ○ Pitching for a product
  ○ How to convert new customers for the product
• Efficient educational technologies and techniques to further improve the effectiveness of training
• Capacitating local trainers to be able to install, assemble, and test solar PV systems
	10 minutes	Video		INR 80,000 – 1,00,000

Module 2.1 – Business Models and Financing of Solar Dryers				

• Understanding Business models
  ○ Investment required for buying and running the solar dryers
  ○ Aggregation based business model for group of farmers/ women self-help groups
• Understanding project economics
  ○ Comparative analysis of profitability with respect to conventional sources
  ○ Breakeven Analysis of the rural enterprise to understand profitability
  ○ Estimation of NPV and IRR and financial viability of the project
	10 minutes	Presentation		INR 60,000 – 80,000

TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,00,000 – 2,60,000**

Solar Cold Storage

Level 1

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,05,000 – 2,70,000.**

Table 54: Duration and Cost for specific e-learning Training Modules for solar cold storages for Service Providers / Product Developers / Rural Entrepreneurs in fishery sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Module 1.1 – Designing a solar cold storage				
• PV system sizing and design for cold storage ○ Knowing the exact purpose and cooling requirement of the cold storage by potential ○ Assessment of cooling load and auxiliary electricity demand ○ Solar resource assessment (including 'no sun' equivalent days) ○ System configuration ○ Calculate storage and autonomy requirement – Thermal (PCM) or Battery ○ PV array sizing, selection of compressor driver / inverter and BOS component design	15 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 75,000 – 1,00,000
Module 1.2 – Economic Benefits of solar cold storages				
• Understanding Business models ○ Investment required for buying and running the aerators powered from solar ○ Self-investment/ RESCO model for solar aerators • Aggregation based business model for group of farmers/ women self-help groups	10 minutes	Presentation		INR 60,000 – 80,000
• Understanding savings ○ Understanding cost benefit analysis using solar power ○ Understanding energy saving based on future projection	5 minutes	Video		INR 40,000 – 50,000
• Understanding project economics	5 minutes	Presentation		INR 30,000 – 40,000

○ Comparative analysis of profitability with respect to conventional sources ○ Breakeven Analysis of the rural enterprise to understand profitability ○ Estimation of NPV and IRR and financial viability of the project				
TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,05,000 – 2,70,000**

Level 2

A total effort estimation of developing training content has been taken as 15 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 3,00,000 – 3,50,000 and cost of designing the training is INR 2,00,000 – 2,60,000.**

Table 55: Duration and Cost for specific e-learning Training Modules for solar cold storages for Service Providers / Product Developers / Rural Entrepreneurs in fishery sector at Level 2

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 Market Assessment and Prioritization				
• Understand the market to be serviced and map possible geographies • Assess potential of the identified productive uses • Market Linkages (Backward and Forward Linkages) for the productive use • Develop 4 Ps of Marketing (Product, Price, Place and Promotion) for the rural enterprise • Developing a Marketing Strategy • Need and utility of a Business Plan for a rural enterprise • Components of a Business Plan and Guidelines for preparing a Business Plan	10 minutes	Presentation	INR 3,00,000 – 3,50,000	INR 60,000 – 80,000
Module 1.2 - Communication skills				
• Developing interpersonal skills: • Effective communication • Pitching for a product	10 minutes	Video		INR 80,000 – 1,00,000

• How to convert new customers for the product • Efficient educational technologies and techniques to further improve the effectiveness of training • Capacitating local trainers to be able to install, assemble, and test solar PV systems				
Module 1.3 – Solar Cold Storage Branding				

• Knowing your own product modalities
  ○ Specifications, uses and limitations
  ○ After sales service
  ○ Can O&M and troubleshooting be managed locally
  ○ Availability of spare parts
  ○ Quality vs price
  ○ Value for money
  ○ Expected Life
• Guarantee/ warrantee
	10 minutes	Presentation		INR 60,000 – 80,000

TOTAL COST			**INR 3,00,000 – 3,50,000**	**INR 2,00,000 – 2,60,000**

Solar Water Pumps

A total effort estimation of developing training content has been taken as 44 days. Costing inputs have been obtained from training institutes already developing such content. **Total cost identified for training content development is INR 4,50,000 – 5,00,000 and cost of designing the training is INR 4,20,000 – 5,40,000.**

Table 56: Duration and Cost for specific e-learning Training Modules for solar water umps for Service Providers / Product Developers / Rural Entrepreneurs in fishery sector at Level 1

Training Module	Duration	Flow of training	Cost of training content development	Cost of designing the training
Module 1.1 – Sizing of solar water pumps				

• Size of the array and its dependence on the power needed for the pump
  ○ Soil texture, field capacity, wilting point, saturation percentage and infiltration rate, percolation rate
  ○ Estimating the irrigation demand
  ○ Calculating the peak discharge
  ○ Head requirements
	20 minutes	Descriptive presentation	INR 4,50,000 – 5,00,000	INR 1,00,000 – 1,20,000

○ Impact on cost of the system				
• Availability of pump sizing tools that can be used ○ Examples of pump sizing tools available e.g. SIP Sizing Tool by MNRE ○ Checking the sizing options with the vendor	5 minutes	Video		INR 40,000 – 50,000
Module 2.1 – Serving the market needs				
• Prioritize solar pumps in areas where: ○ Farmers lack energy access for fish farming ○ Avoiding areas where groundwater tables are low or declining ○ Prioritizing support for pump sizes that meet small and marginal farmers' needs, avoiding both oversizing and under-sizing	10 minutes	Presentation		INR 60,000 – 80,000
• Address barriers to participation: ○ Promoting ownership models, such as community and entrepreneurship models ○ Building demand for pumps through education, awareness, and engagement ○ Enhancing water use efficiency by bundling solar pumps with other fish farming practices	5 minutes	Video		INR 40,000 – 50,000
Module 2.2 – Solar Water Pump Marketing and Branding				
• Understanding customer need ○ Objective of the customer – what is the specific need? ○ How do they fulfil the present need and what price they are paying? ○ How critical is the need? ○ What is the future growth possibility? ○ Which business model will be the most suitable? ○ What are the objections and clarifications received from the customer?	10 minutes	Presentation		INR 60,000 – 80,000

○ Customer Assurance through product/ system documentations / handbooks, warranty information, after sales service commitment, etc.				
• Knowing your own product modalities ○ Specifications, uses and limitations ○ After sales service ○ Can O&M and troubleshooting be managed locally? ○ Availability of spare parts ○ Quality vs price ○ Value for money ○ Expected Life ○ Guarantee/ warrantee	10 minutes	Video		INR 80,000 – 100,000
• Potential strategic partnerships at the local level • Who can carry out promotional activities for you? – NGOs, Co-operatives, SHGs, MFIs, rural retailers, local youth, RE mascots, etc.	5 minutes	Audio visual		INR 20,000 – 30,000
• Deploying effective marketing techniques ○ Word-of-mouth Marketing ○ Leveraging local roadshows / festivals / melas ○ Identifying evangelists / RE mascots who can be distributors	5 minutes	Audio-visual		INR 20,000 – 30,000
TOTAL COST			**INR 4,50,000 – 5,00,000**	**INR 4,20,000 – 5,40,000**

7. Way Forward

7.1. Identified Platforms for Hosting of e-Learning Training Modules

National Institute of Agricultural Extension Management (MANAGE)

MANAGE was established in 1987, as the National Centre for Management of Agricultural Extension at Hyderabad, by the Ministry of Agriculture & Farmers Welfare, Government of India as an autonomous Institute. In recognition of its importance and expansion of activities all over the country, its status was elevated to that of a National Institute in 1992 and re-christened to its present name i.e., National Institute of Agricultural Extension Management. Overall, MANAGE offers services in five streams,

namely, management training, consultancy, management education, research and information services[11].

The institute also manages Government of India's flagship programme, i.e., Skill Development of Rural Youth. The institute also maintains a knowledge repository on natural farming[12]. Similarly, this platform could also be used to host the training content developed under the 'Promoting Solar Water Pumps component of Indo-German Energy Programme' (PSWP module).

MANAGE's mission is to facilitate the acquisition of managerial and technical skills by extension officers, managers, scientists and administrators in all sectors of agricultural economy to enable them to provide most effective support and services to farmers and fishermen for practicing sustainable agriculture. Provision of a knowledge repository around training content for DRE-specific livelihood applications on its website bodes well with MANAGE's mission.

Indian Council of Agricultural Research

ICAR is an autonomous organisation under the Department of Agricultural Research and Education, Ministry of Agriculture and Farmers Welfare , Government of India. Formerly known as Imperial Council of Agricultural Research, it was established on 16 July 1929 as a registered society under the Societies Registration Act, 1860 in pursuance of the report of the Royal Commission on Agriculture. With 111 ICAR institutes and 71 agricultural universities spread across the country this is one of the largest national agricultural systems in the world[13].

In the last year, ICAR has undertaken capacity development of 1.41 lakh extension personnel was conducted through 4,620 courses in the country. The extension, functionaries engaged both in government and non-government organizations for the development of agricultural sector in the country were included in these trainings. Other than this, about 45,469 training courses for farmers and farm women targeting productivity enhancement and cost reduction of field crops, horticultural crops, plant protection, empowerment of rural women, livestock production and management, soil health and fertility management, capacity building for group actions, agricultural engineering, production of inputs, fisheries, and agro-forestry have been developed in the last year[14].

With its current mandate of aiding, imparting and coordinating agricultural education to enable quality human resource development, hosting of DRE-specific self-paced e-learning training modules furthers this objective for the Council and place it as an apex institute for promotion of DRE-based livelihood development in the country. ICAR maintains a 'Publications' web page which can be used to host the DRE-specific self-paced e-learning training courses being developed by GIZ.

National Power Training Institute

National Power Training Institute (NPTI), an ISO 9001 & ISO 14001 organization under Ministry of Power, Government of India is a National Apex body for Training and Human Resources Development in Power Sector. NPTI had been providing its dedicated service for more than five decades and had trained over 3,20,000 power professionals in regular Programs over the last 5 decades[15].

[11] https://www.manage.gov.in/aboutUs/ourOrganization.asp, Accessed on May 24, 2023
[12] https://www.manage.gov.in/nf/nf.asp, Accessed on May 24, 2023
[13] https://icar.org.in/content/about-us, Accessed on May 24, 2023
[14] https://icar.org.in/sites/default/files/ICAR-AR-21-22%E2%80%93E.pdf, Accessed on February 16, 2023
[15] https://npti.gov.in/, Accessed on May 24, 2023

Currently, NPTI has a provision for hosting online trainings in the renewable energy sector[16]. Therefore, integrating the DRE-specific training courses for self-paced e-learning would not require a sustained effort to develop a new webpage to host the same. Furthermore, NPTI has also maintains a "resource Centre' on its website which currently provides access to various reports, publications, presentations, etc. which it has given (solo or in partnership with other institutes / organizations)[17]. This platform could also be used for hosting of the DRE-specific self-paced e-learning training modules.

Skill Council for Green Jobs

Skill Council for Green Jobs is an initiative launched by the Government of India aligned to the National Skill Development Mission. It is promoted by the Ministry of New and Renewable Energy (MNRE) and Confederation of Indian Industry (CII) with an inclusive representation of the Government, industry and industry associations across India, and financial support by NSDC[18].

SCGJ has the mandate to capture the skill requirements for both service users and manufacturers/service providers within the sector and implement a roadmap for nationwide and industry-led collaborative skill development initiative to fulfill India's potential for green businesses. SCGJ's mandate of collaborative skill development provides the perfect opportunity to GIZ to collaborate with the institute to host the DRE-specific self-paced e-learning training modules being developed under its PSWP module. Under its 'Publications' web page, SCGJ already hosts training content which it delivers[19]. This web page can be expanded further to include the training content for DRE-specific livelihood applications in the agriculture, dairy and fishery value chains.

National Institute of Rural Development and Panchayati Raj (NIRDPR)

The National Institute of Rural Development and Panchayati Raj is an autonomous organization under the Ministry of Rural development[20]. The institute organizes training programmes, workshops, seminars, etc. on various themes related to rural development and need-based training on various sectoral themes.

NIRDPR has a dedicated **eGramPrashikshan[21]** Portal where it offers certification courses to promote skill development among various stakeholders, including rural development functionaries, elected representatives of PRIs, bankers, NGOs, and more. Through a combination of training, research, and consultancy activities, NIRDPR aims to build the capacities of these individuals. hosting skill development certification courses. Currently, it does not offer any e-learning content related to DRE, but there is potential for it to be utilized as a platform to host self-paced e-learning training modules focused on DRE. Other than eGramPrashikshan portal NIRDPR maintains a webpage on 'model training modules' that can be used to host the DRE-specific self-paced e-learning training courses being developed by GIZ.

National Institute of Solar Energy (NISE)

NISE, a specialized autonomous institute under the Government of India's Ministry of New and Renewable Energy (MNRE), is responsible for research and development, certification and testing of

[16] https://npti.gov.in/brochure-6-months-certification-course-regulatory-framework-commercial-aspects-indian-power-sector, Accessed on May 24, 2023
[17] https://npti.gov.in/presentations, Accessed on May 24, 2023
[18] https://sscgj.in/about-us/, Accessed on May 24, 2023
[19] https://sscgj.in/publications/training-content/, Accessed on August 24, 2023
[20] http://nirdpr.org.in/, Accessed on August 24, 2023
[21] https://gramswaraj.nirdpr.in/, Accessed on August 24, 2023

solar components, capacity building, and the creation of solar products and their applications. As part of the MNRE's skill development program, NISE has been designated as the nodal agency to administer the "Suryamitra Skill Development Programme (SSDP)" [22]. The goal of SSDP is to enhance the skills of young people in light of the expanding job opportunities in the installation, operation, and maintenance of solar energy power projects in India and internationally. Furthermore, SSDP is designed to train candidates to become budding entrepreneurs in the solar energy sector.[23]

NISE provides skill development programs focused on solar PV design for technicians. The training is designed to equip youth with the necessary skills for employment in the expanding field of Solar Energy Power project installation, operation, and maintenance.[24] While it doesn't currently have any e-learning content specifically for DRE, there is potential for it to serve as a platform for hosting self-paced e-learning training modules focused on DRE in the agri, dairy, and fishery value chain.

National Institute for Entrepreneurship and Small Business Development (NISBUD)

The National Institute for Entrepreneurship and Small Business Development is a distinguished entity under the jurisdiction of the Ministry of Skill Development and Entrepreneurship. The institute is involved in various activities such as training, consulting, and research to encourage entrepreneurship and skill development.[25]

NIESBUD's e-learning portal serves as a platform with training programs aimed at trainers and entrepreneurs. The Institute primarily engages in Training of Trainers, Management Development Programs, Entrepreneurship-cum-Skill Development Programs, Entrepreneurship Development Programs, and Cluster Intervention.[26] Currently, its e-learning portal does not contain self-paced e-learning content related to DRE, but it can be expanded further to include the training content for DRE-specific livelihood applications in the agriculture, dairy, and fishery value chains.

7.2. Scaling-up Knowledge Dissemination

Once the training content is developed, multiple communication channels can be adopted by GIZ and MNRE to promote the uptake and use of the developed content by different stakeholder groups. For the training modules to have a more pronounced impact, a strategy needs to be developed around:

1. Raising public awareness
2. Strengthening outreach efforts
3. Increasing information dissemination

Thus, a communication strategy for the training material shall be developed in such a way that it provides a guided, tactical approach for reaching target audiences and creating stronger, more effective communication products across various outreach channels. The knowledge dissemination plan for the target groups of stakeholders is provided below.

[22] https://suryamitra.nise.res.in/info/About-Suryamitra.html, Accessed on August 24, 2023
[23] https://suryamitra.nise.res.in/info/About-Suryamitra.html, Accessed on August 24, 2023
[24] https://training.nise.res.in/Trainings, Accessed on August 24, 2023
[25] https://niesbud.nic.in/institute.htm, Accessed on August 24, 2023
[26] https://www.niesbud.nic.in/resource-section/resource-secton.html, Accessed on May, 2023

Farmers

To effectively reach out to the farmer community, their attention could be captured and their interest in the training module following methodology could be adopted:

Collaboration with local agricultural/ dairy/ fishery organizations: Partnering with local agricultural/ dairy/ fishery organizations, cooperatives or farmers associations could help in the dissemination of the link of the platform where training modules developed are hosted. They have an extensive network of farmers; leveraging their network and resources can help in reaching farmers.

Leveraging technology and media: Since farmers are mostly acquainted with watching YouTube videos and using WhatsApp, these platforms can be suitably used for uploading the link for training content and sharing the link in WhatsApp announcements groups will guarantee awareness of such training module among farmers.

Localizing the content: Translating the training module content into local languages and integrating it with regional farming practices in agri/dairy/fishery sector will make the module more accessible and relatable to farmers.

Seeking endorsements from influential farmers: Endorsement from influential farmers in the form of positive feedback or testimonials on the training content developed can significantly encourage other farmers to engage with e-learning modules developed.

SRLMS / SNAs

Utilizing SRLMs/ SNAs websites for promotion: Most of the SRLMs and SNAs have their own websites with their e-newsletters and press release sections. Promotion of the platform link through these mediums could increase the outreach of the training content developed.

Leveraging SRLMs / SNAs social media communication channels: Some SRLMs and SNAs also have social media presence in the form of twitter and Facebook accounts. These can be used to create and circulate targeted posts with link of the platform where the self-paced e-learning training modules can be found.

Associations / Community level Organizations

Utilizing online platforms: Providing the link of the platform where developed e-learning training material is hosted to training institutes, forums, industry specific websites, webinars can significantly increase the visibility and credibility of the training modules.

Partnering with business association/ incubation centers: These organizations usually have their network and resources to connect with farmers. They often host events/ workshops and networking sessions which can be leveraged to promote the e-learning training modules developed and the platform where they are hosted.

Service Providers / Product Developers

Email marketing to service providers and product developers with the link of the platform where e-learning modules are hosted could be potential source of informing technology providers about training module. As a starting point, these emails could be circulated to MNRE's empaneled vendors and these vendors could be further encouraged to share the respective link in their network and with their customers.

MNRE

Utilizing MNRE's websites for promotion: Here as well, promotion of the platform link through MNRE's website could increase the outreach of the training content developed.

Leveraging MNRE's social media communication channels: MNRE has social media presence in the form of LinkedIn, twitter and Facebook accounts. These can be used to create and circulate targeted posts with link of the platform where the self-paced e-learning training modules can be found. Industry specific hashtags can be used to increase the visibility of posts. Officials could focus on using them with common words that targeted stakeholders would generally be interested in and be searching for.

Sample hashtags could be:

#Distributedrenewable energy	#Agriculture	#Dairy	#Fishery	#DRE	#RenewableEnergy
#Solarpumps	#Solarcoldstorage	#Solardryer	#Solarregrigerator	#Solaraerator	#Solarmilkingmachine
#Training	#DREtraining	#DREcapacity building	#E-learning	#trainingmodulesinDRE	#Trainingagenda

8. Annexures

8.1. Annexure 1 - List of the Companies Consulted for Obtaining Quotation on Training Content Development

Name of the training institute	Contact Person	Contact Details
Global Sustainable Energy Solutions	Mr. Dwipen Boruah	dwipen.boruah@gses.in
National Institute of Food Technology, Entrepreneurship and Management - Thanjavur (NIFTEM-T)	Dr. M. Loganathan	+91 4362 228155
National Institute of Solar Energy (NISE)	Mr. Siddharth Saroha	siddharths@nise.res.in
Appropriate Technology Centre	Mr. Sanjib Roy	gatetrust.mail@gmail.com
Industry Expert	Mr. Arvind Karandikar	Arvind.karandikar@gmail.com
Learnet Skills Limited	Mr. Divakar Singh	divakar.tomar@learnetskills.com
SunMoksha	Dr. Ashok Das	das@sunmoksha.com
SELCO Foundation	Ms. Rachita Misra	rachita@selcofoundation.org

8.2. Annexure 2 - List of the Companies Consulted for Obtaining Quotation on Designing of Training Content

Name of the Designing firm	Contact Person	Contact Details
C&K Management Ltd.	Ms. Archana Samtaney	archanasamtaney@tminetwork.com
Softline Studio Services Private Limited	Mr. Sanjay Bansal	bansalsanjay2003@yahoo.co.in
Evotar Technologies Pvt. Ltd.	Mr. Purvaraj Jhala	purvaraj.jhala@evotartech.com
VidSaga	-	team@vidsaga.com
PwC's design team	Ms. Sujatha Menon	sujatha.menon@pwc.com

Disclaimer

The report has been developed based on research and interactions with the key stakeholders such as farmers, FPOs, product manufacturers/service providers, rural entrepreneurs, state nodal agencies, state rural livelihood missions, training institutes, SAMETIS, foundations, KVKs, cooperatives and national level development boards. The present document is an attempt to assess the capacity gaps of demand group of stakeholders and recommend self-paced e-learning modules to promote the utilization of DRE technologies for productive use across different stages of agricultural, dairy, and fishery value chains. Please note that this document is neither exhaustive nor comprehensive, GIZ will not be responsible for any financial decision based on the information provided in the document.

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