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Project Title:	Solar based irrigation business mode 'pay as you irrigate' for women empowerment, water management and food security in Mozambique
Implemented by:	Practica Foundation & HUB
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Deliverable:	Implementation plan

Solar based irrigation business model 'pay as you irrigate' for women empowerment, water management and food security in Mozambique

Implementation plan

PRACTICA HUB

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1. Approach and Methodology

1.1 Objectives of the Technical Assistance

The overarching objective of this technical assistance (TA) is that the selected group of **smallholder farmers, especially women, can benefit from a financial service that enables them to strengthen their water management practices and increase their food security.** The need to enhance food security is eminent in Mozambique.

It is envisioned that the 'pay as you irrigate' financial model can bridge the current financial gap[1] in the Mozambican agricultural water sector. The 'pay as you irrigate' approach will address the issue of bankability of smallholder farmers, since most farmers do not have assets to serve as collateral in formal banks when applying for loans.

The project aims to enable unbanked smallholder farmers, especially women, to plan, procure and implement SPIS sustainably, considering making cost-effective investments in a situation of climate unpredictability and with the help of this financial model, which supports their economic condition.

The TA sub-objectives are:

1. Establishing proper coordination mechanisms to ensure overall objectives are reached.
2. Analyse the current irrigation practices and design appropriate irrigation and solar water pumping technologies for the commune of Mubobo in Mozambique.
3. Consult the stakeholders and review the design of the Solar Powered irrigation system for Mubobo in Mozambique.
4. Benchmarking existing SPIS and developing a cost estimate in close consultation with relevant stakeholders for the community of Mubobo.
5. Designing an actual "pay as you irrigate" financial model targeting smallholder farmers, including women, in concertation with the beneficiaries.
6. Developing dissemination materials, including workshops and training will be held to increase the awareness of users and investors of SPIS and "pay as you irrigate".

[1] Current SPIS market introductions and donor-driven initiatives are rarely scaling. They are not adapted to meet the context of Mozambican farmers, especially women irrigators. Solar-powered irrigation remains excessively expensive and complex to procure, design, install and maintain for smallholder farmers. This has to do with the fact that more needs to be done regarding SPIS's business model and finance.

1.2 Step-wise approach

STEP 1: Coordination mechanisms for the implementation established

The first work package concerns an inception period. We believe that 'A good start is half the work'. Knowing to find each other easily, having the right set of stakeholders on board and having a clear agreement on the delivery of the work will prevent redundancy and misunderstanding later.

As part of this first step, we will map relevant stakeholders among governmental institutions at the national and sub-national levels. These stakeholders will include at least the NDA, the NDE, the project proponent, as well as the relevant ministries and at least one representative of the commune of Mubobo in Mozambique. The consultants will personally get acquainted with the different stakeholders and get their ideas and opinions on this project's process and impact.

The consortium will make sure to form a restricted working group of 8 representatives with diverse backgrounds. The consortium will consider aspects like gender, representation from vulnerable groups and their capacity to make strategic decisions on irrigation design and its envisioned appropriate business model.

The consultants will ensure that team building between the members of the selected working group takes place. Through the inception workshop, they will be jointly briefed and engaged right from the start.

STEP 2: Analysis of the current irrigation practices and design appropriate irrigation and solar water pump technologies for the commune of Mubobo in Mozambique

The second step of the TA involves in-depth understanding of the current irrigation practices in Mubobo and community engagement. We acknowledge that Solar-powered irrigation systems (SPIS) are not simple plug-and-play systems that can be deployed regardless of the local context. They require proper assessment and analysis of the cropping patterns, weather-soil-water conditions, local farmer capacities and market conditions before they are selected and installed.

The design approach, consisting of the following actions will be leading and assure that both the demand and supply sides are considered:

1. Water source analysis and selection, checking water quantity and quality, water rights, etc.
2. Analysis of the current cropping pattern and market conditions.
3. Assessment with the community whether current crops are most preferable for irrigation: is there a match with the available water source? Will the returns on the current crops justify the investment in irrigation equipment, or would it be wise to switch to other (cash) crops with a better cost-benefit?
4. Calculation of the crop water requirements of the selected crops by the community considering weather data, soil conditions and general crop requirements.
5. Selection of a suitable application & conveyance system and determining the required pump yield and head.

6. Pre-select the pump and its accessories (solar panels, reservoirs, pump switches) that fits the need best and take into account the local availability.
7. Comparison with alternative pumps & accessories, or alternative ways of operation (like night time shifts) and advice on the best cost-benefit.
8. Select in close consultation with the community the most adapted pump and irrigation equipment.

In all proposed actions, the engagement of relevant community members, especially a selected end-user group, will be central to our approach. We will use **participatory methods that are easily understood by farmers** like transect walks in agricultural fields, drawings of system characteristics and participatory mapping exercises in small groups.

The deliverables for this step are:

2.1 Diagnosis of current irrigation systems in the commune of Mubobo.
2.2 Final report to understand the demand side of the SPIS.
2.3 Final report data requested to define a fit-for-purpose PV pump system and irrigation infrastructure (supply side).
2.4 Draft of the architecture of the solar-powered irrigation system for Mubobo in Mozambique.

STEP 3: Consult the stakeholders and review the design of the Solar Powered Irrigation system for Mubobo in Mozambique

The third step of this project concerns the adaptation of the design of the SPIS to the needs and wants of the local stakeholders. Two consultation workshops will be organised to present:

i) The initial architecture;
ii) The revised one.

Because this requires intense collaboration between the TA experts and the project beneficiaries, all activities are scheduled within one period in the presence of the solar irrigation expert (see work plan for more detail). The expert leads the SPIS design and brings extensive international expertise and experience.

Between the two workshops, the solar irrigation expert and the agricultural expert will visit the field locations and exchange with the stakeholders involved to gather a maximum number of relevant inputs for the design, to get a deep understanding of their situation and constraints to make sure that the final (revised) SPIS design satisfies their needs.

The deliverables for this step are:

3.1 Minutes of the stakeholder consultation workshop with materials, list of participants disaggregated by gender and including photos.
3.2 Revised architecture of the SPIS for Mubobo in Mozambique, including taking into consideration the internet of things.

3.3 Minutes of the stakeholder consultation workshop with materials, list of participants disaggregated by gender and photos.
3.4 Final and approved architecture of the SPIS for Mubobo in Mozambique, including taking into consideration the internet of things. (Up to 3 rounds of revision between the workshops and the final version).

STEP 4: Define a cost estimation of the designed solar powered irrigation system

The fourth step builds on the outcomes of the third step. The cost estimation for the SPIS, not solely considers the investment and installation cost but also its full life cycle costs.

The development of several factsheets on the various technologies allows to create a good overview of the technical possibilities and the economic and social implications, and to which extent the solution fits the market conditions of envisioned crops to be cultivated. The cost estimation of each technology will follow from the factsheets. Both deliverables will be made and shared in a clear, synthetic document so that it can easily be shared and understood by all the stakeholders of the project, including the working group and the local stakeholders.

The workshop will be the conclusion of this outcome, with the objective to make sure that all the costs are clearly defined and understood well by all the stakeholders. The costs in terms of investment, but also recurring costs and revenues generated by the sales of produce will have a direct impact on the "pay-as-you-irrigate" business model. Therefore, it is our intention to ensure that an analysis of the costs and benefits of each system (not only economic, but also technical and social) is conducted in a participative manner during this workshop. This is critical in order to anticipate and facilitate the following steps with respect to the design of the business model.

The deliverables for this step will be:

4.1 Technology fact sheets.
4.2 Cost estimation of the prioritized technologies.
4.3 Minute of the restrictive working group meeting including the materials, list of participants disaggregated by gender, and photos.

STEP 5: Define a 'pay-as-you-irrigate' business model targeting smallholder farmers

With a "pay-as-you-irrigate" system, the users will not pay for technology but for the volumetric water that they use. Several challenges are expected to be tackled during this step, here are some examples:

- Users will pay for the water that they use, but while developing the business model, it is our role to propose a cost of the service that is fair and encourages the farmers to keep producing. A too high fee could have a negative impact on the volume of water requested and could even invalidate the business model.
- Payment terms must be defined in a way that is suitable for the producers. The cash flow of farmers is not constant, and the volume of water they require also fluctuates with each

season and cropping stage. It is important to consider these aspects in the definition of the business model to ensure the sustainability of the project.
- Technologies and technical manners to implement the business model must be researched, and tested, if necessary adapted.

Financial institutions, rural banks or cooperatives, are expected to finance this type of activity. For that reason it is important to involve them in the consultation and validation of the business model. Both workshops will be used to brainstorm and decide on the best approach to finance the system and use it. In a way, our role will be to facilitate a conversation between financial institutions, solar equipment supply companies and farmers coming to a solution that facilitates the 'pay-as-you-irrigate' model. Three review rounds are planned because an agreement from all parties is essential to the success of this project. The defined business case must convince finance institutions, solar supply companies, farmers, and facilitators of its benefits in order to be a successful activity.

The first review round is meant to collect information and get a deep understanding of the situation and expectations of each stakeholder. The second round centers around the definition of the business model, and the last round is regarding its validation. In the last review round, the approach (technical, social and financial mechanisms), the cost, the duration, and the risks will be clearly defined and must be agreed by all the stakeholders. If no agreement can be made, we will enable key stakeholders to study and make additions to the business model and continue the iteration process until it becomes fully convincing. The most important aspect is to make a business model that is clear and transparent, and that all stakeholders are "on board".

The deliverables for this step are:

5.1a Minutes of the stakeholder meeting with the local smallholder farmers including photos, a disaggregated list of participants, materials used.
5.1b Definition of the needs of the future users of the SPIS system and pay as you irrigate model.
5.2 Pay as you irrigate business model drafted.
5.3 Total cost/m3 of water used calculated.
5.4a Minutes of the validation workshop of the business model including a list of participants disaggregated by gender, photos, a summary of the inputs received.
5.4b. Business model revised and circulated to the stakeholder working group (up to 3 times)
5.4c. Final "pay as you irrigate" business model

STEP 6: Elaborate and disseminate training's materials

This TA's last step is producing and disseminating materials to communicate the project results. This includes, but is not restricted to, the designed system and the defined business model as a result of the multiple stakeholder consultations.
A presentation of the result and a (short) training will be given to the potential end-users.
A different presentation explaining the business model will be shared with investors to present the opportunities it could generate and the potential of this type of service for rural development.
Finally, municipal and national officers will also be targeted since they would be key actors involved in a scale-up of the solution.

The deliverables for this step include:

6.1a Dissemination material targeting the users
6.1b Dissemination materials targeting the investors
6.1c Dissemination materials targeting the national officers
6.1d Dissemination strategy and planning
6.2 Minutes of the stakeholder consultation workshop with pictures and a list of participants desegregated by gender and materials used, if any.
6.3 Minutes of the stakeholder's consultation with the private sector and financial institutions with pictures and a list of participants desegregated by gender and materials used if any.
6.4 Minutes of the training to municipal and national officers with pictures and a list of participants desegregated by gender and materials used, if any.

1.3 Data collection, compilation analysis and reporting

SPIS is a relatively new technology in Mozambique. Some basic conditions, like a sustainable local market, an enabling institutional environment, and a governmental regulatory framework, still need to be fully met. The project is actually set in an environment with many ongoing developments surrounded by uncertainties. It is not yet known: 'What could work and what not, under which specific conditions? In these types of processes, developments must be documented well, so the relevant actors can learn from them and adapt their strategies accordingly. Creating a proper M&E framework to monitor, evaluate and learn from the project activities is essential. This needs to be supported with a sound system for data collection, compilation, analysis and reporting.

Our TA team will take the following aspects along in the strategy:

1. Sufficient time allocated to different experts in the team. M&E planning and execution will not be the sole responsibility of one expert. The information must be collected and analysed from different angles: agricultural, economic, social, gender, etc.
2. Synergy with existing efforts. It is reasonable to assume that other data collection & analysis efforts are being undertaken in the field of solar irrigation in Mozambique. Practica has an existing collaboration with GIZ Mozambique to develop a PAYGO solution in Gaza province together with pump suppliers. Part of the strategy is to use the existing connection to share information and lessons learnt.
3. Dissemination is as important as production. Often, a lot of resources go to data collection, analysis and compilation, leaving little time to share evaluated data with relevant stakeholders. By systematically collecting, analysing and reporting data within each work package, we strive to produce sufficient pertinent data to capitalise on results and disseminate them effectively under the work package.

1.4 Stakeholder Inclusion

The consortium realises the importance of including key stakeholders at all stages of the implementation assignment. To achieve this complete integration, the tasks will be approached using the following methodology:

Manner of Inclusion of stakeholders for effective and informed decision-making:

(1) Stakeholder mapping (as part of STEP 1)

As a first step, it is vital to understand which stakeholders play a crucial role in irrigation, agricultural and financial services generally and SPIS specifically. Attention should be given to local stakeholders in the Mubobo commune. The engagement should also be more comprehensive than farmers and governmental agencies, as the private sector, financial institutions and NGOs should also be involved. Only when creating synergies between the complete set of stakeholders will it be possible to design an effective PAY-GO / 'pay-as-you-irrigate' type of solution. See the figure below for illustration. Moreover, attention will be paid to effective gender participation.

The stakeholders will include at least the National Designated Authority (NDA), the National Designated Entity (NDE), SDAE as well as the relevant ministries and one representative of the commune of Mubobo, in Mozambique, as well as any other groups of influence relevant to this Technical Assistance, including a representative of the private sector specialized on irrigation solutions for small farmers, experts in solar energy, irrigation practices, agriculture, water availability and use, or affiliate. Other will be:

- Districts' extensions officers,
- Men and women community leaders,

- The management group of farmers' associations,
- Key members of local consultative organs such as the Conselhos Consultivos Locais or Comitês de Gestão de água de Regadio.
- Rural and community banks and representatives of Groups de Poupanças.

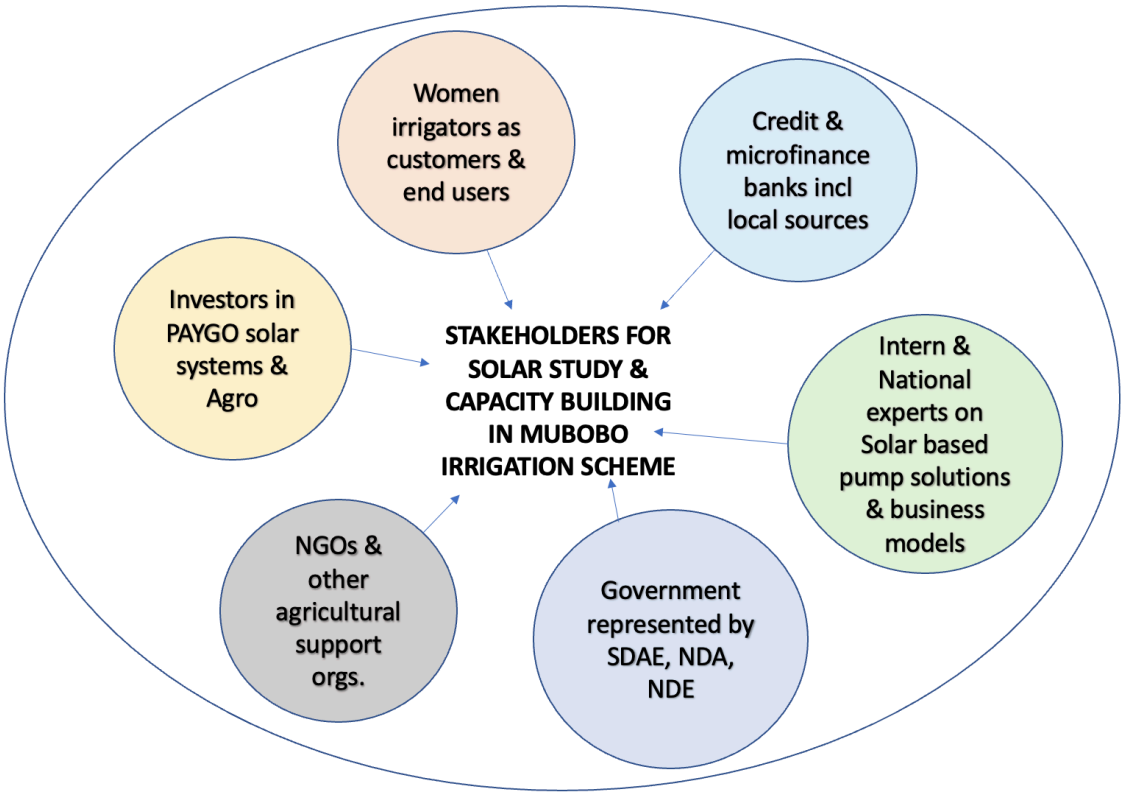


Figure 1. Stakeholders for solar study & capacity building in Mubobo commune.

(2) Understanding stakeholder's influence sphere and capacity (as part of STEP 1 and 2)

While conducting the stakeholder mapping, we will pay attention to **the relationships, the sphere of influence and the capacity levels of the various stakeholders**. Each single stakeholder group will need to have a tailored approach.

For this reason, the consortium will carry out an early and rapid needs assessment in the targeted area to assess needs and identify how the proposed interventions in the TOR will match with the existing capacity of local stakeholders while taking into consideration broader intersectional aspects such as gender, age, health status, level of education, geographical location, ability to access basic services and information, etc. In this endeavor, we will also try to understand governmental institutions and NGOs' current relationships and capacity-building activities.

Based on the collected insights on the influence and capacity of these different stakeholder groups, we will provide advice on how to form an influential Working Group of

approximately 8 individuals, as stipulated in the TOR. The Working Group will be regularly consulted for the design of the SPIS and to develop the “pay as you irrigate'' model.

The consortium aims to strengthen stakeholder engagement early to maximize local institutions' involvement and accountability towards the population: the relevant District Services will always be involved in planning, realizing and monitoring future activities (even beyond the project). Putting them in a leadership role will support the local ownership of these interventions, in this case, the solar based intervention for empowering women irrigators in the Mubobo irrigation scheme.

(3) Interactive data collection, mapping and design with local stakeholders (as part of STEP 2,3 and 4)

A significant part of the assignment consists of the actual design of an SPIS and developing a connected financial “pay-as-you irrigate” solution for Mubobo. The acceptability of these interventions falls and stands with the integration of local stakeholders' knowledge and opinions. The selected SPIS must fit the physical context, needs and capacities of Mubobo.

The consortium will therefore set up a truly interactive process of engaging stakeholders in the planning and design of the interventions.

- First, we will investigate the physical environment of the Mubobo area, which is now about 5 ha of irrigated land, but could possibly be enlarged if water sources are used effectively. We will **set out ‘transect walks’ together with pre-selected community members, local government and SDAE extension officers**. We will avoid exploring the area by ourselves to avoid basing our findings only on expert observation and knowledge, but really integrate local contextual knowledge on the available water resources, and geophysical and agricultural conditions. We will explore in depth why previous attempts to introduce solar irrigation through a borehole connection failed.
- Group discussions with different sets of farmers, considering a good intersection of gender, age, farm size, socio-economic status and vulnerability, will be undertaken. In these **group sessions, we will try to get a deep understanding of the current irrigation and other agricultural practices.** We know that there are about 20 very active farmers, of which about 65% women, who currently use manual bucket irrigation. However, the capacity of the irrigation scheme could easily reach 50 farmers. Also, in terms of seed management, mechanization, pest control and fertilization improvements could be introduced. Exploring these Agri-practices too will support the design of a holistic solution. For example, combining irrigation with fertilizer dosing, or enabling transport options for both irrigation and other types of Agri-equipment.
- **Jointly exploring market conditions with local stakeholders**. It is evident that solar irrigation only has a good cost-benefit if the market conditions are in such a way that envisioned crops to be cultivated are profitable. We know that in this area the following

horticultural crops are popular: lettuce, onions, cabbage, tomatoes, capsicums, and okra. Also, maize and beans are cultivated. Jointly we aim to map with farmers the input-output ratios of those crops over time, and evaluate which crops would be most interesting to include in the envisioned irrigation scheme. We will also pay attention to market linkages, since it is known that these are rather weak in Mubobo. This activity will be supporting Step 4 in which the TA team is expected to develop a cost estimate for the SPIS and evaluate its Pay-back-time.

- The next step would be a **holistic SPIS design session**, in which we present pre-collected data and ask for validation in a participatory manner. We will link data collected on the demand and supply side, and present options to improve the irrigation conditions with help of solar interventions, the so-called draft architecture design. We will collect opinions from all relevant local stakeholders in extra field visits and a kind of design atelier workshop. Pros and cons of each solution will be collected in an interactive manner during this workshop. With the end goal of selecting the most preferable SPIS architecture.

(4) Role playing to come to a "pay-as-you-irrigate" model (as part of STEP3)

Another vital moment of stakeholder engagement will be the **sessions with the financial institutions, solar equipment supplying companies and farmer representatives** to jointly develop a 'pay-as-you-irrigate' model. It is recommended that also SDAE representatives and other relevant stakeholders will join these sessions. We aim to guarantee successful stakeholder inclusion by setting up role plays to simulate the credit risk appraisal of finance institutions towards solar dealership companies and the negotiation process between them. What are the critical components that finance institutions question and what can solar supply companies offer to generate an acceptable risk profile? And vice versa: what are farmers willing to pay that still generates an interesting margin for solar supply companies to invest in "pay-as-you-irrigate"?

(5) Capacity building on stakeholders (as part of STEP 6)

We are fully aware that interactive design is only a piece of the puzzle. The actual implementation capacity and ability to scale will be vital to make this project a real success. This requires capacity building. The proposed approach below builds on the consortium's experiences in the field of agricultural-related training. We consider that the following actors need to be trained at different levels:

- The direct beneficiaries of the SPIS, namely farmers, especially women. For this group, we believe the dissemination materials and training should be as practical as possible. When there are available resources (outside the TA team budget), we will aim to create a demo plot with SPIS technology with support of SDAE extension officers. This would be the perfect learning ground to practically train farmers in a short course. Additionally, we may like to organise a radio broadcast on the use of solar irrigation technology, payment models for women, nutrition, improved production techniques and/or water management through community radio. Community radio broadcast has appeared to be

a very effective strategy during COVID-19 pandemic to reach rural communities. It might be even more effective than the production of the proposed video. The training methodology we suggest, will guarantee women and youth participation through a thorough assessment of their time availability and the use of local languages.

- Those in direct contact with farmers to enhance their capacity, namely districts' extensions officers, men and women community leaders, the management group of farmers' associations, key members of local consultative organs such as the Conselhos Consultivos Locais or Comitês de Gestão de água de Regadio. For this group, we believe **Training of Trainers** is most effective, if there are available resources to do so (outside the TA team budget). Depending on the needs, the training session will be tailored to fit either technical, financial or institutional aspects of SPIS. Extension officers of the District Services for Economic Activities (SDAE) and the District Services for Health, Nutrition, Women and Social Welfare are specifically important to be involved. The SDAE in the targeted area still faces a series of barriers that limit them to reach out to all smallholder farmers. They are not capable of providing training and technical assistance to all, especially not on improving irrigation practices, water management and using more efficient production techniques. ToT to this group of stakeholders will ensure local ownership of the process and increase the capacity of local institutions to deliver quality services to their irrigation stakeholders.
- Those who need to provide finance solutions to farmers, namely financial institutions and solar supply companies. A training on the risks related to SPIS, financial cost-benefit analysis of SPIS, finance delivery mechanisms for SPIS products and credit risk appraisal of potential SPIS clients is most important
- Those who are involved in developing national strategies, namely representatives of relevant ministries and national implementing agencies (MITADER, MISAU and MASA, among others). They require information on how market conditions and institutional & legal frameworks (like standards and certification) can be enabled for SPIS and what finance support scheme could be developed to promote SPIS scaling.

1.5 Quality Assurance & Risk Mitigation

Quality assurance

To ensure delivering quality during our assignment period, we see the following four strategies as essential.

(1) Establishing agreed coordination mechanisms.

We consider a good start to a project vital. We see the envisioned kick-off/inception meeting, as part of work package 1, as essential to:

- Clarify the expectations,
- Detail the implementation plan and work preparations,

- Define the communication mechanisms with the partners and stakeholders,
- Revise the steering structure if needed,
- Define risk measures and
- Confirm the planning and reporting requirements.

The kick-off meeting will also serve to present the backstopping team members.

(2) Timely document sharing for reviews & communication on progress

Throughout the assignment, direct email communication with representatives of the main coordinating partners is preferred in order to establish quick and effective feedback loops on decisions and draft materials. Draft versions of developed products will be shared via a preferable Cloud tool (OneDrive, DropBox or Google Drive) at least one week prior to the planned workshops in order to provide the opportunity to critically examine the content and include detailed feedback directly in the documents.

Activity and result monitoring will principally be the responsibility of the team leader, by regularly checking progress against the agreed work plan and applying measures in a strict but pragmatic manner. Direct communication within the TA team will be facilitated through WhatsApp or equivalent applications, to ensure instant communication in case of challenges or doubts. As for organizing the training sessions, PRACTICA and HUB have a lot of experience in providing both theory and hands-on trainings internationally in collaboration with local partners. Effective procedures are in place with respect to the responsibilities, planning and logistics that are required when organizing training.

(3) Backstopping

The Team Leader is an in-house staff member of PRACTICA and will assure the management of the TA team and direct coordination with UNEP. The TA team will also benefit from backstopping by other colleagues from the PRACTICA and HUB offices. This includes PRACTICA's head of administration and communication, and Management Team member. She will be responsible for the daily financial project management, audits, human resources, public relations and communications. The managing director of HUB will also be available to support in management and strategic steering of the project, and be available in the country to answer to unforeseen project developments with pragmatic measures if necessary. Finally, a senior irrigation expert with 21 years' experience in West Africa is available as a backstopper if required. He is currently team lead on the IRRINN project in Burkina Faso (EU-funded small-scale irrigation project called IRRINN (Intensification of agricultural production through the scaling up of innovative adapted irrigation practices and technologies) and a key author and expert on the development of smallholder private irrigation in Sub Saharan Africa.

(4) Feedback loops

To assure that the progress on the work package moves into a direction that is sustainable, gender-inclusive and corresponding to the expectations of the partners, the TA team will continuously adhere to and regularly reflect on the applied approach in relation to: activity monitoring, management of the TA team, coordination with CTCN and the embedding of the packages in existing networks in the Mozambican irrigation and agriculture sector. The aspects will be fixed agenda points for internal team discussions in order to timely address potential shortcomings in one of the steering processes.

Risk mitigation

We will strive to ensure maximum transparency regarding our planning and field-based activities. As a start, we have developed an initial risk assessment and mitigation measures for this assignment, which we will refine during the inception and determine risk profiles jointly.

Risk	Possible impact	Mitigation measures proposed
Seasonality can largely affect the project timeline	Irrigation is season-dependent, implying that certain project activities can only take place in certain months of the year. Depending on the actual project start date, it might not be realistic to finish the project in 18 months.	It is thus vital that the project timeline is fully aligned with the season. To mitigate this risk prior agreements, need to be in place on how to deal with possible delays due to seasonality.
Data required for irrigation system design or the "pay-as-you-irrigate" model are hard to obtain	There is too little data available to develop a high-quality design and/or financial model	We will try to streamline with other existing data collection efforts in Mozambique to still get the best possible data Within the project timeframe and resources, we will initiate some data collection initiatives ourselves.
Insufficient input from key stakeholders	Project decisions might be taken too top down. The quality of the M&E outputs could be affected	We will follow our proposed Stakeholder inclusion strategy and ensure inclusion from the very start of the project. We will make use of the existing relations UNEP, PRACTICA and HUB to inform and remind stakeholders to contribute to meetings and workshops. We will show willingness to listen and incorporate feedback to address the needs and interest of stakeholders and ensure their inputs are documented well.
Non-acceptance or non-adoption by beneficiaries	Project will not be successful when the community is used to get only 'free' support	We will follow our proposed Stakeholder inclusion strategy and ensure inclusion from the very start of the project. We take beneficiaries along in developing cost estimates and making them understand why SPIS cannot be provided for 'free', but still in an attractive financial model.

The (credit) risk profile of the respective farmers in the Mubobo scheme is too large for SPIS.	Finance institutions won't support SPIS and a 'Pay-as-you-irrigate' model	Finance institutions tend to drop out to invest in technologies they do not understand. We will try to de-risk SPIS by explaining all technical ins-outs of SPIS and how they can be managed. We will facilitate between farmers, social dealership companies and finance institutions to let them speak out what offers they are willing to make in terms of conditions. We will jointly review different types of set-ups and pros & cons to come to a sound decision.
Health and safety concerns for the TA team and stakeholders.	TA team and/or stakeholders could face health concerns or end up in unsafe situations	As part of our compliance procedures, we will make regular H&S assessments. We will follow the rules and precautions recommended by the Mozambican authorities to limit the H&S risks for any of the involved stakeholders.
Restrictions due to a new pandemic outbreak.	Project activities planned in-country cannot take place or need to be postponed	We are flexible: we can postpone or re-organize activities (e.g., smaller groups) when it fits the project planning and scope. We are prepared for alternative meeting management and training delivery, like virtual sessions and/or blended learning We are highly experienced using online, interactive and safe communication and documentation software (like Teams, Dropbox, Mural or Miro online whiteboards). And in case of poor internet access, we can swift to 4G phone connections.

1.6 Roles & responsibilities team

PRACTICA and HUB rely on a vast team of internal and external experts and staff that will be involved in the implementation of the assignment, as per the table below. In particular:

- ***Key theme experts*** *('international experts')* are in charge of the delivery of the assignments. Due to the scope of the assignment, number of beneficiaries to be reached, and relatively short duration, particular attention has been paid to select key experts with a strong expertise in designing, developing and delivering training and support on the relevant themes of solar irrigation and payment models for women support, together with agronomy support/ water management. This consolidated experience will be combined with recent training materials developed both by PRACTICA and HUB; contents' alignment with key national and international guidelines (for example on safe use of irrigation systems for environmental protection) is ensured by the team of key experts.
- ***Supporting Experts*** *('national experts')* are in charge of implementation of the support for the extra themes shared in the ToR. Their roles are described in the "roles" column of the table

below. Due to the high number of sessions to be delivered and beneficiaries to be reached, PRACTICA and HUB rely on their capacity to mobilize experienced staff that is already based in the targeted Province, thus facilitating the logistics and day to day operations during the implementation of the mission. They will be coached by the key experts for full alignment, and collaboration with SDAEs and local District officers in the target irrigation scheme for the realization of the training and implementation of the project.

- ***Technical and administrative support staff*** provide ad hoc technical support and ensure the correct financial reporting to the client and respect of procurement procedures etc.

Table 1. Team experts of the consortium.

Team	Name and organisation	Role
Key experts		
Team Leader	Aldo Zamarroni, **PRACTICA Foundation**	Team mission leader for team coordination and to reach key contacts from CTCN/UN, Working group and other stakeholders.
Key Expert Economist	Pedro Pinheiro, **HUB**	Assist with overall oversight of the economic/ business management outputs of the ToR as requested by CTCN/ UN e.g., Improving the value chain with emphasis on markets and marketing of production and modelling the pay as you irrigate model to sustainable production models that suit the women irrigators and links them to the viable output markets for cereals and horticultural crops. Designing (in consultation to farmers and stakeholders) of viable Business plans that are linked to the SPIS systems.
Key Expert-Solar (SPIS) systems	Berry van den Pol, **PRACTICA Foundation**	Preparation and validation of contents on: Diagnostic and design of SPIS in the Mubobo Irrigation scheme, including usage, maintenance and safety procedures. Modelling of a payment model for the women led associations to ensure affordability of the prime solar irrigation system as well as spares.
Supporting Experts		
Deputy team leader and Agriculture expert	Llionel S. Zisengwe, **HUB**	Field support, coordination with local stakeholders, organisation of workshops and project reporting (Validation and preparation of key reports and preparation of key Deliverables)
Communication Expert	Simão Jordão Anguilaze, **HUB**	Organisation of the communication platforms incl. radio & full reporting of the project implementation, responsible for the dissemination of knowledge into the target groups as well as digital training materials for the beneficiaries.
Gender and financial inclusion Expert	Tania Saranga, **HUB**	Guiding the key gender empowerment and financial inclusion component of the mission. Her role will help to ensure full consultation and inclusion of the female beneficiaries through adequate gender models and Focus Group discussions to make sure that the best payment model for the SPIS is designed focusing on women's capacities and strengths.

Technical and administrative support staff		
Amanda Mabunda	Administrative Support, **HUB**	In charge of financial reporting and logistical support for HUB & PRACTICA team in Mozambique, is based in HUB's Maputo office
Marije Heurter	Head of administration, communication, management team member, **PRACTICA Foundation**	Responsible for the administration of the PRACTICA office, backstopping and supporting the PRACTICA team

Team Structure

The team is led by Aldo Zamarroni, an international water and irrigation expert from PRACTICA and the project manager of "Developing the Solar Irrigation Business Case in the Gaza province", a project financed by GIZ Mozambique. Because of the strong connections between both projects, Aldo has the good profile and skills to be leading the team of experts on this project of "Solar based irrigation business model "pay as you irrigate" for women empowerment, water management and food security in Mozambique". He has worked together with a team of international experts and local consultants to design solar irrigation solutions for small-scale farmers, and developed, tested and monitored the implementation of a "pay-as-you-go" system together with suppliers of technologies. His rigourness and technical expertise are an asset for the team.

Since Aldo has a limited professional experience in terms of years employed, we have decided to present the agriculture expert, Llionel Zisengwe as a Deputy Team Leader in charge of field coordination and local representation of the team. Llionel has a long and extensive track record in irrigation and business development throughout Southern Africa. In the past he has worked as a technical expert in agriculture and irrigation, and supported on a more strategic and managerial level, the development of local businesses.

The second international expert is Berry van den Pol, also part of PRACTICA as a project manager and representative of the management team. Berry has more than 10 years of experience in the domain of irrigation and the development sector. He has been involved in multiple projects throughout Sub-Saharan Africa to provide technical assistance for the design, installation and operation of (solar) irrigation systems, training on design and choices of technologies for irrigation, and has conducted studies on the feasibility and potential of solar irrigation in Mozambique and Ethiopia. With an excellent technical background and a good knowledge of the field, Berry is a strong asset for the team. He also has good didactical qualities and often leads interactive workshops and practical training. When it comes to the choice and installation of irrigation technologies, Berry always tries to intervene in a participatory manner, by putting the farmer at the centre of the construction process. This ensures a good inclusion of farmers' needs and wants that will be essential to guarantee successful SPIS design.

Pedro Pinheiro is the key expert economist coming from Portugal. We believe that Pedro's experience, track record and skills are ideal for the position and in good complementarity with the rest of the team. Pedro has had many experiences working on similar development projects and his location in Maputo, are an asset for the assignment. His good knowledge of the Mozambican context and his ability to easily visit the field and the beneficiaries are an advantage for the implementation of the project.

The communication expert is Simão Jordão Anguilaze. Simão has an extensive professional experience as a journalist and as a teacher in Communication. Since 2020, he works as an independent communication consultant for projects and businesses. During his career, Simão has assumed multiple positions and roles related to communication. His expertise and experience in this domain are key to the development of high-quality dissemination materials that we plan to produce during the 6th output of this project. He will ensure that the materials produced are adapted to each of the target groups, with the right balance of technicality and user-friendliness to communicate effectively on the results of the project.

Finally, the Gender and Inclusion expert of our team is Tania Saranga also based in Maputo close to the project location. This is an opportunity for the team to be located close to the project location and therefore have the opportunity to visit and spend as much time as needed with the stakeholders of the project. Tania's role will be to ensure a good inclusion of women in the activities of the project and make sure that their perspectives are well represented in the output and deliverables of the project. In order to facilitate a good inclusion of female participants, she needs to make sure that they are comfortable exposing their views and needs to the expert's team, and during the workshops that will be organised. Her position as an experienced gender expert, and her proximity to the field are assets for the realisation of the project.

The proposed team has been built in order to ensure that: (i) all the team members have previous proven experience and multidimensional knowledge of the country dynamics, the context of implementation, target groups, gendered and social issues and speak Portuguese fluently (and national expert also speaking local languages); (ii) all the team members are well versed on climate change response and mitigation principles, social inclusion, gender sensitivity, and have a consolidated experience in collaborating with local institutions; (iii) technical, specialised knowledge on solar based irrigation technologies (SPIS), agricultural production, water management, value chain development, business management and gender mainstreaming, as aligned to the Terms of Reference.

The diagram below presents the envisioned project steering mechanism. Each team member has specific responsibilities corresponding to his or her expertise, on either a coordinating, thematic and/or supporting role. The organigram figure 2 also shows roles and location of the team members, and in the table 2 below we demonstrate the specific skills and a short resume of the key positions.

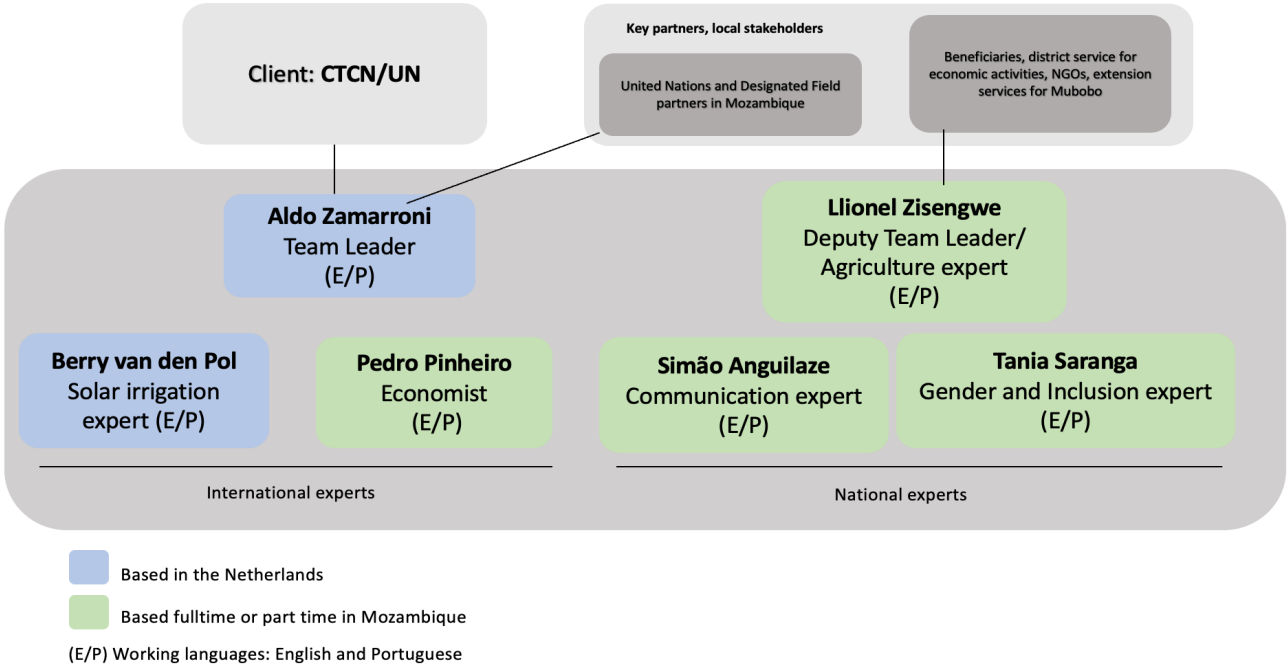


Figure 2. Organigram of the team with roles, location, focal point and working languages.

Table 2. Expertise team members

	Team leader	Key thematic experts					Technical backstopping
	Aldo Zamarroni	Pedro Pinheiro	Berry van den Pol	L.S. Zisengwe	Simão Jordao Anguilaze	Tania Saranga	PRACTICA
Experience in project management	★	★	★	★	★	★	★
Expertise in solar water pumping system	★		★	★			★
Expertise on the design of business model for smart agriculture technologies	★	★	★	★		★	★
Experience on training, capacitating, knowledge transfer			★	★	★		★
Experience in Mozambique	★	★	★	★	★	★	★
Knowledge about social inclusion and gender empowerment				★		★	

2. Work plan

The work-plan presented below is structured around the 6 sub-objectives described in the step-wise approach, and the mandatory output of expert days. Four missions are planned for the international experts involved in the project. The economist of the team is an international expert from Portugal but with a second base in Maputo, with a strong track record in the development sector. International mission tickets are therefore not needed for him. This team composition allows an easy access to the field and will favor interactions between experts and the local stakeholders. Even though international missions are scheduled at key moments of the project (for specific activities and workshops), additional missions for the local experts can easily be undertaken when needed, and are encouraged to increase interactions with the stakeholders and encourage their participation.

International missions are scheduled at the same time as one or multiple workshops are being organised for the stakeholders of the project in Mubobo, Mozambique. These will be unique opportunities for the (international) experts and project beneficiaries to interact. National experts are also expected to participate in each of the workshops. Most workshops will be organised and led by the agriculture expert who is also in a position of deputy team leader. The economist will take the lead in organizing the two workshops related to the definition and validation of the business model for the pay-as-you irrigate system.

Mandatory output:

56 expert-days are scheduled for the mandatory output. We see this output as a transversal activity with main inputs required during the inception phase of the intervention and during the closing phase. We believe that it is important to involve all the experts during the initiation. A good preparation requires all the actors to be involved so that they can agree and appropriate themselves with the plan and the process.

Output 1: Map stakeholders and establish a working group

For this output 29 days are scheduled and divided amongst the 6 experts. Similarly, to the mandatory output a large amount of time will be dedicated to the mapping of the relevant stakeholders, in line with our Stakeholder inclusion strategy point 1 and 2. This is because it is an activity and a deliverable that will serve as a basis for the rest of the project and will ensure that the following outcomes and deliverables have a strong basis. We have decided to allocate some time to each expert so that they can do literature and field research based on their expertise and make sure that all the important aspects of the work, including gender inclusion, are correctly planned for.

The first mission will be made by the team lead at the end of the first output delivery. It will be the opportunity for the actors of the project to meet and make a good start for the rest of the

project. During that mission the Working Group to track the project progress, constituted of local stakeholders, will be established. The experts will organize the inception meeting, finalize the stakeholder mapping and use this opportunity to visit the location of the project and gather data on the demand and supply for the fit-for purpose SPIS. Thus, this mission will cover both the output 1 and 2 mentioned in the work-plan below.

Output 2: Analyze the current irrigation practices and design an appropriate irrigation and solar water pumping technologies for the commune of Mubobo, in Mozambique

A similar number of days as to what is proposed in the response plan is scheduled for the realization of this output. Only the diagnosis of the existing irrigation system is Mubobo is expected to take more expert days. That is because it involves a number of field days for the experts during the first mission. It will be the opportunity for each expert to get familiar with the location of the project, meet the local stakeholders, and discover and understand their current systems and practices. Dedicating time and getting a good understanding of how things are organised at the beginning of the project will facilitate the communication between the experts and the local stakeholders during the rest of the project and the various workshops planned. Therefore, we consider that this activity cannot be neglected and requires 27 days to be conducted and to write the report.

Output 3: Consult the stakeholders and review the design of the Solar Powered irrigation system for Mubobo in Mozambique.

49 expert days are planned for the realization of output 3. This timeline is shorter than scheduled in the response plan. Our team and each of our experts already have experience working with solar irrigation systems in Mozambique after conducting several projects in these settings. Their existing knowledge of the markets, and environmental conditions and their observations during the field visits and data collection will facilitate this technical design step. Up until now, PRACTICA has designed multiple decision-making tools for the design and sizing of solar irrigation systems that will be useful for this activity. Nevertheless, a key element will be the consultation with stakeholders and co-construction of the systems according to the needs and wants of the local stakeholders who will benefit from the installation. Gender aspects will also be given good attention during the design process thanks to the constant involvement of the gender expert.

The second mission will focus on output number 3. The solar irrigation expert will join the national experts in Mubobo, Mozambique, to consult the stakeholders and review the design of the Solar Powered irrigation system. After a draft architecture for the design of the irrigation system has been determined, the experts will go in the field. They will organize a workshop with the stakeholders to present the draft. Based on the results of the workshop and additional field visits in the perimeters where the technologies will be installed, the architecture will be revised by the solar irrigation and the agriculture expert and the final design will be presented for validation in a second workshop a few days later. The objective is to select systems that are functional and adapted to the needs and wants of the beneficiaries. The iterative process

involving multiple workshops and field visits are meant to ensure a good adequation between the technologies selected and the expectations of the Mubobo stakeholders. Previous experiences of solar irrigation systems installation from both PRACTICA and HUB experts in Mozambique have already yielded interesting results and lessons learnt that will certainly help during the design.

Output 4: Define a cost estimation of the designed solar powered irrigation system

Similarly, to the third output, less time than scheduled in the response plan will be dedicated to the realization of the fourth output thanks to the previous experiences and existing knowledge and skills of both the technical experts (solar irrigation, agriculture and team leader) but also of the economist.

Output 5: Define a "pay as you irrigate" business model targeting small smallholder farmers

The design of the “pay-as-you-irrigate” system is at the heart of the project. That’s why the largest number of days is dedicated to this output. Because it is spread over a period of 6 months (which should ideally also coincide with the productive season), two missions will be undertaken during this output. Local travel from the national experts is also expected. The economist will be leading the activities related to this output, but a strong involvement of all the local experts is expected. The gender expert in particular will have 17 days for this activity in order to ensure a good inclusion of women in the design of the business model and to ensure that the business model is inclusive and adapted to the situation of women stakeholders of Mubobo.

The third mission will involve international travel from the team. But the first activity of this mission will be to present and validate the results of the cost estimation of the solar irrigation systems designed (output 4). The second activity will be a workshop organised by the economist to brainstorm with the local stakeholders and the working group on the design of the business model. Based on the result, the business model will be drafted, the definition of the actual business model will require the involvement of all experts over a period of almost 6 months. It provides time to elaborate a good business model and reflect on all the aspects and potential risks before the validation workshop. During that period, local experts (including the economist) will make field missions to assess and adjust the business model of the pay-as-you-irrigate system together with the users, financial institutions and solar supply companies. It is also an opportunity to collect additional information from the farmer’s side if needed. Following this period, the validation workshop will constitute a fourth mission for all the national experts, and will mark the beginning of the preparation of the dissemination materials.

Output 6: Elaborate and disseminate training’s materials and workshops

The sixth output relates to the dissemination of the results of the projects. The communication expert will naturally coordinate the preparation and dissemination of the promotion and training materials but the two international experts will also come back in order to communicate on the results of the projects to external stakeholders.

The last mission will gather all the experts for three workshops and the objective to share the results and lessons learnt from this project. One of the workshops will target smallholder farmers, another one the private sector (including investors and banking institutions), and the last one will take the shape of a training to municipal and national officers.

Overall summary of the workplan

In a nutshell, the work is divided regularly over the 18 months of the project. Nine workshops are planned with the objective to gather experts and local stakeholders and facilitate interactions and reinforce the implication of the beneficiaries. These workshops will also be key moments for the international experts to implement field missions. In between these international missions, the local experts will also have the possibility to visit the project location and meet with the stakeholders. The proximity between the project location (Mubobo) and the residence of the experts (Economist, communication, and gender) in Maputo allows for field trips over a day or two days and one night. The agriculture expert based in Chimoio can also take a national flight or a bus to visit the project location even though two traveling days are necessary to go back and forth.

3. Invoicing plan

The invoicing of the activities will occur per output delivered. In total through the 18 months assignment, there are expected 6 invoices, see table below for a summary.

Output	Month	Total (USD)
Mandatory Output & Output 1: Map stakeholders and establish a working group	2	**41.262**
Output 2: Analyze the current irrigation practices and design an appropriate irrigation and solar water pumping technologies for the commune of Mubobo, in Mozambique	5	**28.570**
Output 3: Consult the stakeholders and review the design of the Solar Powered irrigation system for Mubobo in Mozambique.	8	**32.836**
Output 4: Define a cost estimation of the designed solar-powered irrigation system	11	**25.162**
Output 5: Define a "pay as you irrigate" business model targeting small smallholder farmers	16	**39.668**
Output 6: Elaborate and disseminate training's materials and workshops	18	**56.952**
	TOTAL	**224.450**

Work Plan																			
Months	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**Total**
International mission						**ESI**												**ESI**	2
		TL									**TL**							**TL**	3
Mandatory output: Develop communication documents and implementation work plan																			**56**
Activity i: Develop detailed implementation plan																			13
• **i) Implementation plan**	•																		
Activity ii: Develop a monitoring and evaluation plan																			19
• **ii) Monitoring and evaluation plan**	•																		
Activity iii: Impact description document																			8
• **iii) Impact description document**	•																		
Activity iv: A CTCN closure and data collection report																			16
• **iv) Data collection report**																		•	
Output 1: Map stakeholders and establish a working group																			**29**
Activity 1.1: Map relevant stakeholders and establish a stakeholder working group																			19
• **1.1 Stakeholder mapping report**		•																	
◊ Activity 1.2 Conduct an **inception meeting**		◊																	10
• **1.2 Inception meeting report**		•																	
Outcome 2: Analyze the current irrigation practices and design an appropriate irrigation and solar water pumping technologies for the commune of Mubobo, in Mozambique																			**81**
Activity 2.1: Diagnose current irrigation system in Mubobo																			27

• 2.1 Diagnosis of current irrigation systems including operational costs			•																
Activity 2.2 Gather data to understand the demand side of the fit-for-purpose SPIS																			19
• 2.2 Final report to understand the demand side of a SPIS					•														
Activity 2.3: Collect data to define PV pump system and irrigation infrastructure (supply side)																			16
• 2.3 Final report to define a fit-for-purpose PV pump system and irrigation infrastructure (supply side)					•														
Activity 2.4 Draft the design architecture of the solar powered irrigation system for the commune of Mubobo, in Mozambique																			19
• 2.4 Draft of the architecture of the solar powered irrigation system for Mubobo					•														
Output 3: Consult the stakeholders and review the design of the Solar Powered irrigation system for Mubobo in Mozambique.																			**49**
◊ Activity 3.1 Organize a stakeholder meeting to present the (draft) architecture of the solar powered irrigation system in Mubobo in Mozambique						◊													12
• 3.1 Minute of the stakeholder consultation workshop with materials, list of participants disaggregated by gender and photos.						•													
Activity 3.2: Revise the design the solar powered irrigation system and include the internet of things.																			15
• 3.2 Revised architecture of the solar powered irrigation system for Mubobo in Mozambique, including internet of things.							•												

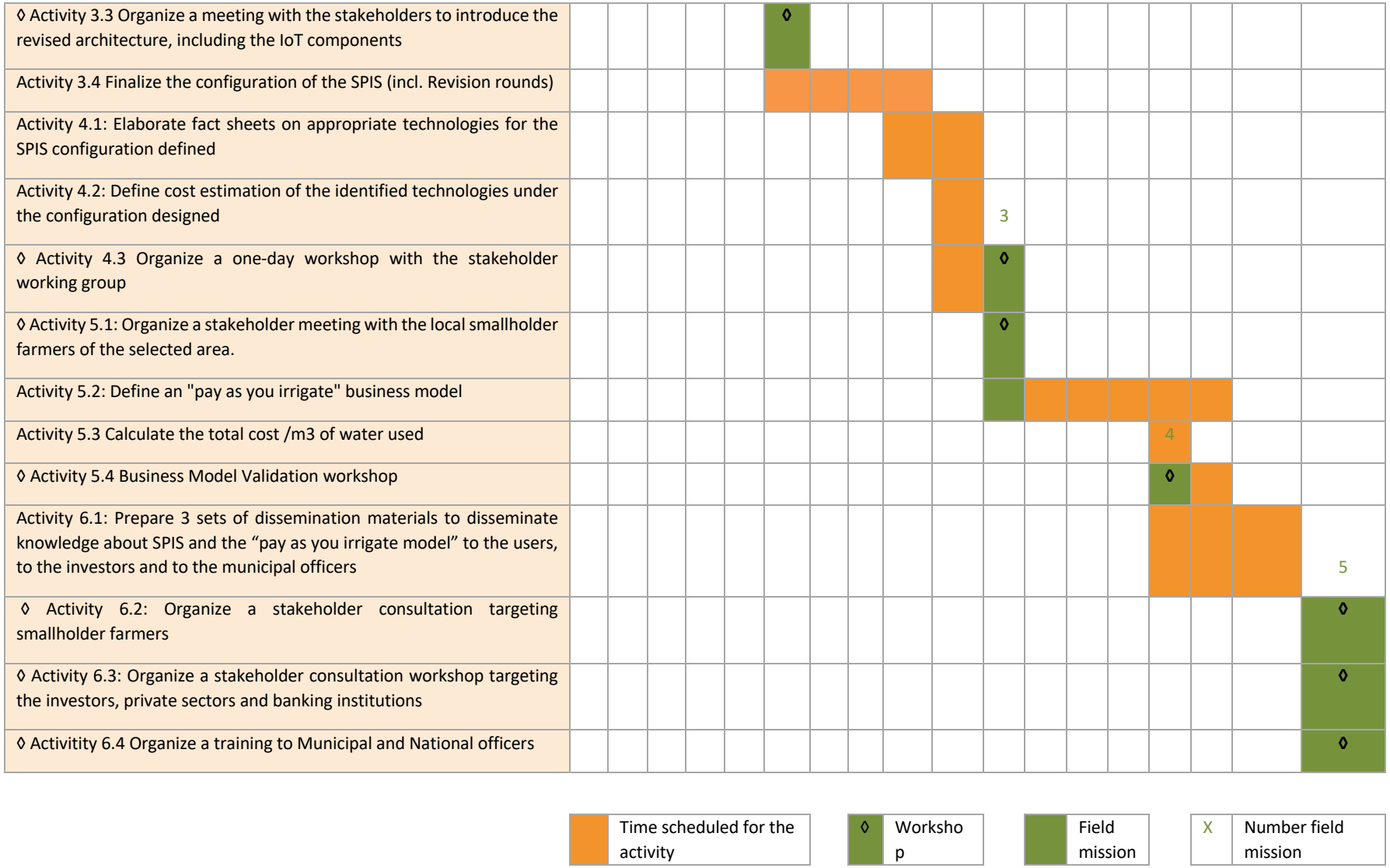
◊ Activity 3.3 Organize a meeting with the stakeholders to introduce the revised architecture, including the IoT components						◊													10
• 3.3 Minute of the stakeholder consultation workshop with materials, list of participants disaggregated by gender and photos.							•												
Activity 3.4 Finalize the configuration of the SPIS (incl. Revision rounds)																			12
• 3.4 Final and approved architecture of the solar powered irrigation system for Mubobo in Mozambique, including internet of things.								•											
Output 4: Define a cost estimation of the designed solar powered irrigation system																			**46**
Activity 4.1: Elaborate fact sheets on appropriate technologies for the SPIS configuration defined																			20
• 4.1 Technology fact sheets									•										
Activity 4.2: Define cost estimation of the identified technologies under the configuration designed																			14
• 4.2 Cost estimation of the prioritized technologies										•									
◊ Activity 4.3 Organize a one-day workshop with the stakeholder working group										◊									12
• 4.3 Minute of the restrictive working group workshop including the material, list of participants disaggregated by gender, photos, conclusions.										•									
Output 5: Define a "pay as you irrigate" business model targeting small smallholder farmers																			**100**
◊ Activity 5.1: Organize a stakeholder meeting with the local smallholder farmers of the selected area.										◊									21

• 5.1 a Minute of the stakeholder meeting with the local smallholder farmers including photos, a disaggregated list of participants, materials used, etc.												•							
• 5.1 b Definition of the needs of the future users of the SPIS system used through pay as you irrigate model												•							
Activity 5.2: Define an "pay as you irrigate" business model																			39
• 5.2 Pay as you irrigate business model drafted															•				
Activity 5.3 Calculate the total cost /m3 of water used																			17
• 5.3 Total cost/m3 of water used calculated.															•				
◊ Activity 5.4 Business Model Validation workshop															◊				23
• 5.4 a Minute of the validation workshop of the business model including a list of participants disaggregated by gender, photos, a summary of the inputs received.																•			
•5.4 b. Business model revised and circulated to the stakeholder working group (up to 3 times)																•			
• 5.4 c. Final "pay as you irrigate" business model																•			
Output 6: Elaborate and disseminate training's materials and workshops																			**85**
Activity 6.1: Prepare 3 sets of dissemination materials to disseminate knowledge about SPIS and the "pay as you irrigate model" to the users, to the investors and to the municipal officers																			40
• 6.1 a Dissemination material targeting the users																	•		
• 6.1 b Dissemination materials targeting the investors																	•		

• 6.1 c Dissemination materials targeting the national officers																	•		
• 6.1 d Dissemination strategy and planning.																	•		
◊ Activity 6.2: Organize a stakeholder consultation targeting smallholder farmers																		◊	16
• 6.2 Minutes of the stakeholder consultation workshop with pictures, and a list of participants desegregated by gender as well as materials used if any.																		•	
◊ Activity 6.3: Organize a stakeholder consultation workshop targeting the investors, private sectors and banking institutions																		◊	15
• 6.3 Minutes of the stakeholder's consultation with the private sector and banking institutions with pictures, and a list of participants desegregated by gender as well as materials used if any.																		•	
◊ Activitity 6.4 Organise a training to Municipal and National officers																		◊	14
• 6.4 Minutes of the training to municipal and national officers with pictures, and a list of participants desegregated by gender as well as materials used if any.																		•	

	Time scheduled for the activity
•	Deadline for the deliverable
◊	Workshop, training
	Period of completion of the output

Planning field missions																		
Months	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
International mission						**ESI**												**ESI**
		TL									**TL**				**Eco**			**TL**
Activity i: Develop detailed implementation plan																		
Activity ii: Develop a monitoring and evaluation plan																		
Activity iii: Impact description document																		
Activity iv: A CTCN closure and data collection report		1																
Activity 1.1: Map relevant stakeholders and establish a stakeholder working group																		
◊ Activity 1.2 Conduct an **inception meeting**		◊																
Activity 2.1: Diagnose current irrigation system in Mubobo																		
Activity 2.2 Gather data to understand the demand side of the fit-for-purpose SPIS																		
Activity 2.3: Collect data to define PV pump system and irrigation infrastructure																		
Activity 2.4 Draft the design architecture of the solar powered irrigation system for the commune of Mubobo, in Mozambique						2												
◊ Activity 3.1 Organize a stakeholder meeting to present the (draft) architecture of the solar powered irrigation system in Mubobo in Mozambique						◊												
Activity 3.2: Revise the design the solar powered irrigation system and include the internet of things.																		


◊ Activity 3.3 Organize a meeting with the stakeholders to introduce the revised architecture, including the IoT components
Activity 3.4 Finalize the configuration of the SPIS (incl. Revision rounds)
Activity 4.1: Elaborate fact sheets on appropriate technologies for the SPIS configuration defined
Activity 4.2: Define cost estimation of the identified technologies under the configuration designed
3
◊ Activity 4.3 Organize a one-day workshop with the stakeholder working group
◊ Activity 5.1: Organize a stakeholder meeting with the local smallholder farmers of the selected area.
Activity 5.2: Define an "pay as you irrigate" business model
Activity 5.3 Calculate the total cost /m3 of water used
4
◊ Activity 5.4 Business Model Validation workshop
Activity 6.1: Prepare 3 sets of dissemination materials to disseminate knowledge about SPIS and the “pay as you irrigate model” to the users, to the investors and to the municipal officers
5
◊ Activity 6.2: Organize a stakeholder consultation targeting smallholder farmers
◊ Activity 6.3: Organize a stakeholder consultation workshop targeting the investors, private sectors and banking institutions
◊ Activitity 6.4 Organize a training to Municipal and National officers
Time scheduled for the activity
◊ Worksho p
Field mission
X Number field mission

Completed deliverables / activity	Invoicing plan																		
	Months																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Mandatory Output																			**20.600**
Activity i: Develop detailed Implementation Plan	5.110																		
Activity ii develop a monitoring and evaluation plan	6.710																		
Activity iii: Impact description document	3.040																		
Activity iv: A CTCN Closure and Data Collection report																		5.740,00	
Output 1																			**20.590**
Activity 1.1: Map relevant stakeholders and establish a stakeholder working group		6.370																	
Activity 1.2 Conduct an inception meeting		14.220,																	

Output 2																			**28.570**
Activity 2.1:Diagnose current irrigation system in Mubobo			8.730																
Activity 2.2 Gather data to understand the demand side of the fit-for-purpose SPIS					6.710														
Activity 2.3: Collect data to define PV pump system and irrigation infrastructure (supply side)					5.740														
Activity 2.4 Draft the design architecture of the solar powered irrigation system for the commune of Mubobo, in Mozambique					7.390														
Output 3																			**29.390**
Activity 3.1 Organize a stakeholder						12.020													

meeting to present the (draft) architecture of the solar powered irrigation system in Mubobo in Mozambique																			
Activity 3.2: Revise the design the solar powered irrigation system and include the internet of things.							5.190												
Activity 3.3 Organize a meeting with the stakeholders to introduce the revised architecture, including the IoT components							7.620												
Activity 3.4 Finalize the configuration of the SPIS								4.560											
Output 4																			**22.360**

Activity 4.1: Elaborate fact sheets on appropriate technologies for the SPIS configuration defined										6.920									
Activity 4.2: Define cost estimation of the identified technologies under the configuration designed											5.660								
Activity 4.3 Organize a one-day workshop with the stakeholder working group											9.780								
Output 5																			**38.160**
Activity 5.1: Organize a stakeholder meeting with the local smallholder farmers of the selected area.												10.270							
Activity 5.2: Define an "pay as you irrigate" business model															11.590				

Activity 5.3 Calculate the total cost /m3 of water used															5.270				
Activity 5.4 Business Model Validation workshop																11.030			
Output 6																			**64.780**
Activity 6.1: Prepare 3 sets of dissemination materials to disseminate knowledge about SPIS and the "pay as you irrigate model" to the users, to the investors and to the municipal officers																	13.300		
Activity 6.2: Organize a stakeholder consultation targeting smallholder farmers																		16.500	
Activity 6.3: Organize a stakeholder consultation workshop																		9.190	

targeting the investors, private sectors and banking institutions																			
Activitity 6.4 Organise a training to Municipal and National officers																		8.140	
Travel and per diem local experts		5.812				3.446					2.802				1.508			4.082	
																			TOTAL
Invoicing per output (USD)		**41.262**			**28.570**			**32.836**			**25.162**					**39.668**		**56.952**	**224.450**