Commissioned by:	UN Environment, CTCN, Adaptation Fund
Project Title:	Solar based irrigation business mode ‘pay as you irrigate’ for women empowerment, water management and food security in Mozambique
Implemented by:	Practica & HUB
Country:	Mozambique
Deliverable:	4.3 Minute of the stakeholder consultation workshop to present the fact sheets and the cost estimation of the selected technology for the solar powered irrigation system in Pangalata, Moamba, Mozambique.

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

Minute of the stakeholder consultation workshop to present the fact sheets and the cost estimation of the selected technology for the solar powered irrigation system in Pangalata, Moamba, Mozambique

August 2024

PRACTICA HUB

This project has been proposed by Universidade Pedagógica de Maputo

With the support of the Ministry of Science and Technology and High Education

Implemented by PRACTICA & HUB

Commissioned by UN Environment, CTCN, Adaptation Fund

Disclaimer:
This document is an output of the Technical Assistance Response in Mozambique. The present report is the output of the project 'Solar based irrigation business model 'pay as you irrigate' for women empowerment, water management and food security in Mozambique. The views and information contained herein are a product of the international TA implementation team led by PRACTICA & HUB.

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1. Introduction

This report is part of the deliverables for the project *Solar-based irrigation business model' pay as you irrigate' for women empowerment, water management and food security in Mozambique* implemented by the consortium PRACTICA and HUB. The project's overall objective is to identify the best Solar Powered Irrigation System (SPIS) for the Pangalata association in Moamba that could be deployed using groundwater, surface water, and the possibility for rainwater harvesting. The system's design will be reinforced by the definition of a clear *pay-as-you-irrigate* business model that will be customized for the lowest-income farmers.

This deliverable aims to collect the inputs received during the stakeholder consultation meeting to present the cost estimation and the technology fact sheets to demonstrate what technology matches the realities and expectations for the smallholder farmers in the Pangalata association.

2. Objectives

1. Present the cost estimation and the technology fact sheets for the solar-powered irrigation system.
2. Collect inputs and feedback on the cost estimation and the technology fact sheets.

2.1 Agenda

Workshop for stakeholder consultation project 'Solar-based irrigation business model *pay-as-you-irrigate* for women empowerment, water management and food security in Mozambique

Objective: To present the cost analysis of the technologies selected (activity 4.3), and to organize a participatory consultation to understand the main barriers to financing SPIS (activity 5.1).

Local time: Mozambique (GMT+2)
Data: Tuesday 25th July 2024
Local: Meeting Room of the Government of Moamba District

Time	Activity
08:30-09:00	Registration and welcoming of participants
09:00-09:30	Presentation of the agenda and introduction of the team and participants Inácio Nhancale (HUB) & Pedro Pinheiro (HUB)
09:30-09:45	Presentation of the fact sheets & cost analysis Inácio Nhancale (HUB)
09:45-10:00	Participatory discussion on the fact sheets & cost analysis Inácio Nhancale (HUB)
10:00-10:30	Coffee break
10:30-13:15	Participatory consultation to understand the main barriers to financing SPIS faced by smallholder farmers and financial institutions. Pedro Pinheiro (HUB)
13:00-13:15	Q&A about the next steps of the project, Wrapping up and closure of the meeting Inácio Nhancale (HUB) & remote by Berry van den Pol (PRACTICA
13:15-14:15	Lunch

2.2 List of Participants

No	Name	Institution	Gender
1	Herrita Massango	UP Maputo	F
2	Arsenio Mindú	UP Maputo	M
3	Cesar Menaco	CITT	M
4	Rosita Cumbe	GAPI	F
5	Aderito Miranda	FUNAE	M
6	Saibo Amade	SDAE	M
7	Joaquim Valoi	SDAE	M
8	Domingos F. Macandio	INIR	M
9	Neussia M. Ubisse	INIR	F
10	Manuel P. Miquitaio	INIR	M
11	Olaxio Messa	SDAE Moamba	M
12	Adelino Magu	Smallholder farmer Pangalata	M
13	Ana Bernardo	Smallholder farmer Pangalata	F
14	Elisa Elmane	Smallholder farmer Pangalata	F
15	Watanica Fernando	Smallholder farmer Pangalata	F
16	Marta Tazula	Smallholder farmer Pangalata	F
17	Elisabeth José	Smallholder farmer Pangalata	F
18	Cecilia Alberto	Smallholder farmer Pangalata	F
19	Inocencio Decivi	SDAE	M
20	Celso Francisco	SDSMAS	M
21	Lidia timana	Smallholder farmer Pangalata	F
22	Adelina Mutuque	Smallholder farmer Pangalata	F
23	Maniamo Francisca	Smallholder farmer Pangalata	F
24	Ezar Essau	UP Maputo	M
25	Manuel Oliveira	UP Maputo	M
26	Paulino Victor	UP Maputo	M
27	Jose Chamessango	UP Maputo	M

3. Main outcomes of the consultation workshop

27 participants (of which 12 were female and 15 males) + 3 HUB staff attended the workshop (see Annex 1). Participants belong to the Pangalata association, Mubobo association, agricultural extension services (SDAE), District Service for Health, Women and Social Action (SDSMAS), Center for Research and Technology Transfer (CITT), and National Irrigation Institution (INIR). Maputo Pedagogical University (UP and HUB also attended the meeting (see 2.2 list of participants).

3.1 Opening remarks

The opening session was led by Eng. Messa, the district supervisor of agricultural extension (SDAE), emphasized the importance of the present project in developing agriculture for the district of Moamba and urged the participants for their active involvement and contributions during the sessions. Finally, he acknowledged the participation and support of the different concerned Mozambican institutions and different levels, as well as the project proponent (UP Maputo) and CTCN, for their effort and commitment to making this technical assistance a reality. After Eng Messa's intervention, the day's agenda was introduced, and activities officially began.

Figure 1. Plenary session during the workshop.

3.2 Presentation of the fact sheets & Cost Analysis

After the opening session, the presentation[1] (Annex 3) started as a reminder of what key milestones have been achieved under the technical assistance and the coming activities. Moreover, the overall irrigation management of the system has been presented as a refresher for the participants. Emphasizing that for the two production plots of 2.5 ha each, each irrigation cycle will use 66 lines, with the duration of the irrigation cycle of 40 minutes. Which provides a total irrigation time per plot of 5.1 hours per day during the most critical period (see Figure 2).

[1] Link for access: https://docs.google.com/presentation/d/1_4jjn9hwCpyX1LE-2sDJzjfT-2eFU1sq/edit?usp=sharing&ouid=112789746957537703336&rtpof=true&sd=true

Figure 2. Geometry of the accepted irrigation system for Pangalata association.

As part of Output 4 of this technical assistance, appropriate technologies have been compared using a scale from 1 to 5. The value 1 represents non-recommended technology, 3 represents indifferent impact, and 5 represents a highly recommended technology[2].

The scale was used to compare 3 different types of technologies: a) borehole drilling, b) solar pumping devices, and c) irrigation application systems. The most appropriate technologies for each point were: a) Manual drilling, b) submersible pump, and c) drip line (for more details on this assessment, see deliverable 4.1).

The overall cost of establishing the solar irrigation system for Pangalata was provided in hard copies to all the participants and presented in detail (see deliverable 4.2) and annexe 4 to this document.

3.3 Discussion session to collect feedback from the working group

A plenary discussion took place for participants to share their observations and doubts on the presented analysis of the most feasible technologies and the cost estimations.

[2] This scale represents only the outcomes for the conditions in Pangalata, for other project in any other place, the scores might be adjusted and the outcomes can be completely different.

Table 1. Concerns and answers or (possible) solutions discussed during the workshop.

Concerns	Answers/ (Possible) Solutions
The criteria for selecting the borehole drilling comparison does not make sense. Specifically in two criteria (depth and geological constraints). Why do manual and mechanical techniques have the same scores?	The consortium clarified that the weighted criteria are tailored to the Mozambican context and the situation in Pangalata. During the first field visits, a manual drilled borehole was performed (up to 8 m depth) to measure the static water depth and to identify the different soul layers close to the river bed. (see deliverable 'Extra activity' and 2.1 Diagnosis of the current irrigation system). The outcome of this analysis is that the static level is too shallow (less than 5 meters), and there is no difference in whether a manual or mechanical technique is used to drill. Both of them will be able to reach the productive part of the aquifer quickly. The same applies to geological constraints; drilling at a considerable depth will not be required; therefore, whether manual or mechanized technique is used does not make a difference.
Is there a geological study on the area?	An analysis of the geological maps of the Moamba association was conducted during the diagnosis of the current irrigation system (deliverable 2.1). The results show that the soils are alluvial and only have a superficial (10-25 cm) clay structure, followed by sandy soils, which give the characteristics of a productive aquifer underneath the river. See details below. *'In general, the predominant soils in the district of Moamba, are those of alluvial and basaltic origin, with plains of medium texture and depths that vary from marginal to good. The soils of the Incomati valley are alluvial and have medium to high fertility with good agricultural aptitude. The red soils of Moamba, are characterized by having a superficial layer, reddish brown, sometimes very dark, clayey and with a granulose structure. The thickness varies from 10 to 25 cm and gradually transitions to red earth, chocolate color, strong clayey, compact to very compact, with calcareous nodules and generally with medium thickness.'* A Vertical Electrical Sounding (VES) can be done in the Pangalata fields. Still, the consortium does not recommend it, as the results will confirm what has been identified in the geological maps. The costs of conducting a VES will increase the installation cost by approximately 30%.
Is the cost estimation considering the land preparation for installing the	The cost estimation includes the 'supply and underground installation of the pipes' (see Annex 3, under specifications). However, this means just the preparation of the ditches for burying the pipe. The land preparation for agricultural activities is not included in the cost estimation.

solar irrigation system?	

3.4 Final remarks and next steps

Therefore, once all the questions and concerns raised by the participants of the working group were discussed and clarified, the working group considered approved the cost estimation and the comparison of the fact sheets. Being aware that in the possible next phase[3] of the project (construction of the system), an updated on the prices of quotation should be requested to potential suppliers[4], but deliverable 4.2 should be used as a reference to assess the quality of the proposal. As shown in the agenda, only half of the session was used for the cost estimation consultation, the floor was given to the economics specialist for the second part of the workshop (definition of the needs of the future users of the SPIS through the pay-as-you-rigid system).

[3] It was clarified to the participatns that a this is not confirmed yet and a whole tender process needs to be followed. It was also clarified that Practica and HUB will not be involved in the tender process.

[4] When the irrigation system is constructed, an update on the prices should be requested from potential suppliers. They should comply with the requirements and specifications provided under deliverable 4.2 Cost estimation, annex 3 to this document.

3. Annexes

Annex 1. List of Participants

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LISTA DE PRESENÇAS

Data:

Nota: Ao assinar esta lista, você concorda com o consórcio em contatá-lo para qualquer assunto relacionado ao projeto, bem como utilizar as fotos e materiais gerados na reunião para fins de relatórios e comunicação

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Annex 2. Pictures from the workshop.


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Annex 3. Detailed cost estimation for the Solar Powered Irrigation System for Pangalata association[5].

Plot 1							
n°	**Specifications**	**Unit**	**Quantity**	**Unitary Price (MZN)**	**Total price (MZN)**	**Total Price (USD)**	**Remarks**
1	**Borehole**				**525,000**	**8,223.68**	
1.1	Borehole using rotary method, and supply and installation of 8 inch casing, including flow rate testing.	meter	35	15000	525,000	8,224	Minimum yield 22 m3/h, max dynamic level 25 m
2	**Solar pumping equipment**				**584,289**	**9,152.40**	
2.1	Supply, and installation of a submersible pump 22 m3/h at 41 m (TDH), 6-inch diameter , including pipes and accessories.	unit	1	584289.4	584,289	9,152	Lorentz PSk2-7 C-SJ30-6 (Includes pump+controller+electric wiring+pipes+pannels+supports &structures)
2.2	Supply, and installation of a solar generator, including electrical accessories for regulation and protection, wiring, and panel support.	kW	8.2	*Included with the pump installation			Approximately 26 pannels (320 Wp 2m x 1m) = 52 m2 = 13m x 4m (2 lignes)-To be defined by the supplier.
3	**Irrigation equipment**				**413,561**	**6,478.09**	
3.1	Supply, and installation of a header station: connection accessories, valves, 130-micron filtration, pressure gauge, water meter.	unit	1	43511	43,511	682	fertilizer injector is excluded. Does not include land preparation for agricultural activities.

[5] During the workshop, these materials were presented in portuguese, but for this deliverable the English version is attached.

3.2	Supply, and underground installation of main PVC pressure pipe with a diameter of 90 mm, including connection accessories	m	120	97	11,640	182	
3.3	Supply, and underground installation of manifold diameter 50 mm, including regulation unit (4 manifolds) and accessories	m	264	51648	51,468	806	underground with PE flat pipe. Does not include land preparation for agricultural activities.
3.4	Supply and surface installation of integrated drip line diameter 16 mm, 1 L/h at 10 m, spacing 0.3 m, including connection accessories	m	1	306942	306,942	4,808	Netafim streamlineX. Does not include land preparation for agricultural activities.
4	**Internet of Things (Sensors)**				**277,000**	**4,339**	
4.1	Sensors for the implementation of smart-irrigation systems in Mozambique				**277,000**	**4,339**	
				SUBTOTAL	**277,000**	**4,339**	
				TOTAL	**1,799,851**	**28,193**	

	Plot 2						
n°	**Specifications**	**Unit**	**Quantity**	**Unitary Price (MZN)**	**Total price (MZN)**	**Total Price (USD)**	
1	**Borehole**				**525,000**	**8,223.68**	
1.1	Borehole using rotary method, and supply and installation of 8 inch casing, including flow rate testing.	meter	35	15000	525,000	8,224	Minimum yield 22 m3/h, max dynamic level 25 m
2	**Solar pumping equipment**				**584,289**	**9,152.40**	
2.1	Supply, and installation of a submersible pump 22 m3/h at 44 m (TDH), 6-inch diameter , including pipes and accessories.	unit	1	584289	584,289	9,152	Lorentz PSk2-7 C-SJ30-6 (Includes pump+controller+electric wiring+pipes+pannels+supports &structures)
2.2	Supply, and installation of a solar generator, including electrical accessories for regulation and protection, wiring, and panel support.	kW	8.8	*Included with the pump installation			Around 28 pannels (320 Wp 2m x 1m) = 56 m2 = 14m x 4m (2 lignes)
3	**Irrigation equipment**				**424,231**	**8,223.68**	
3.1	Supply, and installation of a header station: connection accessories, valves, 130-micron filtration, pressure gauge, water meter.	unit	1	43511	43,511	682	fertilizer injector is excluded
3.2	Supply, and underground installation of main PVC pressure pipe with a diameter	m	230	97	22310	349	Does not include land preparation for agricultural activities.

	of 90 mm, including connection accessories						
3.3	Supply, and underground installation of manifold diameter 50 mm, including regulation unit and accessories	m	264	51648	51,468	806	underground with PE flat pipe. Does not include land preparation for agricultural activities.
3.4	Supply and surface installation of integrated drip line diameter 16 mm, 1 L/h at 10 m, spacing 0.3 m, including connection accessories	m	1	306942	306,942	4,808	Netafim streamlineX. Does not include land preparation for agricultural activities.
				TOTAL	**1,533,521**	**24,021**	

Total Costs Summary

Summary Table prices in Meticais		
Component	**Plot 1**	**Plot 2**
Borehole Drilling	525,000	525,000
Solar Pumping Equipment	584,289	584,289
Irrigation Equipment	413,561	424,231
Sensors (Internet of Things)	277,000	-
Total (MZN)	1,799,851	1,533,521
Total (MZN)	**3,333,371**	

Note: Price in Meticais, including components from the Internet of Things

Summary Table prices in Meticais		
Component	**Plot 1**	**Plot 2**
Borehole Drilling	525,000	525,000
Solar Pumping Equipment	584,289	584,289
Irrigation Equipment	413,561	424,231
Sensors (Internet of Things)	-	-
Total (MZN)	1,522,851	1,533,521
Total (MZN)	**3,056,371**	

Note: Price in Meticais, excluding components from the Internet of Things