Completion Report

Solar solutions for African smallholder farmers, Zambia, NCF-C7-074

Grantee: Solar Village

Local Partner(s): Alliance Ginneries, Conservation Farming Unit

Other Partner(s): -

Project start date: *01/07/2018*

Project end date*: 30/06/2021*

Date	Person responsible (Signature)
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TABLE OF CONTENTS

1. Executive summary 4

2. ACHIEVEMENT OF RESULTS 4

2.1 Achievement of outcomes and outputs 4

2.2 Deviations from the planned outputs and activities 4

2.3 Achievement of NCF indicators 4

3. Climate change 5

4. Development impacts and cross-cutting issues 5

5. Assessment of the results and impacts of the project 6

5.1 Relevance 6

5.2 Effectiveness 6

5.3 Efficiency 6

5.4 Impact 6

5.5 Sustainability 6

5.6 Coherence 7

6. INNOVATION 7

7. potential for scaling up and follow-up investments 7

9. Monitoring and evaluation 7

10. Lessons learnt 8

11. OUTREACH 8

12. FINANCIAL SUMMARY 8

13. Conclusions and recommendations 8

ANNEXES

Annex 1 Project completion fact sheet

Annex 2 Updated Results Framework / Logical Framework Matrix

Annex 3 Pictures

Annex 4 Other supplementary documentation

Annex 5 Impact story

1. EXECUTIVE SUMMARY

The Solar Village Battery Stick and Micron Ulva+ sprayer are a climate smart agriculture solution and home solution for African smallholder farmers living off-grid. It improves productivity and yields, is highly resource efficient in terms of water and chemicals, and the Battery Stick's remote locking mechanism enables it to be used as a collateral for farmer loans. This NCF project was about testing the viability of selling Solar Village's Battery Stick and Micron's Ulva+ agricultural sprayer to Zambian farmers with Pay-As-You-Go payments plans as well as use the Battery Stick's remote locking mechanism to collateralise cookstove sales to farmers. It sought to demonstrate how a partnership between Solar Village and Alliance Ginneries could be mutually beneficial for both parties helping Solar Village to build its rural sales agent network, as well as market, sell and deliver its products to Alliance's farmers and the farmers around them. It also sought to demonstrate how a partnership between Solar Village and the Conservation Farming Unit could support training of farmers in climate resilient farming techniques including effective and safe use of the solar-powered Micron sprayer for herbicide applications. The project sought to reach 9000 farmers, provide €1,281,005 in credit to farmers, create 510 jobs and pay €70,423 in sales commissions, as well as sell 2250 cookstoves and save 7763 tonnes of CO_2e. The project managed to prove the viability and scalability of its business model under ordinary circumstances related to local currency stability. Under the extraordinary currency depreciation circumstances experienced during parts of the project it proved not to be viable. In spite of proving the viability of the Battery Stick and Micron sprayer sales business, the project only managed to reach about one third of its targeted beneficiaries which was due to unexpected technical product problems early in the project negatively affecting revenues generation and working capital availability for procurement of inventory later on in the project when the largest sales were supposed to happen. The only business model component that did not work out were the cookstove sales, as a poor match was found between Solar Village's clientele - rural farmers with access to "free" firewood in the forests nearby farmers' farms - and the value proposition that cookstoves could offer, i.e. cost savings on fuel for cooking. The project ended up reaching 2960 farmers, provided €213,973 in credit to farmers, created 191 jobs, paid €23,276 in sales commissions, and sold 79 cookstoves and saved a total 2276 tonnes of CO_2e. Based on the proof of the business model Solar Village is now seeking funding for a 4 year 41,000 farmer project with Alliance Ginneries and 3 other agribusinesses organising in total 150,000 farmers in its outgrower schemes.

2. ACHIEVEMENT OF RESULTS

2.1 Achievement of outcomes and outputs

See annex 2.

2.2 Deviations from the planned outputs and activities

No planned outputs or activities did not take place at all. However, the number of farmers reached was only a third of the original target due to technical product problems early in the project and sales suspended for much of 2019 affecting cashflow and availability of funds later on in the project. The cookstove component of the project was not successful as it was found that there was a poor match with Solar Village's clientele - rural farmers with access to "free" firewood in their nearby forests - and the main value proposition that the cookstoves could bring - cost saving on fuel for cooking.

2.3 Achievement of NCF indicators

NCF core indicator	Results (quantitative)			Clarifications/Means of verification
Number of beneficiaries reached	women		7400	Battery Sticks sold * 5 household members (assuming each household consists of 50% men and 50% women)
	men		7400	
	total		14800	
Number of people with increased resilience to climate change	women		3296	Participants of sprayer / climate smart agriculture trainings
	men		4552	
	total		7848	
Number of people with improved livelihoods	women		7400	Battery Sticks sold * 5 household members (assuming each household consists of 50% men and 50% women)
	men		7400	
	total		14800	
New decent jobs created	full-time	women	4	Permanent Solar Village staff and Solar Village sales agents
		men	14	
		total	18	
	part-time	women	21	
		men	152	
		total	173	
	seaso-nal	women		

		men		
		total		

3. **CLIMATE CHANGE**

Climate change mitigation

In terms of climate change mitigation, the project's impact was related to reduction of fossil fuels at household level. Solar-powered Battery Sticks replace greenhouse gas (GHG) emitting lighting devices such as kerosene lamps and candles (0.0299 tCO2 per Battery Stick per year for 7 years). Energy-efficient cook stoves reduce GHGs by 0.87 tCO2 per cook stove per year for 3 years.

In the course of the project 2276 tCO2 were saved which is significantly lower than what was targeted (7783 tCO2). The main reason for that is that the sales of cookstoves to the rural farmers largely failed. The project found a poor match between Solar Village's clientele (rural farmers with access to "free" firewood) and the value that cook stoves can deliver (saving on fuel for cooking). The initial assumption that the main bottleneck for higher cook stove adoption among the rural population is due to low affordability of cook stoves (which Solar Village intended to overcome by providing credit for cook stoves) did not turn out to be true.

Climate change adaptation

In terms of climate change adaptation, the project's impact was related to farmers' adoption of a highly water-efficient spraying technology.

In the context of climate change, water sources become more difficult to access for farmers. This impacts their ability to manage their crops appropriately for weeds, pests, and diseases, while certain pests become more prevalent (e.g. the Fall Armyworm), seriously threatening farmers' yields and livelihoods. Farmers can not spray their fields properly because conventional spraying technologies require large volumes of water which are difficult to access. The Micron spraying technology in our project requires only minimal water volumes compared with conventional sprayers used by smallholder farmers (90% water reduction) and therefore removes this bottleneck for effective weed, pest, and disease management. In the course of the project, 324 new Micron sprayers were sold, hundreds existing "dormant" sprayers were revived through the Battery Stick which conveniently powers the sprayers, and product awareness among thousands of farmers was created preparing the ground for higher sprayer sales in the farming seasons ahead. 7848 farmers were trained in correct and efficient use of the Micron sprayer in climate-smart agricultural practices ensuring farmers' ability to make use of that technology and preparing the grounds for a high uptake of the spraying technology also after the end of the project.

4. Development impacts and cross-cutting issues

In the course of the project, 2960 families got access to modern energy through the Battery Stick used both for agricultural and domestic purposes. The remote locking mechanism enabled the use of the Battery Stick as collateral both for the sale of the Stick itself but also for agricultural input loans improving farmers' creditworthiness towards agribusinesses and their access to credit. In the course of the project €213,973 in credit was directly provided by Solar Village to farmers. 191 jobs were created, of which 173 rural sales agents earned €23,276 in sales commissions paid by Solar Village.

Particular efforts were made to reach female farmers. 42% of the trained farmers were female. And where the spraying technology has been adopted, 235 hours (29 person days) of manual female/child labour per year per family are being avoided. This has had a positive impact on school attendance of children and freed time for women to pursue other economic activities.

5. Assessment of the results and impacts of the project

5.1 Relevance

The high popularity and demand for Solar Village's products among rural smallholder farmers proves that the general product offering and value proposition is valued highly by farmers. Solar Village's customers have also been highly loyal with the vast majority making their payments reliably almost unaffected by difficult Covid times. Also the project partners Alliance Ginneries and Conservation Farming Unit (CFU) highly valued the offering, as it enhanced their core business. In the case of CFU, the progressive spraying technology enables the highly efficient and effective application of herbicides, a key method in the conservation agriculture approach, which avoids soil disturbance and labour saving for farmers. In the case of Alliance Ginneries, the spraying technology significantly increased the productivity of their cotton farmers, as well as increased farmer loyalty by using the lockable Battery Stick to collateralise cotton input loans.

5.2 Effectiveness

Broadly speaking, the project achieved about one third of the targets it had set out to achieve. All outcome areas were addressed and all planned activities were executed, however, to a significantly lower extent than envisaged. 2960 out of the targeted 9000 farming households were reached and €213,973 out of targeted €1,281,005 sales credit provided, a rural sales network of 173 agents out of the targeted 500 was built, €23,276 out of targeted €70,423 were paid in sales commissions to these agents. The main reason for why the project fell behind its targets were unexpected technical product problems at the beginning of the project

which delayed sales income and had negative repercussions on availability of working capital at the later stages of the project. The second major challenge experienced in the course of the product were extremely high levels of local currency depreciation. As products are imported and paid in foreign currency but local revenues from customers are in local currency, this led to high losses on the value of receivables and making the raising of additional funding from financiers difficult.

Overall, the business concept (apart from the cookstoves component) was proven to be viable and scalable under more "ordinary" conditions in terms of volatility of the local currency than were experienced during extraordinary circumstances of parts of the project period.

5.3 Efficiency

The overall approach of Solar Village to build its rural sales agent network by piggybacking on cotton companies' rural networks has proven to be a very cost-effective way of building its distribution structures in rural areas. At scale, this will be a highly cost-effective and scalable model. However, at the project level, the cost-efficiency of funds was reduced due limitations in working capital to procure sufficient quantities of inventory for Pay-As-You-Go sales of Solar Village's product. As volumes of working capital were lower than expected in the project, the amount of human resources needed per customer was higher than originally planned for, as customer service and administrative functions needed to be covered also with lower number of customers.

In the course of the project, Solar Village has also learnt important lessons about how to further increase operational efficiency - particularly by applying a more disciplined periodisation of different organisational tasks, such as marketing, sales, and training, and by changing its payment plans to align better with farmers' seasonal cashflow and reducing the frequency of payments to reduce the amount of time used by sales agents and field staff to collect payments.

5.4 Impact

Although the scale so far is not big enough to make claims of substantial systemic impact, the positive experiences of the win-win collaboration between Alliance Ginneries and Solar Village in this project suggest that this model of collaboration has the potential to change the cotton sector in Zambia in a very positive way both for cotton companies like Alliance Ginneries as well as their farmers. Cotton companies organise farmers in outgrower schemes, provide agricultural inputs to farmers on credit, provide access to agricultural extension services, and buy farmers' cotton crop after harvest. This system has been undermined by farmers side-selling their crop to other cotton companies and defaulting on their input loans. Cotton companies have responded to these losses by minimising their risk by reducing the value of inputs provided to farmers which in turn reduces farmer productivity, yields and income. The sprayer and Battery Stick have helped address this challenge in 2 ways: firstly, the lockable Battery Stick is used to disincentivise side-selling of the

crop, as it locks if farmers default on their cotton input loans. Secondly, because the equipment increases farmer yields. In this way, a negative spiral of high degrees of side-selling leading to smaller input packages leading to lower yields leading to more side-selling is turned into a positive spiral of less side-selling leading to higher farmer creditworthiness and larger input packages leading to higher farmer yields and incomes leading to higher farmer loyalty and less side-selling. To achieve a large impact, Solar Village and Alliance Ginneries hope to be able to scale up their collaboration significantly by reaching Alliance's entire 40,000 farmer base upon securing funding for this.

5.5 Sustainability

The project has proven the viability of a highly scalable collaboration model between Solar Village and cotton companies with large outgrower schemes. However, to turn this successful model into a profitable and financially sustainable venture, it needs to be implemented on a large scale. The biggest bottleneck for this is to secure sufficient volumes of capital to finance the inventory needed to reach that level of scale.

5.6 Coherence

As mentioned above, the project found a high alignment of interests between the project partners. In the case of CFU, the progressive spraying technology enables the highly efficient and effective application of herbicides, a key method in the conservation agriculture approach, which avoids soil disturbance and labour saving for farmers. In the case of Alliance Ginneries, the spraying technology significantly increased the productivity of their cotton farmers, as well as increased farmer loyalty by using the lockable Battery Stick to collateralise cotton input loans. The project partners found good ways of integrating project activities into existing arenas and activities thereby maximising synergies and avoiding duplication of efforts and use of resources. For example, instead of building up its own rural sales agents network from scratch, Solar Village with the facilitation of Alliance Ginneries recruited Alliance Ginneries' rural cotton agents (who organise ordinary cotton farmers) as its sales agents.

6. INNOVATION

Solar Village's products are designed in a way that addresses issues perceived as real problems by rural smallholder farmers in Zambia and offers it to them with a financially attractive proposition which makes the products highly popular.

At the same time, the product and service offering also addresses key pain points of Alliance Ginneries and CFU. This is the basis for their active support for the business Solar Village is conducting with the farmers they organise.

These win-win synergies between Solar Village, Alliance Ginneries and CFU form the basis for being able to potentially reach a very large number of smallholder farmers cost-effectively with Solar Village's product offering. This product offering both improves farmers' livelihoods as well as tackles climate change - particularly from a climate change mitigation perspective.

7. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

Based on the learnings in this project, there are firm intentions of scaling up this project in Zambia. Solar Village is working on raising EUR 2.2 million in private sector financing for the next 4 years to reach 41,000 new smallholder farmer customers. So far, the funding has not been secured. But conversations are ongoing with potential investors.

8. RISKS

One of the risks identified before the start of the project was the risk of currency depreciation which has the potential to put the profitability and sustainability of business at risk. In the course of the project, this risk materialised to a degree that we had not anticipated. By the end of the project, the Zambian Kwacha had lost 57% of its value to the EUR compared to the beginning of the project. Solar Village tried to mitigate the currency depreciation risk by closely following how the currency develops and by regularly adjusting the prices of its products - at least twice a year. and by encouraging farmers to pay off their products as quickly as possible. However, these measures were not sufficient to meet the extent of currency depreciation that actually occurred. After the change of government in Zambia, and through that the macroeconomic prospects, the currency situation seems to have stabilised. However, to further reduce risk in future sales, Solar Village will reduce the length of the payment plans from 30 to 24 months, and farmers will have to pay 33% of product costs upfront to minimise the currency depreciation risk.

9. MONITORING AND EVALUATION

There has only been internal monitoring of activities and results by the project partners. No external evaluations have been conducted.

10. LESSONS LEARNT

The 3 main lessons learnt are related to how sprayer marketing and training activities should be conducted, how the payment plans for farmers should be structured, and related to the cookstoves component of the project.

Sprayer marketing and farmer training leveraging demo plots

As a result of the learning in the project, Solar Village has changed its approach to sprayer marketing and training by establishing demo plots where farmers in that locality gather regularly to receive practical training and guidance throughout the whole crop cycle. Here farmers learn how to correctly apply herbicides for weed management, insecticides for pest management, fungicides for disease management, foliar fertiliser for crop nutrition, as well as biological/organic applications as substitutions or supplements to conventional chemical applications. In addition to spraying specific topics, Solar Village field staff also provide advice on other agronomy related topics. The training sessions are held between the months of October to April. This approach requires more resources but has proven far more effective in terms of convincing farmers to adapt the Micron spraying technology as well as in terms of enabling them to utilise it in a way that yields good results. Changes in payment plan structure leading to fewer payments and reduced need to dedicate human resource to payment collection, human resources have been freed to accommodate the increased resource requirements in terms of training.

New payment plans

Based on the bad experiences of a very high local currency depreciation and resulting losses from that, and based on the realisation that Solar Village needs to further streamline its operations for higher cost-effectiveness, Solar Village will change the Pay-As-You-Go payment plans for future sales. In the new payment plans, farmers will:

- Make a down payment of ⅓ of the product package price before product handout
- Fully pay for the product within 24 months (instead of 30 months as earlier)
- Pay in 3 annual post-harvest installments rather than monthly installments

In this way, Solar Village reduces the currency depreciation risk by receiving a larger amount from customers upfront and by reducing the total length of the payment period. This way of structuring payments also aligns with farmers' seasonal cashflow, as payments are made when they have received income from crop sales. And it enables Solar Village to spend less resources continuously "chasing after money" and instead spend more time on e.g. marketing and training activities directed at farmers.

Cookstoves are not good match for rural farmers with access to "free" firewood

Based on Solar Village's experiences which suggest that there is a poor match between rural Zambian farmers with "free" access to firewood and therefore low importance of reducing cooking fuel consumption, and cookstoves' value proposition which is based on its ability to reduce fuel need, Solar Village will not continue to sell pre-fabricated cookstoves to farmers.

11. OUTREACH

No specific external outreach activities are planned. The learnings are only meant for internal learning of the project partners.

12. FINANCIAL SUMMARY

Table 1. Project financing per partner

	Financing, EUR					
Expenditures, EUR	NCF	Solar Village	Alliance Ginneries	Conservation Farming Unit	Revenues from the project	Total
Milestone 1	106,487	48,185			1,554	156,226
Milestone 2	150,308	1,789			29,393	181,490
Milestone 3	80,204		126	4,714	16,758	101,802
Milestone 4a	77,037	14,666	236		5,262	97,200
Milestone 4b	67,510	36,153	511		9,845	114,019
	€481,546	€100,793	€873	€4,714	€62,812	€650,737

13. Conclusions and recommendations

In light of the learnings mentioned above, the project confirmed that Solar Village's product is highly popular among Zambian farmers who are loyal customers of Solar Village (only 5% customer churn). The project partnerships with Alliance Ginneries and the Conservation Farming Unit have proven to be an effective way of creating product awareness and product demand, and to build up a network of rural sales agents cost-effectively to reach larger numbers of customers. The main encountered challenges in the course of the project were some initial technical product challenges and a strongly depreciating local currency.

In the course of the project, the technical product design was improved and the product is now technically stable. The negative spillover effect of the early product challenges were reduced sales revenues due to suspension of sales in 2019 until the product redesign was completed. These missing revenues were then lacking later on in the project as they could not be reinvested to buy the required inventory volumes to reach the project targets. Because of that, Solar Village halted the geographical project expansion and was also faced with a high product demand which it could not meet due to shortage in inventory.

Solar Village tried to compensate for the revenue reductions early in the project by raising additional funds from investors. However, this proved to be difficult also due to the high uncertainties related to local currency depreciation making it appear risky to invest in Solar Village's business model under the prevailing circumstances which was further exacerbated by the uncertainties created by the global Covid 19 pandemic. Since the election of a new Zambian government in August there is hope that macroeconomic and currency stability will be reestablished, as the rapid strengthening of the Zambian Kwacha versus other currencies in the weeks following the elections suggests. Solar Village is currently engaging with investors hoping to secure financing for the next 4 years for the scale-up of its highly scalable and cost-effective business model to reach 41,000 new farmer customers across Zambia.

The only component of Solar Village's business model which, unfortunately, did not work at all was its cookstove sales component which was found to be incompatible with the priorities of Solar Village's clientele. As such, the attempted cookstoves approach will be discontinued. Alliance Ginneries initiated a new cookstoves approach which is without cost to farmers and which is financed through international carbon credits. Solar Village is currently experimenting with this new approach, and depending on the outcome of the current trials, Solar Village may or may not continue with being involved in cookstoves in the future.

Annex 1 Project completion fact sheet

Project Name:	**Solar solutions for African smallholder farmers, Zambia**		
Project no.	NCF-C7-074		
Country:	Zambia	**Financing:**	
		EUR	**%**
Nordic Partner:	Solar Village	€163,605	25
Local Partner:	Alliance Ginneries and Conservation Farming Unit	€5,587	1
Other Partner:			
	NCF grant disbursed	€481,546	74
	Total	€650,737	**100.00**
Classification:	Mitigation/ Adaptation/ Combination		
Project cycle:	Project start date: 01.07.2018 Original closing date: 31.12.2020 Actual closing date: 30.06.2021		
Short project description:	Solar Village (SV) is a Norwegian company on a mission to improve African smallholder farmers' yields and quality of life by distributing its multifunctional solar Battery Stick. SV develops, manufactures, distributes and finances smart solar energy solutions tailored to the needs and aspirations of African smallholder farmers. SV improves the livelihoods and well-being of smallholder farmers living off-grid by offering a holistic solar energy solution that provides income-generating opportunities and climate smart technologies tailored to smallholder needs and aspirations. The solar-powered Battery Stick powers a highly beneficial agricultural sprayer that is already well established in the industry and provides electricity for in-home applications (lights, phones, etc). The sprayer was previously powered by disposable batteries which were an unpopular energy source for farmers, and proved to be a bottleneck to more widespread product adoption. This progressive spraying technology is much more efficient than conventional backpack sprayers, reducing time spent spraying and water use by 90%. This allows farmers to reinvest time and resources into expanding acreage, increasing productivity and yields, and focusing on secondary income generating opportunities. By adopting this climate smart solar technology smallholder farmers can improve their livelihoods and ensure food security for their families. This NCF project was about testing the viability of selling Solar Village's Battery Stick and Micron's Ulva+ agricultural sprayer to Zambian farmers with Pay-As-You-Go payments plans as well as use the Battery Stick's remote locking mechanism to collateralise cookstove sales to farmers. It sought to demonstrate how a partnership between Solar Village and Alliance Ginneries could be mutually beneficial for both parties helping Solar Village to build its rural sales agent network, as well as market, sell and deliver its products to Alliance's farmers and the farmers around them. It also sought to demonstrate how a partnership between Solar Village and the Conservation Farming Unit could support training of farmers in climate resilient farming techniques including effective and safe use of the solar-powered Micron sprayer for herbicide applications. The project sought to reach 9000 farmers, provide €1,281,005 in credit to farmers, create 510 jobs and pay €70,423 in sales commissions, as well as sell 2250 cookstoves and save 7763 tonnes of CO_2e. T		
Project performance:	**Expected Outcomes and Outputs**	**Achieved**	**End-of-project status**
	Outcome 1.1 – households with increased financial security	Partly	33%
	Output 1.1.1 - Battery Sticks used to promote financial security	Partly	33%
	Output 1.1.2 – Credit provided to smallholder farmers	Partly	17%
	Outcome 1.2 - New decent jobs created	Partly	37%
	Output 1.2.1 – Commission paid to Solar Village Agents	Partly	33%
	Outcome 2.1 - persons with increased access to agricultural financial services	Partly	33%
	Output 2.1.1 - persons with access to improved agricultural input packages	Partly	33%
	Outcome 2.1 - persons with increased agricultural productivity	No	8%
	Output 2.1.2 - Micron sprayers sold to farmers	No	8%
	Outcome 2.1 – farmers with improved resilience to climate change.	Yes	196%

	Output 2.1.2 – farmers trained in climate-smart agriculture and resilient farming practices.	Yes	196%
	Outcome 2.2 – Beneficiaries with improved access to energy	Partly	33%
	Output 2.2.1 - Battery Stick kits sold to farmers	Partly	33%
	Outcome 2.2 – tonnes of CO_2e reduced by Solar Village products	Partly	29%
	Output 2.2.1 - Cook stoves sold to farmers	No	4%

Climate change outcomes and impacts:

Mitigation:
- 2276 tonnes CO2e saved

Adaptation:
- 327 highly water-efficient Micron sprayers sold (+ hundreds "dormant" Micron sprayers revived)
- 7848 farmers trained in sprayer use in climate smart agriculture

Development outcomes and impacts:
- 2960 families got access to modern energy through the Battery Stick used both for agricultural and domestic purposes
- Remotely lockable Battery Stick used as collateral to unlock farmer credit
- €213,973 credit directly provided by Solar Village to farmers
- 191 jobs created
- 173 rural sales agents earned €23,276 in sales commissions
- 42% of the trained farmers were female
- With the new spraying technology 235 hours (29 days) of manual female/child labour per year per family saved

NCF core indicators

NCF core indicator	Results (quantitative)			Clarifications/Means of verification
Number of beneficiaries reached	women		7400	Battery Sticks sold * 5 household members (assuming each household consists of 50% men and 50% women)
	men		7400	
	total		14800	
Number of people with increased resilience to climate change	women		3296	Participants of sprayer/climate smart agriculture trainings
	men		4552	
	total		7848	
Number of people with improved livelihoods	women		7400	Battery Sticks sold * 5 household members (assuming each household consists of 50% men and 50% women)
	men		7400	
	total		14800	
New decent jobs created	full-time	women	4	Permanent Solar Village staff and Solar Village sales agents
		men	14	
		total	18	
	part-time	women	21	
		men	152	
		total	173	
	seasonal	women		
		men		
		total		

Annex 2 Results Framework

Outcome 1.1

Indicator	Latest update	Progress
1.1.0 Number of households with improved access to financial services and increased financial security	2021-06-30	2 960 households (33%)

Output 1.1.1

Indicator	Latest update	Progress
1.1.1.0 The number of Battery Sticks (and associated payment data) used to increase access to financial services and promote financial security	2021-06-30	2 960 items (33%)

Activity	Due date	Responsible person	Latest update	Status
1.1.1.1 Use the locking mechanism of the Battery Stick to collateralize the credit received from Solar Village to purchase Solar Village products, and for input loans received from cotton companies. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready
1.1.1.2 Further develop remote locking technology by providing a better user experience and increasing functionality to help serve newly targeted markets. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready
1.1.1.3 Provide training on how to use the Battery Stick to generate secondary revenue streams (e.g. spray services, phone charging services). This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready
1.1.1.4 Use Pay-As-You-Go payment history to create a credit score/profile for each customer. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready

Output 1.1.2

Indicator	Latest update	Progress

Indicator	Latest update	Progress
1.1.2.0 Amount of credit provided to smallholder farmers	2021-06-30	213 973 EUR (17%)

Activity	Due date	Responsible person	Latest update	Status
1.1.2.1 Provide credit to smallholder farmers, allowing them to purchase Solar Village products on a Pay-As-You-Go basis. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready

Outcome 1.2

Indicator	Latest update	Progress
1.2.0 Number of new decent jobs created	2021-06-30	191 jobs (37%)
1.2.0 Number of green business concepts tested	2021-06-30	1 business concepts (100%)

Output 1.2.1

Indicator	Latest update	Progress
1.2.1.0 Commission paid to Solar Village Agents	2021-06-30	23 276 EUR (33%)

Activity	Due date	Responsible person	Latest update	Status
1.2.1.1 Provided Agents with a "Business in a box": all relevant training and marketing material and demonstration units (Battery Stick, Sprayer, TV, Stove). This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready
1.2.1.2 Pay 10% commission to Solar Village Agents as client payments are collected. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready

Activity	Due date	Responsible person	Latest update	Status
1.2.1.3 Recruit and manage a network of new sales agents. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready
1.2.1.4 Train a network of new sales agents. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready

Outcome 2.1

Indicator	Latest update	Progress
2.1.0 Number of farmers with improved resilience to climate change.	2021-06-30	7 848 persons (196%)
2.1.0 Number of farmers with increased access to agricultural financial services	2021-06-30	2 960 persons (33%)
2.1.0 Number of farmers with increased agricultural productivity	2021-06-30	327 persons (8%)
2.1.1 Project specific increase in yields	-	No data

Output 2.1.1

Indicator	Latest update	Progress
2.1.1.0 Number of farmers with access to improved agricultural input packages	2021-06-30	2 960 persons (33%)

Activity	Due date	Responsible person	Latest update	Status
2.1.1.1 Collateralize cotton company input loans by using the Battery Stick as collateral, via the Pay-As-You-Go locking mechanism. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready

Output 2.1.2

Indicator	Latest update	Progress

Indicator	Latest update	Progress
2.1.2.0 Number of Micron sprayers sold to farmers (including training on how to correctly use the spraying technology to apply pesticides).	2021-06-30	327 units (8%)
2.1.2.0 Number of farmers trained in climate smart agriculture and resilient farming practices	2021-06-30	7 848 persons (196%)

Activity	Due date	Responsible person	Latest update	Status
2.1.2.1 Aquire Micron sprayers to be sold as part of the Battery Stick product package. Inventory orders received throughout the project will be based on full container quantities to maximize shipping efficiency. Since container quantities do not necessarily align with Milestone quantities, we have assigned each Activity related to receiving inventory to Milestone 4 to allow for flexible receiving of inventory to deliver the project Output/Outcome indicators. Note that inventory received throughout the project will be equal to or greater than the required number of products to reach project Impacts/Outcomes/Outputs	31.12.2020	Unassigned	21.12.2021	Ready
2.1.2.2 Train farmers in climate smart agriculture, resilient farming practices and sustainable spraying techniques. This Activity has been assigned to the Milestone 4 to reflect that the associated actions need to be executed throughout the project. Each Activity has specific and verifiable Outcomes/Outputs with quantifiable indicators that can be used to effectively monitor progress throughout the project. Each of the associated indicators will be monitored and reported on at each Milestone.	31.12.2020	Unassigned	21.12.2021	Ready

Outcome 2.2

Indicator	Latest update	Progress
2.2.0 Tonnes CO2 equivalent reduced by Solar Village products	2021-06-30	2 276 tonnes of CO_2e (29%)
2.2.0 Number of beneficiaries with improved access to energy	2021-06-30	14 800 persons (33%)

Output 2.2.1

Indicator	Latest update	Progress
2.2.1.0 Number of Battery Stick kits sold to farmers	2021-06-30	2 960 units (33%)
2.2.1.0 Number of cook stoves sold to farmers	2021-06-30	79 units (4%)

Activity	Due date	Responsible person	Latest update	Status

Activity	Due date	Responsible person	Latest update	Status
2.2.1.1 Import Battery Sticks to be sold in Zambia. Inventory orders received throughout the project will be based on full container quantities to maximize shipping efficiency. Since container quantities do not necessarily align with Milestone quantities, we have assigned each Activity related to receiving inventory to Milestone 4 to allow for flexible receiving of inventory to deliver the project Output/Outcome indicators. Note that inventory received throughout the project will be equal to or greater than the required number of products to reach project Impacts/Outcomes/Outputs	31.12.2020	Unassigned	21.12.2021	Ready
2.2.1.2 Receive cook stoves to be sold in Zambia. Inventory orders received throughout the project will be based on full container quantities to maximize shipping efficiency. Since container quantities do not necessarily align with Milestone quantities, we have assigned each Activity related to receiving inventory to Milestone 4 to allow for flexible receiving of inventory to deliver the project Output/Outcome indicators. Note that inventory received throughout the project will be equal to or greater than the required number of products to reach project Impacts/Outcomes/Outputs	31.12.2020	Unassigned	21.12.2021	Ready

Annex 3 Pictures

Zambian farmer using Solar Battery Stick and Micron sprayer

Well-attended farmer meeting in the shade of a huge tree in the Luangwa Valley

Annex 4 Other supplementary deliverables/documentation/links

Not available.

Annex 5 Impact story

Farmer story “Maxwell’s Second Wife and His Organic Cotton Trial” attached.

Maxwell's Second Wife and His Organic Cotton Trial

Recently, we paid Maxwell a visit. Maxwell is one of our 200 sales agents who is also in charge of managing one of the first 16 demo plots that we introduced this year. We use the demo plots to demonstrate to other farmers how well our product works, to train farmers on correct use of our product, and, sometimes, we test a new approach or application. Like in Maxwell's case. Maxwell grew a portion of maize, soya beans, and cotton. The maize and soya beans were grown in a conventional way. He applied herbicides to get rid of the weeds that compete against the crop's plants for soil nutrients and diminish yields. He applied an insecticide against Fall Armyworm which - due to climate change - has become an annually recurring pest plague wiping out small-scale farmers' maize fields across Zambia and most other African countries. He applied foliar fertiliser on the soya beans to accelerate crop growth. And he sprayed a biological insecticide made of solanum incanum, a fruit commonly found in Zambia, that can be dried and which Alliance Ginneries, one of our key cotton partners, turns into powder which is then delivered back to farmers, nicely packaged, free of charge, to manage pests.

This year, Alliance launched their organic cotton program. They chose four marginalised districts in North-Western and Northern Province where farmers have poor access to markets and where the organic cotton program will be a highly welcome opportunity for farmers to earn cash. It will take Alliance three years to firmly establish its organic program and get certified by the Cotton Made in Africa label. If all goes well in the next 5-7 years, they hope to work with 30,000 smallholder farmers in those areas growing organic cotton. And we intend to join their journey from the very beginning to make our product the preferred spraying technology among their farmers from day one. The first 60 farmers already use our product in the ongoing trial with them.

So, what does Maxwell have to do with this? Well, to get more first-hand experience, we asked Maxwell to only apply the biological solanum insecticide - not conventional insecticides - on his demo cotton field. During our visit we can see that Maxwell has taken very good care of his demo plot. The fields look "clean" - free from weeds -, and the crop looks strong and healthy. He has managed to control the leaf sucking aphids which make leaves wilt and prevent cotton plants from producing enough "food" for itself. And Maxwell has managed to control the bollworms that like making holes and completely damage the cotton bolls which later on become the white cotton that is picked and which give farmers the badly needed income. So, Maxwell has done well. And the biological solanum has done its job. We are all very happy. This is the result we wanted for Maxwell and all other cotton farmers. And for us to be able to demonstrate to Alliance that our solar-powered Micron sprayer works - also with the biological insecticide which will be key in their organic cotton program.

In the meantime, Maxwell's wife Beauty* has joined us holding the hand of Hope*, their last-born 2 year old daughter. She talks about how our sprayer has saved her and the children so much work. All the weeding that normally needs to be done by her and the children - like it is so common in rural Zambian farming households. "Ah, weeding is tough!" she says. "Before, even the kids needed to stay home from school to help weed the fields. Because, otherwise, I couldn't manage." This is different now, as all that job is now done by the herbicides applied through our sprayer. The sprayer saves families, on average, 300 hours - 37 days - of labour per year. And those hours saved are now used on growing bigger fields, and on kids going to school rather than weeding the fields. Maxwell has his own way of explaining the impact of the sprayer on the lives of his family. While his wife Beauty* stands next to him smiling he says: "The Solar Village sprayer is like having a second wife." All of us laugh. This may sound a bit instrumental. But we all get the point. To be able to manage the fields of the size he has now, he would need two wives and probably more children to get the job done - if it wasn't for our sprayer. Maxwell and Beauty* smile caringly at each other. They both seem to agree that it is good that no second wife is needed.

* Not her real name. Changed to protect the family's privacy.