OORJA

Access o Inclusion o Impact

IMPACT REPORT FOR CATALYZETECH

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Executive summary

This report explores the immediate impact of the CatalyzeTech project supported by the SELCO Foundation and implemented by Oorja Development Solutions India Private Limited. The project, which was implemented in the Spring of 2022, aimed to train 500 smallholder and marginalised farmers in modern and sustainable agronomic practices to increase their agricultural productivity and subsequently income. With a particular focus on mobilizing and building capacity of women farmers, additional technical and agronomic training was offered to women who are particularly marginalised and deprived from participation in decision making in rural Uttar Pradesh where the project was implemented.

After an introduction to the project and the context in which it was implemented, we will in the report explore the impact of training sessions based on data collected from participants pre- and post-training. Drawing on the highly positive outcomes of the training but also on identified opportunities for improvement, we will, lastly, outline three key recommendations to guide Oorja's further development of capacity building strategies and activities.

Introduction and context

Oorja Development Solutions India Private Limited (Oorja) is a Farming-as-a-Service (FaaS) company working at the intersection of sustainable agriculture and clean energy. Its mission is to empower 10 million farmers globally by 2030 with the agricultural services they need to sustainably increase their income and quality of life. Oorja has been providing solar-powered irrigation, milling, and cooling services to smallholder and marginal farmers in the Indian states of Uttar Pradesh and Bihar since 2018. As Oorja has continued to expand, gaining traction for its inclusive pay-per-use services with more customers, the need for complimentary training and capacity building of farmers in the areas in which it operates has become evident. Participatory interactions and focus group discussions with smallholder farmers at Oorja's project sites have revealed farmers' limited knowledge of and access to information on modern and sustainable techniques and practices for agriculture, stifling their potential to increase crop yields and income from farming. To address this gap in knowledge and capacity, Oorja has under the CatalyzeTech project, supported by the SELCO Foundation, designed and conducted agronomic training and capacity building sessions for smallholder and marginal farmers at Oorja's project sites in Uttar Pradesh. Only when supplementing the solar-powered agricultural services provided by Oorja with agricultural capacity building of farmers, can marginalized farmers' productivity and income be accelerated further, lifting them out of poverty. The CatalyzeTech project is a time bound close-ended project. However, it has kickstarted the expansion of Oorja's core agricultural services in which agronomic training and capacity building will be an integral part going forward. With the project's particular focus on women farmers, Oorja took a series of steps aiming to mobilise participation from women, who endure multiple deprivations and exclusion from decision making.

The CatalyzeTech project was divided into two phases for implementaion during the months of March, April and May 2022. In the first phase, Oorja conducted agronomic training sessions for 507 smallholder and marginal farmers from the villages around Oorja's project sites in Bahraich and Shravasti districts, Uttar Pradesh. The workshops conducted by Oorja's in-house Agronomist trained participants in sustainable and modern agronomic techniques and practices with the potential of significantly increasing farmers' productivity, yields and hence income. Being one of the poorest states with lowest farmer incomes in India[1], agronomic capacity building is key in lifting marginalized farmers out of poverty in Uttar Pradesh. The CatalyzeTech project's particular focus on engaging women farmers in the first phase of the training lead to the second phase of the project, namely the 'Krishi Sakhis'[2] training programme. During the Krishi Sakhis programme, more than 60 women farmers received additional agronomic training in growing new high-value crops as well as training in digital literacy, namely using a smartphone, and basic financial management. As a key objective of the Krishi Sakhis training programme was to employ a selected number of the trained women in last-mile roles with the company, the Krishi Sakhis were further trained in operations and maintenance (O&M) of solar assets and as collections agents. Uttar Pradesh is characterized by structural gender inequality across different socioe-conomic factors[3]. Women farmers in Oorja's project sites here

[1] https://timesofindia.indiatimes.com/blogs/minorityview/income-of-uttar-pradesh-farmers-are-among-the-lowest-in-the-country/

[2] Hindi for "women friends of agriculture"

[3] Srivastava, Achala (2010). Gender equality in Uttar Pradesh: progress and challenges. Madhya Pradesh Journal of Social Sciences, 15(2).

have very limited, if any, formal education and are predominantly economically dependent on their male family members. For these women, the participation in the Krishi Sakhis programme was an opportunity to acquire new skills and knowledge, increasing their agency within their communities and catalyzing the empowerment of women in agriculture.

The agronomic training workshops during the first phase of the project were conducted over three days with groups of 25-40 farmers participating in each workshop. The workshops were facilitated in 14 villages surrounding Oorja's project sites in Bahraich and Shravasti. Women farmers participating in the training workshops during the first phase of the project were offered the opportunity to continue with the Krishi Sakhis programme in the second phase of the project. The Krishi Sakhis training was a four-day programme, each day dedicated to a different subject. Besides female participants from the first phase of the training choosing to continue with the Krishi Sakhis programme, additional new female participants from the villages were also offered to participate. The Krishi Sakhis workshops were conducted at a rented venue in Nanpara, Bahraich and transportation had been organized by Oorja to pick up participants from their respective villages as well as drop them back to their villages at the end of the day. Acknowledging the significant house-bound workload and duties shouldered by women in addition to their farm work, such as cooking, childcare, and cleaning, it was important for Oorja to maintain flexibility in the planning of the Krishi Sakhis workshops. As a result of this, some participants in the Krishi Sakhis programme participated on all four days of the programme while others only participated on one or two days. Additionally, while some participants on the first day of the training did not participate on the remaining days, other new participants joined later workshops resulting in a total of over 60 participants across all workshops.

Table 1: Training schedule and topics for phase 1 and 2

Training schedule and topics		
Schedule	*Phase 1*	*Phase 2*
Day 1	Human nutrition, growing kitchen garden vegetables and vermicomposting	Agronomic training in growing five new high-value crops, namely black wheat, peppermint, marigold, shatavar and mustard
Day 2	Crop rotation and SRI method to grow paddy	Digital literacy: Using a smartphone
Day 3	Distribution of seeds for and practical field demonstration of growing kitchen garden vegetables	Basic numeracy skills and financial management
Day 4	-	O&M of solar assets, including practical field demonstration at nearby solar irrigation pump site, and training as collections agents

Methodology

This report is based on data collected through pre- and post training surveys filled by participants during the first and second phase of the project. The purpose of the data collected was to measure the impact of training sessions as well as identify positive outcomes and possibilities for improvement.

The training sessions in both phases of the project were, as mentioned, conducted with high degree of flexibility welcoming new participants to join as the sessions moved along as well as allowing participants to leave the sessions early to attend to other duties including house- or fieldwork. Pre- and post training data was therefore not collected for all participants. The foundation for this report is a sample of data collected for participants who responded to both the pre- and post training survey. While this carries the risk of skewing the results extracted, we assume the sample to be representative for the whole population of participants given the similar socio-economic background and conditions of participants. Furthermore, the gender ratio in the sample is similar to that of the whole population and the sample includes participants from a cross-section of villages as well as both customers and non-customers of Oorja, in the ratio of 49% and 51% of the sample population respectively.

Table 2: Overview of total participants and sample of participants for analysis

	Phase 1: Agronomic training		**Phase 2: Krishi Sakhis training**	
	Participants	*Sample*	*Participants*	*Sample*
Female	136	48	54	19
Male	371	118	-	-
Total	**507**	**166**	**54**[4]	**19**

[4] 54 participants responded to the pre-training survey. However, up to 10 additional women participated on an ad hoc basis in some of the training workshops.

Exploring the impact of training sessions

Phase 1: Agronomic training of 500+ smallholder farmers

The pre-training surveys confirmed the initial expectation that participants had very little existing knowledge of the subjects taught during the workshops (see table 3). While the participants reported having slightly higher knowledge level of human nutrition and growing kitchen garden vegetables pre-training, the data clearly underscores the gap in knowledge across subjects taught during the workshops in phase 1 of the project. Table 4 showing participants' expected benefits from the training highlights higher expected benefits from the training in human nutrition and growing kitchen garden vegetables but also expected benefits from training on the remaining subjects.

Table 3: Prior knowledge of subjects taught during phase 1 workshops

Prior knowledge					
	No knowledge	*Little knowledge*	*Some knowledge*	*Good knowledge*	*Significant knowledge*
Human nutrition	66%	33%	1%	0%	0%
SRI-method for growing paddy	86%	13%	1%	0%	0%
Crop-rotation techniques	79%	20%	1%	0%	0%
Vermicomposting	77%	19%	4%	0%	0%
Growing kitchen garden vegetables	19%	60%	16%	5%	0%

Table 4: Expected benefits from phase 1 training per subject taught

Do you think you will benefit from the training?				
	No	*Maybe*	*Yes*	*Don't know*
Human nutrition	1%	16%	71%	12%
SRI-method for growing paddy	0%	31%	49%	20%
Crop-rotation techniques	1%	31%	46%	22%
Vermicomposting	2%	27%	48%	23%
Growing kitchen garden vegetables	1%	6%	87%	6%

Data from the post-training surveys overall show high perceived learning outcomes, particularly for the training in growing kitchen garden vegetables but also from the trainings on human nutrition and SRI-method for growing paddy (see table 5 below). Although slightly lower, the perceived learning outcomes for the training on crop-rotation techniques and vermicomposting were also positive, and very few participants reported no learning outcome across the subjects they received training on. When asked which new practices the participants will use in their own future farming practices, almost all participants reported that they will use techniques to grow kitchen garden vegetables, knowledge of eating more nutritious food and the SRI method for growing paddy (see table 6 below). Furthermore, 65% report that they will use obtained knowledge on crop-rotation

techniques and 35% on vermicomposting in their future farming practices. Overall, this underlines the perceived relevance of the agronomic training workshops in phase 1 of the CatalyzeTech project.

Figure 1: Practical field demonstration and classroom training during phase 1


Table 5: Perceived learning outcome post phase 1 training

Perceived learning outcome				
	No outcome	*Has learned little*	*Has learned some*	*Has learned a lot*
Human nutrition	0%	1%	57%	42%
SRI-method for growing paddy	0%	4%	48%	48%
Crop-rotation techniques	1%	15%	52%	32%
Vermicomposting	3%	27%	53%	17%
Growing kitchen garden vegetables	0%	1%	30%	69%

Table 6: Future use of knowledge obtained in own farming practices

Will use in own farming practices in the future	
Answer	*% of total participants*
Growing kitchen garden vegetables	98%
Eating more nutritious food	94%
SRI-method	86%
Crop rotation techniques	65%
Vermicomposting	35%
Other: Organic/bio insecticide	1%

Because of cropping and growing cycles, it is not possible to measure the impact of the SRI-method and crop rotation technique trainings on participants' farming practices yet. However, Oorja has already been able to observe some of the early positive outcomes from the training workshops. For example, participants from several different villages have already started growing kitchen garden

vegetables using the free seeds provided during the training workshops. The impact of transitioning to the SRI method of growing paddy will be monitored when the farmers adopt the technique.

Figure 2: Newly cultivated vegetable gardens by participants after phase 1 training

Oorja's project sites in Bahraich and Shravasti, Uttar Pradesh are characterized by a gap in cultivation, consumption and sales of vegetables leading to malnutrition. The seven vegetables targeted for the training workshops, namely bottle gourd, pumpkin, spinach, radish, ladies' finger, cow pea and ridge gourd, were chosen based on seasonal conditions and availability of inputs but particularly also on their nutritious value. The early impact of the trainings displays how the tools and hands-on experience with techniques for growing vegetables have given farmers confidence to start cultivating their own vegetable gardens. Aside from being able to ensure proper intake of nutrition throughout the year for themselves and their families, farmers are furthermore estimated to be able to save INR 12,000-15,000 per year on buying vegetables by growing them themselves.

Phase 2: Krishi Sakhis training

Data from the pre-training survey conducted on the first day of the Krishi Sakhis programme similarly underscored participants' limited prior knowledge of the subjects taught during the programme. Particularly, prior knowledge on growing three of the five high-value focus crops for the agronomic training session as well as on the use of smartphones was very low across participants (see table 7 below). However, the data also highlights relatively higher levels of prior knowledge on managing finances as well as on growing peppermint and mustard. While most participants reported having limited knowledge of using a smartphone, 32% reported having some knowledge. Prior knowledge of O&M of solar assets and the role as collections agent was not measured in the pre-training survey as this workshop was directly related to potential future employment with Oorja as operators, collections agents and in other last-mile roles and participants were hence not expected to have any prior knowledge of these topics.

Looking at the expected benefits from the training, the majority of participants believed they could benefit from the training sessions (see table 8 below). However, the benefits were expected to be lower for agronomic training. This could, for example, be explained by the fact that many participants in the Krishi Sakhis programme reported already growing several high-value crops beyond the general portfolio of crops grown in the area (see appendix). Looking at the pre-training

survey data, it is evident that the main expectation of the training was to learn new skills that when applied who help earn money. This indicates an interest in potential employment opportunities amongst the participants in the Krishi Sakhis programme hence underlining an opportunity for Oorja to employ some of the trained women in different last-mile roles with the company.

Table 7: Prior knowledge of subjects taught during Krishi Sakhis programme

Prior knowledge					
	No knowledge	*Little knowledge*	*Some knowledge*	*Good knowledge*	*Significant knowledge*
Use of smartphones	47%	21%	32%	0%	0%
Managing finances	26%	37%	32%	5%	0%
Agronomic topics					
Black wheat	95%	0%	0%	0%	5%
Peppermint	42%	11%	21%	26%	
Marigold	84%	5%	0%	11%	0%
Shatavar	100%	0%	0%	0%	0%
Mustard	21%	26%	11%	42%	0%

Table 8: Expected benefits from Krishi Sakhis programme per subject taught

Do you think you will benefit from the training?				
Workshop	*No*	*Maybe*	*Yes*	*Don't know*
Use of smartphones	5%	21%	74%	0%
Managing finances	11%	26%	63%	0%
Agronomic training	21%	11%	68%	0%
Expected benefit from/expectation of training				
Benefit			*% of participants*	
Learning new skills and earning money			42%	
Earning money			16%	
Good training			5%	
Little scared			5%	
Not interested			21%	
Not answered			11%	

Data from the post-training survey revealed particularly positive perceived learning outcomes from the training on financial management as well as on O&M of solar assets and training as collections agents (see table 9 below). Perceived learning outcomes from the agronomic training varied significantly across the five focus-crops. An explanatory factor for this variance could be that picking up participants from their respective villages on the first day of the programme was more time

consuming than on the following days, delaying the training. Therefore, the curriculum for the agronomic training workshop was reduced slightly and more time was given to certain crops over others possibly explaining the differences in perceived learning outcomes across crops.

Figure 3: Group work during financial management workshop and workshop on using a smartphone

Contrary to the initial assumption that it would be difficult to mobilize women to participate in the Krishi Sakhis programme, an assumption which was based on the patriarchal structures and gendered inequality characterizing rural Uttar Pradesh, the participants showed great and increasing enthusiasm and interest during the workshops. Despite 21% of the participants reporting not being interested in the training in the pre-training survey (see table 8 above), we saw a flow of repeat-participants across all four days of the training programme and, as previously mentioned, the sample of respondents to the pre- and post training surveys participated on both the first and the final day of the training. This indicates that participants' interest in the training increased during the course of the workshops. Around 30 women on average participated on each day of the Krishi Sakhis programme adding up to more than 60 participants in aggregate during the programme exceeding the ambitious target of training 50 women.

The success of the programme in attracting a significant number of participants, as well as a continuous flow of repeat- and new participants, can largely be accredited to the facilitation of the workshops itself. Firstly, by providing transportation for the participants Oorja was able to ensure participation from women who would otherwise not have been allowed to or comfortable with travelling a longer distance to participate in the training. Secondly, Oorja put great emphasis on active participation and engagement of women throughout the workshops. By facilitating practical activities in smaller groups supported by Oorja's field team members, it became possible to engage

the less active or withholding participants. Additionally, Oorja had significant success with including both participants who were comfortable with the subject and less confident participants in the same smaller group during activities. This approach allowed some participants to assist in teaching others, increasing learning outcomes for the participants who found the training difficult.

Table 9: Perceived learning outcome post Krishi Sakhis training

Perceived learning outcome					
	No outcome	Has learned little	Has learned some	Has learned a lot	Didn't take the training/blank
Use of smartphones	25%	0%	32%	32%	11%
Managing finances	11%	10%	52%	16%	11%
O&M of solar assets and collection of payments	11%	5%	47%	37%	0%
Agronomic training topics					
Black wheat	31%	16%	31%	11%	11%
Peppermint	26%	5%	21%	37%	11%
Marigold	26%	26%	26%	11%	11%
Shatavar	32%	21%	38%	0%	11%
Mustard	21%	0%	21%	47%	11%

Figure 4: Practical demonstration of operating and maintaining solar assets

Next steps and recommendations

Based on lessons learned during the CatalyzeTech project, three key recommendations for next steps will guide Oorja's further development of capacity building strategies and activities.

Fill the knowledge gap

Relying on traditional practices and without access to new knowledge and sustainable agronomic techniques to increase productivity and yields, marginal and smallholder farmers are not able to adapt to changing climate conditions and increase their income from farming. The observed early impacts of the training workshops under the CatalyzeTech project underscores that by continuing to provide the support and capacity building farmers need, Oorja has an opportunity to provide farmers with methods and tools to increase their incomes further, lifting them out of poverty.

Targeted trainings

Looking at the perceived learning outcomes from the Krishi Sakhis programme in phase 2 of the CatalyzeTech project (table 9), significant variances are evident revealing that some participants were left behind. While 32% of the participants in the Krishi Sakhis programme found the training easy and 16% found the level appropriate, 52% found it difficult. Due to the different levels of education and prior knowledge of the subjects taught, it was a challenge to engage all participants equally and communicate content at a level appropriate for all participants. In future capacity building efforts, especially of women farmers who have lower levels of education and access to knowledge than their male family members, Oorja should design training sessions according to participants' levels of prior knowledge to optimize the learning outcomes for all participants.

Improve employment opportunities for women farmers

Despite a historical challenge with hiring women as operators, collections agents and in other last-mile roles with Oorja, the Krishi Sakhis programme revealed a considerable interest from women farmers in employment opportunities. 47% of the participants indicated interest in employment with Oorja, the vast majority in any last-mile role (see appendix). To accelerate the empowerment and economic independence of women at its project sites, Oorja should consider and evaluate for recruitment trained Krishi Sakhis for the role of future operators and collections agents. By providing further targeted training equipping these women to successfully fulfill different last-mile roles, Oorja has an opportunity to create a ripple effect at community level inspiring more women to take up employment and earn their own income.

Conclusion

The CatalyzeTech project has kickstarted the expansion of Oorja's core solar-powered services to include complimentary agronomic training and capacity building. Hereby, the project is the first step towards closing the gap in capacity and access to knowledge on agricultural practices to improve productivity, yields, and income and subsequently contributes to lifting smallholder and marginal farmers in rural Uttar Pradesh out of poverty. Oorja has under the CatalyzeTech project trained 507 marginal and smallholder farmers in sustainable agricultural practices and techniques as well as more than 60 women farmers as Krishi Sakhis providing women with additional agronomic and technical training. While the long-term impact of the training workshops is yet to be discovered, participants reported great perceived benefits from the training and have already started employing some of the new techniques in their own farming practices.

As Oorja continues to broaden its efforts on training and capacity building of farmers, the lessons learned from the CatalyzeTech project will provide critical knowledge to be utilized in designing and delivering workshops in the future. The Krishi Sakhis training programme has built a bridge to reach women farmers and an opportunity to recruit some of them for last-mile roles at Oorja's project sites. Employment provides a much-needed opportunity for female farmers to gain financial independence and better livelihoods. On the other hand, it also enables Oorja to increase its women customer base and catalyze the empowerment of women at its project sites.

Oorja will continue to monitor and measure the impact of the CatalyzeTech training programme in the time to come as farmers start employing new sustainable agronomic techniques and practices. With the experiences obtained during the CatalyzeTech project and the regular and close interactions with the communities we work in, we will continue to adjust and expand our capacity building efforts to support marginal and smallholder farmers in the transition out of poverty.

Appendix

Phase 1: Post-training survey			
Liked most from the training		**Liked least from training**	
Answer	*% of total participants*	*Answer*	*% of total participants*
Everything	32%	Everything	1%
Kitchen garden	42%	Kitchen garden	3%
SRI-method	24%	SRI-method	1%
Organic/bio insecticide	14%	Organic/bio insecticide	1%
Human nutrition	7%	Crop rotation	1%
Vermicomposting	3%		
Organic farming	2%		
Crop rotation	2%		

Phase 1: Post-training survey			
Thinks they will benefit from knowledge obtained during the training in the future			
	No	*Maybe*	*Yes*
Human nutrition	0%	16%	84%
SRI-method for growing paddy	2%	32%	66%
Crop-rotation techniques	5%	38%	57%
Vermicomposting	36%	28%	36%
Growing kitchen garden vegetables	1%	10%	89%

Phase 2: Pre-training survey	
Education level	
Education level	*% of participants*
No formal education	53%
Primary education	21%
Secondary education	21%
Graduate or above	5%
Literacy	
Ability to read Hindi	*% of participants*
Does not read any Hindi	47%
Reads some Hindi	16%
Reads Hindi well	37%
Crops grown	
Crop	*% of participants growing crop*
Rice	95%
Wheat	95%
Mustard	68%

Maize	58%
Pulses	37%
Peppermint	37%
Vegetables	16%
Banana	11%
Household income	
Range of income (annual)	*% of participants*
INR 0-50,000	90%
INR 1,00,000-2,00,000	5%
Over INR 2,00,000 INR	5%
Household savings	
Amount saved (per month)	*% of participants*
INR 0	11%
INR 1,000-2,000	58%
INR 2,001-3,000	11%
INR 4,001-6,000	5%
INR 6,001-8,000	11%
INR 8,001-10,000	4%

Phase 2: Post-training survey			
Liked most from the training		**Training which could be improved**	
Answer	*% of total participants*	*Answer*	*% of total participants*
Use of smartphones	58%	Use of smartphones	11%
Financial management	63%	Financial management	16%
Agronomic training	53%	Agronomic training	11%
Operations and maintenance of solar assets	74%	Operations and maintenance of solar assets	16%
Collections agent	68%	Collections agent	5%
Do you think the training was relevant for you/related to your challenges as a woman?			
Answer		*% of participants*	
No/blank		5%	
Partly		5%	
Yes		90%	

Phase 2: Post-training survey	
Interest in employment with Oorja	
Interested	*% of participants*
Yes	47%
No	53%