END LINE ASSESSMENT REPORT

CARE - SWITCH ASIA-II initiative on “Evolving a Women Centered Model of Extension of Improved Cook Stove for Sustained Adoption at Scale”

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By

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Project background

Over 45% of the country's population is currently denied energy access. In the states where Bachat project implemented namely Chhattisgarh and Odisha have a substantial poor and tribal population (Chhattisgarh- poor 45% and tribal 31%; Odisha- poor 36% and tribal 23%) who are largely forest dependent. Forests in these states are the main source of fuel wood for cooking for around 19 million residents More than 800 million Indians depend on simple cook stoves that burn solid fuel, mainly fuelwood or coal. Household Air Pollution (HAP) caused using traditional cook stoves is responsible for around 500,000 deaths in India every year, which can be avoided through adoption of Improved Cook Stoves (ICS). According to a WHO report, over 145 million Indian households use traditional cook stoves for their daily cooking and depend on biomass (wood, dung, agricultural residue) as fuel, and despite government thrust and subsidies, poor adoption of ICS in India has been a puzzle. A complex combination of factors like cooking traditions, intra-household distribution of incomes and gender dynamics, culture, religion, and affordability affect sustained adoption and use of ICS in the country. However, few programmes address these challenges in an integrated manner'.

Recognizing these issues, the European Union (SWITCH Asia II facility) supported project i.e. 'Evolving a Women-centred Model of Extension of Improved Cook Stoves for Sustained Adoption at Scale' (locally called BACHAT) was designed to increase the adoption of sustainable lifestyles among Forest Dependent Households (FDHs) in the states of Odisha and Chhattisgarh in India. Following an incremental approach to increase the awareness of women on clean energy options for household use, facilitate acquisition of Improved Cook Stoves (ICS) financial and technical interventions, and influence men and other stakeholders in the ICS ecosystem to be supportive of women's endeavors for clean energy transition, the programme has been implemented for almost five years in 107 villages in three project districts – Jashpur in Chhattisgarh and Kalahandi and Kandhamal in Odisha, India. The project intended to transform adoption of ICS by (i) creating sustained demand for Improved Cook Stoves (ICS) as a clean cooking energy device among forest dependent households; (ii) developing an enabling and supportive environment for women and their households to make clean energy transition and (iii) promoting and disseminating scaling up of clean energy transition.

The programme was designed with multiple components including:

- **SHE (Sustainable Household Energy) Schools** as a collective learning platform of women from forest dependent households on clean energy and ICS options. These Schools following the Farmer Field School methodology played as an agent of change by engaging with and educating women to build their ownership with an opportunity to test 23 varieties of ICS options against parameters like device functionality, affordability, smoke lessness, ease of use and other individual and household preferences.
- **Active engagement with ICS ecosystem actors** (like manufacturers, suppliers, financiers, government departments) and mobilization to introduce varied ICS options, train women on ICS usage and to share and educate the project participants on schemes and programmes. Interface events provided a platform to share observations and inputs by women from FDHs with manufacturers and this has resulted in the designing of a new local ICS model in a participatory manner.
- **Strengthening ICS value chain** resulting in the promotion of SHE technicians with enhanced capacities and skills on the installation of locally designed ICS and minor repairing and maintenance of factory-produced ICS. Women are also coming forward to start energy enterprises.

About endline assessment study

- The broad objective of the endline study is to assess the sustainable adoption of ICS by women in project districts compared with the baseline. The endline study intends to measure its project's achievements against the impact and outcome indicators of the project, which are committed in the project log frame. The project aims at contributing to women empowerment process through ICS 'Intervention' and hence, key women empowerment indicators are also analyzed against the baseline parameters. In light of the expected project impact, outcomes and results, following change areas have been assessed as a part of the endline study.
- Women from forest dependent households' adoption rate of ICS as a clean energy option.
- Forest dependent households' acquisition and sustenance Improved Cook Stove (ICS) as a clean energy solution.
- ICS Value Chain actors (ICS manufacturers, suppliers, technicians, and financiers' availability to support and service ICS users in project villages.
- Change in women's preference for ICS.
- Men in households aware of HAP and respond to women's needs for appropriate cooking solutions.
- Women from FDHs able to identify ICS options to suit their needs, by price and design.
- Women having confidence and influence on HH cooking energy decision making such as decision to procure and use ICS.
- Women and women's groups starting clean energy-related business/trade as ICS Entrepreneurs.

Study sample

The samples for the endline study were selected from one project states, i.e. Odisha. In Odisha, both the project districts (Kalahandi and Kandhamal) were covered under the study. From each selected district, one block where Switch Asia programme intervention has already been initiated was chosen on the basis of project village data in consultation with CARE India staff. From each Intervention blocks, 20 forest dependent sampled villages were selected randomly from the list of Intervention villages provided by CARE India. Due to several field challenges posed by sporadic cases of COVID 19 in both the states (Chhattisgarh and Odisha), travel was restricted fully in Chhattisgarh and partly in Odisha. However, the project team endeavored to complete the survey with the best levels of diligence in the selected study area after obtaining permission from CARE India. The final endline assessment, therefore, pertains to impact in Odisha.

Socio-economic characteristics of the respondents and project area

- The demographic distribution of the forest-dependent households shows that most of the households in the project area are tribal households.
- Also, the percentage of SC households is higher than the non-SC households in all the villages included in the study. The proportion of SC households is around 17% in the Endline whereas it was 21.3% in endline. The ST population in endline constituted 62% and Baseline it was 71.6%.
- It is also found that in the study area, there are around 61% are kuchha houses, 37.7% are pucca houses and 1.3% is of the other types of houses. Access to toilet facility in kuchha houses is better than in pucca and other types of houses as 61% of kuchha houses have access to toilets.
- It is also found that penetration of the toilet facility is better among all the communities in the endline assessment as compared to baseline.
- About 1.25% of the households in Kandhamal district were found to have solar light connectivity during the endline assessment whereas in Kalahandi district, no respondent had solar connectivity.

Community insights on ICS & Switch Asia-II Bachat Programme

a) Cooking practices and use of cook stoves

- Overall, 37.7% of users have adopted ICS in Odisha from which more than 80% beneficiaries have been using it for last two years.
- In the Kandhamal, about 30% of the households and in Kalahandi, 30.5% of the households have switched to improved cook stoves respectively in the intervention villages. More than 69.7% of the people in both the districts are still using traditional cook stoves. Against the targeted household of 10,000 households through SHE schools around 4800 household switched to ICS. It shows the programme penetration has reached to a satisfactory level.
- The adoption of cook stoves varies 5% to 95% in the surveyed villages during endline assessment. Dandika and Tandalnjau are two villages where adoption rates are more than 90% whereas villages such as Ambjor, Dalguma, Delarpada, Karandagada, Ratanga showed less than 5% adoption rate.
- In Kandhamal district, the average hour spent for days on cooking has been slightly decreased by 56 minutes while time saved is 32 minutes in Kalahandi comparing with base and endline.
- In Kandhamal district, usage of LPG stoves was found to be similar to the baseline data whereas it increased marginally in Kalahandi district from 5.3% during baseline to 17.5% in endline assessment.
- During the endline assessment, it was found that the communities are happy to use ICS during the rainy season. The beneficiaries informed that collection of wood reduces to minimum during rainy season due to ICS use.
- During the endline assessment, it was found that the proportion of households cooking thrice a day has same as compared to the baseline data.
  Fuel wood use has been reduced by 42.5% in Kalahandi and by 36.1% in Kandhamal district for the main course food preparation after SWITCH-Asia II Bachat Programme Wood log and wood-shreds fuel use pattern was found to be prevalent during the baseline in both the districts.
- However, households in Kalahandi district exclusively depend on wood logs and chopped wood for preparing the breakfast items which is same as was found during the baseline assessment.
- For preparing tea and coffee, other fuels such as chopped wood (2.2%), LPG (1.1%), Electric Heater (1.1%) are also found to be used in Kandhamal district in addition to the traditional fuels.

b) Respondent awareness

- It is found that the level of awareness about ICS as a cooking option increased significantly to 90% from 20% between baseline and endline assessment.
- SHGs were found to have created a significant level of awareness on ICS as reported by around 23% respondents.
- Other than CARE functionaries, word of mouth through friends and family members also influences and create awareness about ICS among people.
- The forest department programmes also found to have contributed to this awareness building on ICS as reported by about 2% of the households.
- Overall, 25.6% of the respondents are aware about the individual health issues and other associated problems in the houses. The respondents said that ICS addresses eye-related health issues and prevents blackening of walls, roofs due to smoke. They also found this cooking device more hygienic. The beneficiaries also informed that smoke coming out from the traditional stoves not only created health hazards but also degrades the entire living environment inside the house which is now improved by adopting ICS.
- Between baseline and endline there is a change of 19% in satisfaction level with TCS i.e. at baseline 67% of the households were not satisfied with the TCS which increased to 86% during the endline assessment, thus indicating an increase in the awareness levels about ICS

c) Women's decision making in ICS

- About 51% women in Kandhamal and 48.5% women in Kalahandi from total study respondents were able to independently decide and purchase ICS, which was negligible during baseline study.
- The ability of the women respondents for influencing other women members to adopt ICS improved through working with SHG women members.
- About 52.6% elicited that they are confident enough to influence other women members to adopt ICS.
- About 45% of women members of the SHGs visited in project area reported that they are able to act as retailers in ICS value chain activity.
- Overall 38% of the women respondents from among the women SHGs in the project area are interested to work as ICS manufacturers.
- Overall 6.2% of the women respondents from among the women SHGs in the project area are interested to work as ICS entrepreneur.
- Men and Key ICS Supply Chain Stakeholders become sensitive and respond to Women's needs for appropriate cooking solutions.
- About 95% women respondents in Kalahandi and 55.5% in Kandhamal have interacted and negotiated with the suppliers who are a significant value chain actor.

d) Respondent affordability

- The overall annual fuel expenditure is calculated to be 800 INR in Kandhamal as compared to 1105 INR in Kalahandi. This expenditure is slightly reduced from the baseline where it tanged between 800-1400 INR, thus providing a scope for small savings.
- Overall, the average willingness to pay for a cook stove is calculated at 943 INR (in Kandhamal) and 1009 INR (in Kalahandi) in the endline assessment which is a significant improvement from the baseline data where it was reported to be only 300 INR.

SHE School's role

- As per the analysis, overall 82.25% (which was only 52.6% during baseline) of the households in the project area had SHE School membership (as a collective learning platform of women fashioned on the basic principles of Farmers Field School) and about 29.25% (compared to 12.9% in baseline) of the SHE members are actively participating in SHGs meetings.
- About 78% (earlier 38.5% at baseline) of the women SHG members in the project area stated they were able to influence other members of the community to install ICS as a better and convenient alternative to ICS if cook stove costs can be reduced between 500 INR to 1000 INR.
- A significant influence (reaching out to 41%) was found to be created through the SHG members who played a pivotal role in distributing ICS as part of CARE's SHE programme.
- The interest of women members of the community in value chain activity of ICSs was positive with the percentage of women members of the community who are interested to work as retailers or manufacturers or distributors. It was found out that overall 58% of the women SHE School members would be happy to work as retailers compared with 42% during baseline, about 45% of women are interested to work as manufacturers as against 44% during baseline, and about 39 are interested to work as distributors as against 38.3 % during baseline.
- Due to the varieties of cook stoves and options were introduced by SWITCH Asia –II Bachat Programme, the SHE members found it difficult to choose any one or two options as a manufacture or distributor.

a) Number of ICS suppliers, technicians and financiers available in the project area:

- The overall number of ICS manufacturers increased to 16 as reported in endline assessment as compared to 3 during baseline study. Similarly, there has been an increase in number of ICS technicians from 3 to 16.
- The number of suppliers and distributors was also seen to be increased from 4 to 15.
- Most significantly, the number of financiers (bank branches) which financed ICS users was found to be 18, which was 0 during the baseline study.
- One particularly successful ICS entrepreneur was Mr. Padama Behera (owner of M/S Khushboo Enterprise) who has been in the ICS business for the last 4 years. He has successfully sold around 4000 improved cook stoves out of which 2500 through CARE and the network that was developed as a part of the CARE India Bachat Programme, and the rest with his own channel and government order.
- No MFI is operating in either of the study districts in Odisha to promote ICS programme (earlier reported as existing during the baseline). Presently, existing MFIs are only financing solar products business. An interaction with MFIs during the endline study showed that they are very much interested in financing consumers for purchasing such durable household goods, though on group basis or SHGs.
- A loan from MFI/NGO/development agencies is not commonly preferred by the community individuals or groups in Odisha but they are interested to get this money as a grant instead of a repayable loan. The financing of a cook stove programme will benefit from collaboration with a micro-finance institution, because this will visibly and organizationally distinguish between aid and business.

b) Household Air Pollution Awareness among men and women

- More than five thousand people are aware of HAP in Odisha and Chhattisgarh
- It is found that percentage of households that are aware and interested in having a smoke exit facility in the household kitchen has increased by 26% (from 40% in baseline to 66% in endline).
- A major contribution of Bachat Programme is that a large proportion of households in Odisha, understood the challenges of dry and wet biomass for cooking, and space associated problems with smoke. Beneficiary told that the fuels were typically burned in simple, inefficient, and mostly unvented household cook stoves, which, combined with poor ventilation, generate large volumes of smoke indoors. Moreover, after ICS cook stoves adoption, typically used for hours each day, at times when people are present, resulting in much lower exposure to indoor air pollutants than before using TCS.

c) Men's sensitivity level towards HAP, cooking energy solutions and VC actors:

- Bachat Programme has helped improve the sensitivity level among men. Men's sensitivity to HAP challenges increased to 56% households from 11.6% during the baseline study. Now, men are supporting women's decision. About 45% of households are willingly deciding to change the household to ICS for domestic cooking purposes.
- In Kalahandi district around 75.3% of the households of the base-line area have blackening of walls, roofs and cooking devices against 33.27% of the households in end-line assessment. In Kandhamal district in Odisha, the situation of blackening of walls, roofs & cooking is found much lesser at 9.09%. Around 31.88% of the households in the Kalahandi districts respondents reported eye related problems.
- The community awareness on ICS and its benefits is summarily presented in the table below:

Table 1 Logical Framework Analysis (LFA) for Care India Switch Asia II Project

S. No	Objectively verifiable indicator	Defined	Unit	Baseline Value	Endline Value
1.	Women Centered model of extension of ICS for sustained adoption developed, documented and disseminated	Percentage of FDH women using ICS	%	2.6	30.2
		% of households acquiring and using ICS as a clean cooking energy device for a minimum of 2 years (5000)	%	0.0	37.0
		Women heads of the household who are not satisfied with their TCS.	%	67.0	86.0
		% of women heads who reported dissatisfaction over the use of TCS aware about Improved Cook Stoves (ICSs).	%	20.1	93.2
		Five top most ICS Models in the project area on the basis of opinion of the women heads of the household	Name	None	Agneeka (45.5%), Vikram (0.5 %), Sarala (0.5 %), and Sikha (1%)
		% of women heads of the household actually involved in the purchase decision of ICS for their respective houses	%	0.0	24.5
		Number of individual women who have assumed leadership positions and become ICS entrepreneurs (50)	%	0.0	6.0
		Number of women SHG members interested to work as retailers	#	42.0	58.0
		% of women SHG members interested to work as manufacturers	%	44.1	45.0
		% of women SHG members interested to work as distributors	%	38.3	39.0
		Number of households ever tries to control kitchen smoke	#	0.0	26.0
		Number of FDH women playing as SHE champions (200)	#	0.0	200
		Women members of households in the project area are found having membership with SHG activity.	%	52.6	82.3

		Proportion of SHG members actively associated with SHG.	%	12.9	29.3
		Ability of women SHG members to influence other members of the community to install ICS as a better and convenient alternative to ICS	%	38.5	78.0
		Number of households willing to recommend other households for future use of ICS	%	Nil	91.8
		Number of Households ever negotiated with ICS value chain Actors (Manufacturers, distributors, retailers etc.)	%	Nil	37.5
		Number of households ever tried to purchase an ICS	%	30.0	93.0
2.	Number of ICS suppliers, technicians and financiers available by the end of project to support and service ICS users in project villages (100)	Number of Manufactures	%	3.0	16.0
		Number of suppliers and Distributer	%	4.0	15.0
		Number of Technicians	#	3.0	16.0
		Number of Financiers to finance ICS users (Bank branches)	#	Nil	18.0
		Number of MFIs	#	2.0	15.0
3.	% of households where men are aware of HAP. (> 5000)	Percentage of households having smoke exit facility in household kitchen.	#	40.0	66.0
4.	Number of new ICS VC actors (ICS manufacturers, suppliers, financiers,) operating in project districts by the end of project (20)	No of Manufacturers	#	3.0	11.0
		No. of suppliers	%	4.0	2.0
		No of financiers	#	2.0	3.0
5.	% change in women's preference for ICS.	% of women willing to change their Traditional Cook Stoves.	#		88.0
6.	Number of women trained as SHE champions(200)		#	0.0	200.0
7.	Number of SHE schools established (200).		%	0.0	200.0
8.	Number of men from the community participating in Final		#	0.0	2155

	Field Day of SHE schools (2000).				
9.	% of men who has sensitivity towards HAP and cooking energy solutions.	Percentages of households where male heads are willingly decide to change the household TCS to ICS for domestic cooking purposes.	#	11.7	56.0
10.	Number of women completing SHE technician's training (50).		#	0.0	27.0
11.	Number of Consultations and Dissemination Workshops organized at district level and above.		%	0.0	20.0
12.	"Social Acceptability" criterion introduced in ICS performance measurement protocol of MNRE.	Number of manufacturers supplying IS marked cook stoves in project area	#	0.0	23.0

Challenges of adoption

- A notable challenge faced in TCS uses is related with moisture values and fuel usage in terms of size etc. As reported, ICS cook stoves had to use tiny fuel wood pieces so moisture content can easily be managed by households. The study found that Fire wood in the form of log and chopped wood are the major fuel option for the ICSs which needs to be easily accessible and affordable at rural areas. Any other fuel options are not reported. It is further noticed that specifically for these ICSs, there are no other customized fuels developed by the manufacturers and suppliers.
- Some of the ICS users also shared about a few operational difficulties associated with ICS usage such as igniting the stove and cooking during rainy season and need for frequent repair and maintenance which needs to be addressed.
- With regard to the design selection, the respondents were asked to suggest suitable designs for improved cook stove. In this regard, the opinion of the existing users was only considered and the non-users as mostly unaware of the technicalities related to ICS, so they were not considered for suggesting the possible designs which would be highly compatible with their cooking practices.
- The members suggested that the cook stove should be portable enough. It was further suggested that a double pot cook stove is more convenient for the regular cooking. The quantity of wood consumption should be sufficiently less so that it would reduce their drudgery to collect fire wood from the nearby forest.

SHE schools a model and way forward

The endline assessment found that the stakeholders accepted and appreciated SHE schools as an effective approach for promotion of ICS adoption while recognizing differential values of the components of the SHE schools such as training & mentoring, SHE champions and Bachat Sathi. This indicates that such a programme is highly effective in bringing positive behavioral changes in rural

areas. Additionally, beneficiaries' perceptions of the SHE trainings were also analyzed and it was found that in Kalahandi about 73.5% respondents reported satisfaction over the trainings/discussions and rated to be excellent. Some of the remarks as shared by the woman respondents are mentioned below in the table.

CHAPTER – 1 INTRODUCTION

1.1 Project background

The European Union (SWITCH Asia II facility) supported project i.e. 'Evolving a Women-centered Model of Extension of Improved Cook Stoves for Sustained Adoption at Scale' (locally called BACHAT) was designed to increase the adoption of sustainable lifestyles among Forest Dependent Households (FDHs) in three districts in two Indian States - Chhattisgarh (Jashpur), and Odisha (Kalahandi and Kandhamal) by CARE India. The project had been on the ground in 107 villages for 4.9 years. This project adopted an incremental approach to increase the awareness of women on clean energy options for household use, facilitate acquisition of Improved Cook Stoves (ICS) with financial and technical interventions, and influencing men and other stakeholders in the ICS ecosystem to be supportive of women's endeavors for clean energy transition. Towards this, the project adopted innovative, women-led extension methodologies and tools which entailed scouting and engaging women leaders from existing Self-Help Groups (SHGs) as Sustainable Household Energy (SHE)-Champions for peer influence and education. The initiative was implemented in Chhattisgarh and Odisha states which have high concentration of poor tribal population (Chhattisgarh- poor 45% and tribal 31%; Odisha- poor 36% and tribal 23%) who are largely forest dependent. Forests in these states are the main source of fuel wood for cooking for around 19 million residents.

The **overall objective** of this programme was to promote the sustainable adoption of Improved Cook Stoves (ICS) as a clean cooking energy solution among forest-dependent households (FDH), through a combination of capacity building, collectivization, market development, and multi-stakeholder engagement actions, resulting in 10,000 women from FDHs using ICS and developing a sustainable ICS adoption model for replication among 800 million rural households in the country who use traditional and polluting cook stoves.

Against the socio-economic dynamics of both the states, the programme was designed with multiple strategies and components including:

- **SHE (Sustainable Household Energy) Schools** as a collective learning platform of women from forest dependent households on clean energy and ICS options. These Schools following the Farmer Field School methodology were engaging with and educating women and building their ownership through a process of testing 23 variety of ICS options against parameters like device functionality, affordability, smoke lessness, ease of use and other individual and household preferences.
- **Active engagement with ICS ecosystem actors** (like; manufacturers, suppliers, financiers, government departments) and mobilisation to introduce varied ICS options, train women on ICS usage and to share and educate the project participants on schemes and programmes. Interface events provided a platform to share observations and inputs by women from FDHs with manufacturers and this has resulted in the designing of a new local ICS model in a participatory manner.
- **Strengthening ICS value chain** resulting in the promotion of SHE technicians with enhanced capacities and skills on the installation of locally designed ICS and minor repairing and maintenance of factory-produced ICS. Women are also coming forward to start energy enterprises.

1.2 Final project evaluation

The overall objective of the project final evaluation is to determine achievements made on results and impact indicators, level of project objectives completion, lessons learnt and promising practices, future project scale up and replication. This evaluation provides information that is credible and useful,

enabling the incorporation of lessons learned into the decision-making process of both direct and indirect project stakeholders. More specifically, the final evaluation objectives are:

1. to assess the level of achievement of Expected Results, effects, project objectives, and intended impact by measuring each indicator set out in the log frame;
2. to assess the capacity and work relationship of partners in implementing the project activities, their management system and strategies put in place;
3. to evaluate the extent to which the management and accountability structures of the project were appropriate in ensuring that it fulfills its stated objectives;
4. to assess the operating environment and its impact on the project, with a particular focus on the effectiveness of working on biomass issues in Odisha;
5. to determine strengths, weaknesses, internal and external challenges, and document cases studies, lessons learnt and promising practices;
6. to formulate recommendations as to how to sustain project achievements and how to increase project effectiveness, efficiency, focus, and internal accountability in CARE, India generally.

Besides the above the evaluation is expected to throw light on preferences of women from FDHs on ICS options to suit their needs, by price and design; extent to which women from project villages take and inform household decision to procure and use ICS Indicator and level of new relation made between men and key ICS supply chain stakeholders to become sensitive and respond to women's needs for appropriate cooking solutions . The project's endline study, thus measures the achievement of impact and outcomes; contribution of the project towards advancing domains of change of CARE India (capacity, capability and self-esteem; leadership at multiple levels; positive attitude and enabling environment of the stakeholders; enabling policy) and recent change in trends within the project.

CHAPTER – 2 RESEARCH METHODOLOGY AND FRAMEWORK

2.1 Study approach

The endline assessment was conducted using a mixed-method approach including both quantitative and qualitative methods by using primary and secondary data with an objective of strong evidence building. The study team adopted a consultative and collaborative approach with the CARE India and other stakeholders. The overall approach adopted for conducting the study is depicted below:

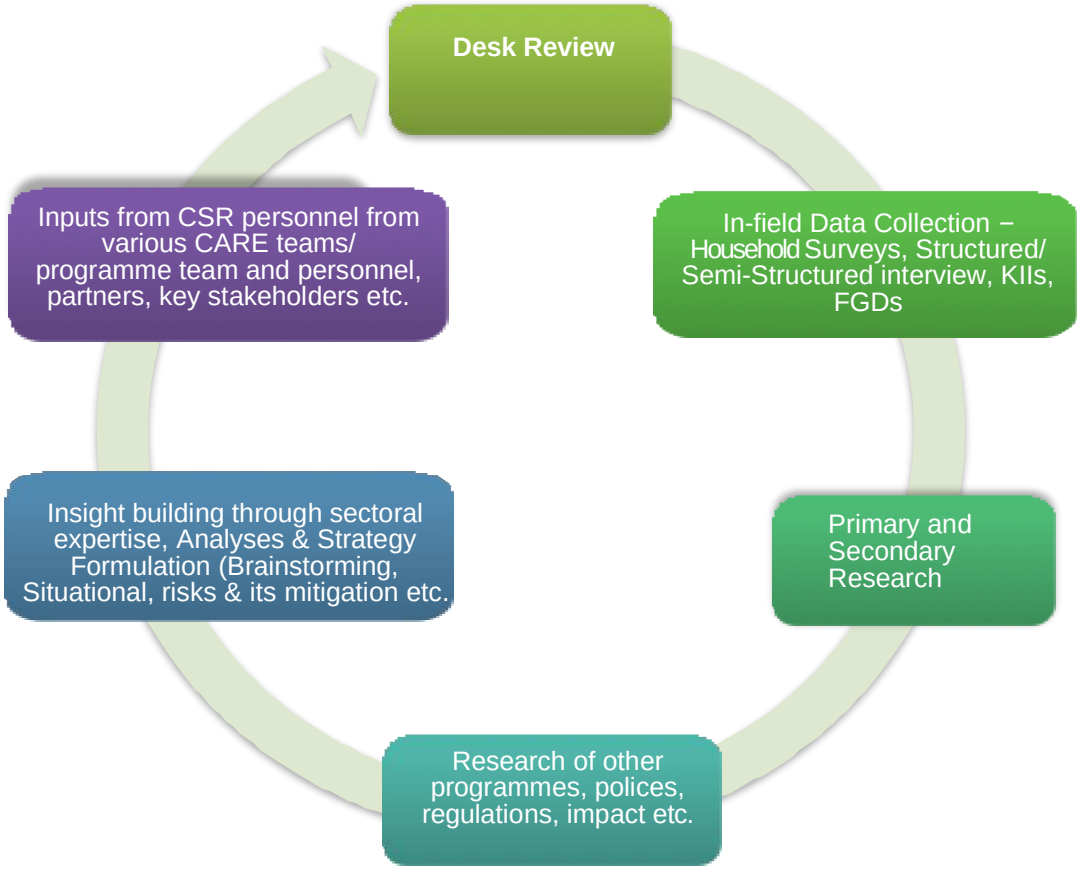


Figure 1 Approach for conducting the study

The impacts of the SWITCH Asia-II Bachat Programme in the study location were assessed by analysing the data collected on adoptions and all cohorts, strategies were prepared for the study location. The study further proposes plans for the future through recommendations for programme improvement such that it is effective and creates an overall impact on the community in the long run.

Questionnaire was developed for endline assessment of the on-going programmes of the community and used for data collection. The quantitative and qualitative data was captured in the study as per the framework shown below:

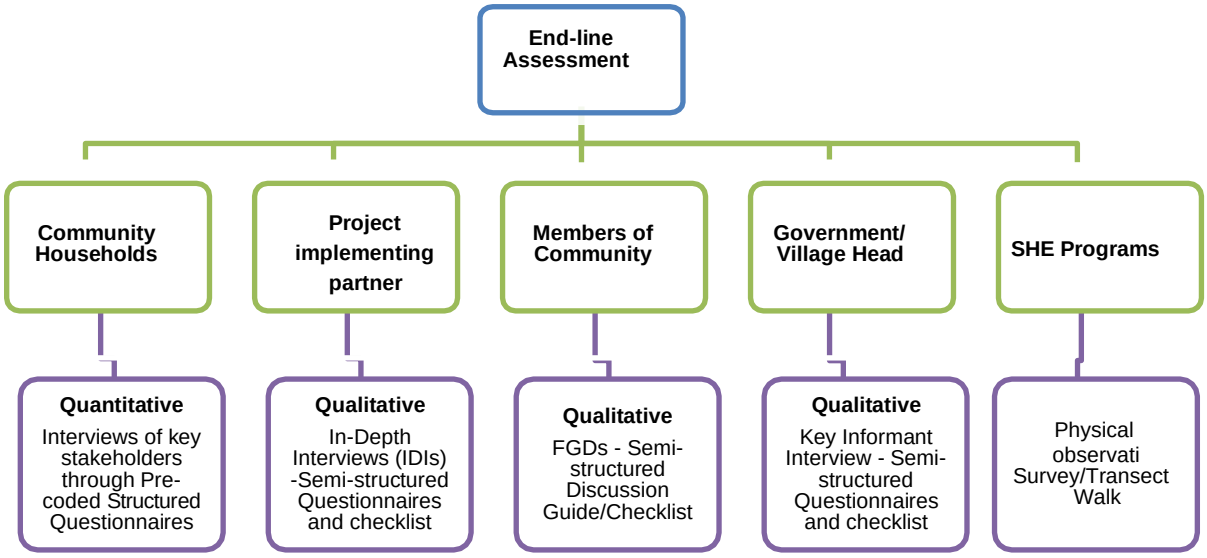


Figure 2: Framework for quantitative and qualitative data collection for the study

Evaluation Design:

A pre & post research design has been planned for the endline study of SWITCH Asia II – Bachat Programme (SWABP) project. The endline study followed principles of pre-post evaluation designs. The proposed sample size which is required to assess the change is estimated based on the following:

- Initial value of variable of interest (taking initial value to be 2%)
- Expected change project will make assumed to be at least 10%
- Appropriate significance level i.e. assigning probability to conclude that an observed change is a reflection of effort and did not occur by chance i.e. at 95% level
- Appropriate power i.e. the probability to conclude study has been able to detect a specified change i.e. at 80% power.

Based on the above considerations the sample size comes out to be 151. Inflating the sample size by 30% to account for non-response due to COVID, the sample size comes out to be 196, which is rounded up to 200 each for each location. This will make a total sample size 400 individuals/households. It is proposed to select one block and 20 villages on random basis. From each village a total of 16-17 FDH was selected randomly. The endline study collected both quantitative as well as qualitative data.

2.1.1 Quantitative methods

Method 1: Survey with target groups

A survey was conducted with households in project areas to measure the level of awareness, cooking practices, women's decision-making, enabling support by eco-system actors and household members. First the This survey was administered with selected samples in treatment in Kandhamal and Kalahandi district of Odisha with women beneficiaries. The data obtained was compared with baseline data to yield results which are presented in the result section.

Table 2 Study sample

Design	Experimental Design
Sample size	400 samples were selected due to COVID-19 spread in both the states (Odisha and Chhattisgarh) and limited access for face to face survey. The sample size estimated keeping the baseline prevalence of valuable of interest, to detect a change of 10%. Accordingly, 200 samples per district were interviewed and analysed to establish changes over period of intervention. Data has compared at base line level, midline level and district level comparison in below sections.
Constraints to the design	Due to COVID-19 pandemic in Chhattisgarh and Odisha with lockdown challenges, Chhattisgarh survey was halted by the local government which after careful consideration was cancelled and hence, not included in the analysis.
Sampling distribution	Treatment: 2 district * 20 Village * 20 HHs
Sample frame	The sample frame was prepared at the field level. The samples were selected from the entire households in the intervention villages covering both SHE School members and non-members.
Sampling procedure	The survey followed systematic random sampling procedure. The villages were identified randomly. From within villages, systematic random sampling was applied.

Stakeholder Information Collection

In addition to information collection from other sources, information was also collected from the CARE staff and other stakeholders who are supported the project about ICS adoptions, participation and representation of target groups, organizational understanding and decision-making practices and capacity assessment.

2.1.2 Qualitative Methods

Method - 1: Key Informant Interview (KII) with stakeholders at district level

Key Informant Interviews (KIIs) were conducted with the indirect target groups and duty bearers at the district level. The key informants for this endline study include government officials, retailer and distributors at the district. The number of KIIs conducted in this study is mentioned below. Several officials were unavailable due to transfer or pandemic.

Table 3 Number of Key Informant Interviews (KIIs) conducted in end line study

Stakeholder/Region	Jashpur (Total)	Jashpur (Completed)	Kalahandi (Total)	Kalahandi (Completed)	Kandhamal (Total)	Kandhamal (Completed)
Local PRI Member	2	2	2	2	2	2
Lead Bank Officer	1	0	1	0	1	1
Formal Financial Institution	2	0	2	0	1	1
ICS Supplier/ Distributors	3	3	2	0	3	1
Retailer/ field technician	5	2	5	0	3	1 (Other two are not a part of the programme)

Renewable energy department	1	1	0	0	0	0
Others (SHG)	2	2	3	3	2	2

Review of SWITCH ASIA documents
KAP, Cohort –I, II, III, Baseline report was reviewed and analyzed to take a stock of current state of endline assessment and outputs.

2.2 Study procedure

1. *Brainstorming and consultation:* Endline study design process took off with rounds of brainstorming and consultation meetings with CARE Odisha, Chhattisgarh and Delhi's project team which was contribute refine further on the research design proposed by the technical proposal.

2. *Review of Literature:* The available literature on endline study design, CARE's project reports, national and governmental reports on topics raised by the project, reports from NGOs, domestic and international publications, newspapers and other sources were reviewed for additional information to assist the design process.

3. *Finalization of research methodology and tools:* Following the literature review, consultation with CARE and internal discussions to test statistical analysis with pre and post data, was finalized as the design for the endline study. Based on the observations from pre-testing and feedback from training sessions, the questionnaire was reviewed, revised and edited and finalized. The finalized tools were then forwarded over to respective districts for the field work and data collection.

4. *Orientation training to enumerators:* Following the finalization of research design and development of methodology/tools, orientation workshop was held for enumerators/researcher. The training content was including discussions on endline as a part of monitoring and evaluation system, endline design, study methods, tools, and strategies for date collection (sampling, ethics, and procedures) and data compilation.

5. *Administration of tools and data collection.* The tools were administered in the selected treatment villages (the complete list of selected villages is provided in Annexure-V) following the pre-testing and finalization. The data collection was done using paper-based questionnaire instead of digital tablets (due to unavailability of internet connection in remote areas) applying R software for statistical analysis. In addition to the field surveyors, a central team of researchers were involved in qualitative data collection.

6. *Data Analysis.* Consultants entered the survey forms in Microsoft Excel. R was used to analyze the quantitative data. Qualitative data was compiled based on field notes and transcripts. Both forms of data were analyzed and triangulated. For the data comparison, data from Annual Survey/ Knowledge Attitude Practice (KAP) survey has been used wherever relevant to show trend and progress analyses. It has been interspersed within the report.

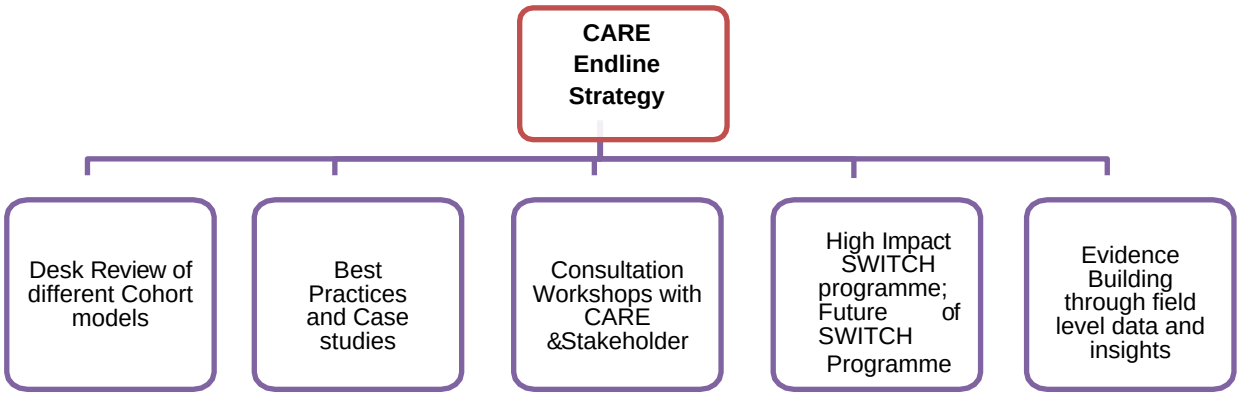
2.4 Human Subject Research Ethics

CCX ensured strict adherence to human subject research ethics related to anonymity, confidentiality, and informed consent in any form of research it conducts. In this endline study, CCX ensured sensitivity

in its execution of research methods. The data collection was done through informed prior consent by using standard consent form and arrangements have been made to protect study participant's rights. The field research data collection enumerators were oriented thoroughly on adhering to human subject research ethics.

2.5 Limitations of the Study

The endline study was conducted within a short period of time in the context of Pandemic. Due to lock down, control arm of the experimental design had to be dropped and therefore the analyses is limited to pre and post comparison. In this study, T Test has been analyzed to know the adoption and willingness to pay for cook stove programme. Fetching baseline and midline data for short time analysis, wherever relevant and feasible has been applied with limitation.



CHAPTER-3 STUDY FINDINGS

3.1 Knowledge related indicators

a) **General knowledge on cooking energy:** The awareness of women on different types of stoves in Kandhamal and Kalahandi is presented in the following tables.

Table 4 Awareness of Women on different types of stoves in Kalahandi district

Type of stoves	Kalahandi			Kandhamal			Odisha		
	Year 1 (%)	Year 2 (%)	Year 3 (%)	Year 1 (%)	Year 2 (%)	Year 3 (%)	Year 1 (%)	Year 2 (%)	Year 3 (%)
Traditional Cook Stove	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Charcoal Stove	1.2	21.1	2.9	6.0	24.7	16.5	3.6	22.9	9.3
Kerosene Stove	6.0	36.8	71.3	10.8	33.7	16.0	8.4	35.2	32.3
LPG	6.0	43.9	3.7	18.1	17.9	14.0	12.1	30.9	8.3
Electric Stove	2.4	36.4	15.4	5.4	4.4	14.0	3.9	20.3	12.3
Bio Gas	1.2	11.5	1.5	3.0	4.9	11.0	2.1	8.2	6.0
Solar Stove	0.0	8.4	0.0	0.0	2.0	4.5	0.0	5.2	2.3
Others/ ICS	8.4	25.9	30.5	2.4	7.9	30.0	5.4	16.9	30.3

During the baseline, the above table shows that in year 1, most women (166 in number) in the Kalahandi district i.e. 100% have aware about the traditional cook stove. The percentage of women who were aware about other types of stoves like LPG and Kerosene Stove were just 6 % and 6% respectively. But during endline assessment, the percentage of the women respondents of the study areas were aware about the ICS improved from 8.4% in year one to 30.5 in year 3. The awareness level about the other types of stoves in the district is also high particularly Kerosene and Electric Stove stated in the above table and in the following graph. In case of Solar Stove and Charcoal Stove the level of awareness has been improved considerably, as stated in the above table and in the following graph.

Table 5 Awareness of Women on different types of stoves in Kandhamal district

Awareness of Women on different types of Stoves in Kandhamal district (Odisha)			
Type of stove	**Kandhamal**		
	Year 1 (%)	**Year 2 (%)**	**Year 3 (%)**
Traditional cook stove	100.0	100.0	100.0
Charcoal stove	6.0	24.7	16.5
Kerosene stove	10.8	33.7	16.0
LPG	18.1	17.9	14.0
Electric stove	5.4	4.4	14.0

Bio gas	3.0	4.9	11.0
Solar Stove	0.0	2.0	4.5
Others/ICS	2.4	7.9	30.0

Table 6 clearly presents that women's knowledge on traditional cook stove in Kandhamal district is more or less same, though there is a little difference in year-1 of Biogas and ICS. The cases in year-2 are nearly the same for both the districts. The comparative analysis shows that the level of awareness on improved cooking is more in the Kandhamal district.

Table 6 Inter-districts comparison on the women's knowledge of different types of stoves (States and district wise)

Type of stove	Kalahandi			Kandhamal			Odisha		
	Year 1 (%)	**Year 2 (%)**	**Year 3 (%)**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**
Traditional cook stove	100.0	100.0	100.0	100.0	99.2	100.0	100.0	99.6	100.0
Charcoal stove	1.2	21.1	15.5	5.4	35.8	16.5	3.3	28.4	16.0
Kerosene stove	6.0	36.8	15.0	13.9	27.8	16.0	9.9	32.3	15.5
LPG	6.0	43.9	13.5	19.3	14.5	14.0	12.7	29.3	13.8
Electric stove	2.4	36.1	13.5	1.8	1.2	14.0	2.1	18.7	13.8
Bio gas	1.2	11.5	10.5	4.8	0.0	11.0	3.0	5.7	10.8
Solar Stove	0.0	8.4	4.5	0.0	0.0	4.5	0.0	4.2	4.5
Others/ICS	8.4	25.9	34.0	3.6	6.7	32.5	6.0	16.3	33.3

In the endline assessment, it was found that the community awareness of ICS is high. It is also found that almost 34% beneficiary in Kalahandi have knowledge to use and promote ICS in their regions whereas in Kandhamal, ratio is 32.5%.

b) ICS general awareness

The respondents of two districts in Odisha have shown significant improvement in awareness on ICS. In Kalahandi district between year one and year three there has been 22.7% change (77.7% and 99.4% respectively) . And average 92% women respondents in the third-year district have become aware about ICS. In Kandhamal, awareness went up by 22.7% (60.8% and 83.5%). It indicates that the level of awareness in the Kalahandi district in year-3 is very praiseworthy.

Table 7 Evolution of respondents declaring they have heard about ICS

Inter-districts comparison on the women's knowledge of different types of stoves (States and district wise)							
Type of stove	**Kalahandi**			**Kandhamal**			**Odisha**
	Year 1 (%)	**Year 2 (%)**	**Year 3 (%)**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**	**Year 3 (%)**
Traditional cook stove	129 (77.7 %)	165 (99.4%)	184 (92%)	101 (60.8 %)	400 (79.6 %)	167 (83.5%)	351 (87.8%)

Table 8 Inter-districts comparison on the women's knowledge of improved cook stoves (states and district wise)

Type of stove	Kalahandi			Kandhamal			Odisha
	Year 1 N (%)	Year 2 N (%)	Year 3 N (%)	Year 1 N (%)	Year 2 N (%)	Year 3 N (%)	Year 3 N (%)
Improved cook stove	109 (65.7 %)	166 (100%)	200 (100%)	101 (60.8 %)	400 (79.6 %)	200 (100%)	400 (100%)

In Kalahandi and Kandhamal districts, in second and third year about 100% women respondents reported that they have seen an ICS whereas in baseline, only 65.7% and 60.8% women respondents had seen an ICS as reported by them. It indicates that the level of awareness in the both the districts in year-2 and year 3 have appreciably increased.

Table 9 Women's knowledge on fuel characteristics requirements for proper ICS functioning

Women's knowledge on fuel characteristics requirements for proper ICS functioning					
Fuel Characteristics	Kalahandi		Kandhamal		Odisha
	Year 2 N (%)	Year 3 N (%)	Year 2 N (%)	Year 3 N (%)	Year 3 N (%)
Adjust size to Smaller Pieces only	45 (27.1)	66 (33.0)	368 (73.3)	66 (33.0)	132 (33.0)
Ensure fuel dryness only	117 (70.5)	64 (32.0)	269 (53.6)	78 (39.0)	142 (35.5)
Both Size and dryness	4 (2.4)	52 (26)	0	44 (22.0)	96 (24.0)
Others	0	15 (7.5)	0	12 (6.0)	27 (6.75)

With respect to women's knowledge on fuel characteristics requirements for proper ICS functioning, it can be seen from the above table that 70.5% and 53.6% women respondents were aware about ensuring fuel dryness as a requirement of fuel characteristics in Kalahandi and Kandhamal districts. In case of the second fuel characteristic i.e. adjust size to smaller pieces, the responses of women respondents in Kalahandi and Kandhamal districts were 33% and 33% respectively.

Table 10 Women's knowledge on relation between fuel, ICS and better forest resource management

Women's knowledge on relation between fuel, ICS and better forest resource management	Kalahandi		Kandhamal		Odisha	
	Year 2 N (%)	Year 3 N (%)	Year 2 N (%)	Year 3 N (%)	Year 2 N (%)	Year 3 N (%)
Optimal use of firewood can contribute to better forest management	166 (100%)	200 (100%)	84 (16.7%)	197 (98.5%)	250	397 (99.3%)
ICS use can contribute to better forest resource management	166 (100%)	200 (100%)	458 (91.2%)	190 (95%)	624	390 (97.5%)
Fuel saving leads to better forest resource management	143 (86.1%)	190 (95%)	458 (91.2%)	200 (100%)	601	390 (97.5%)

In case of better forest and resource management the women's knowledge on importance of use of fuel has been analysed for two districts through the above table and below graph. During endline assessment, optimal use of firewood can contribute to better forest management in Kalahandi and Kandhamal, reached to 100% and 98.5% respectively. Similarly, 86.1% respondents from Kalahandi district and 91.2% from Kandhamal district were able to tell that the fuel saving leads to better forest resource management. Findings on women's knowledge on methods to optimize fuel use while cooking are presented in the table below.

Table 11 Women's knowledge on methods to optimize fuel use while cooking

Methods to optimize fuel use	Kalahandi		Kandhamal		Odisha	
	Year 2 N (%)	Year 3 N (%)	Year 2 N (%)	Year 3 N (%)	Year 2 N (%)	Year 3 N (%)
Turn off fire after use	58 (34.9)	61 (30.5)	301 (59.9)	78 (39)	359	139 (34.8)
Use dry fuel only	62 (37.4)	80 (40)	408 (81.3)	89 (44.5)	470	169 (42.3)
Use only required fuel quantity for cooking only	40 (24.1)	59 (29.5)	NA	39 (19.5)	40	98 (24.5)
All replies above were quoted	1 (0.6)	0	NA	NA	1	NA
Two of the replies above were quoted	5 (3.0)	0	NA	NA	5	NA
Others	0	0	NA	NA	0	NA

Out of the three different methods for optimizing fuel use while cooking as mentioned in the above table, showed that women's knowledge has been improving over period. In, Kalahandi district 35% respondents said to turn off fire after use is the best method for optimize use of fuel while cooking during midline assessment which is almost similar findings in endline assessment. In Kandhamal, 60% of respondents favored this method during midline. Similarly, 24.1% respondents in Kalahandi district reported use of only required fuel quantity for cooking is the best method for optimize use of fuel while cooking. In endline assessment, Kalahandi district 29.5% respondents, there has been slight decline in using this method for optimize use of fuel.

3.2 Awareness on risks and benefits associated with TCS usage

District wise different types of issues were stated by the respondents and have been analyzed in the above table and following graph. In year-1 more than 91% women told due to cooking smoke some problems like tearing and burning of eyes has been occurring. Again it affects the kitchen infrastructure like blackening of pots/wall/roofs as well. Further, 85% women are of the opinion that on account of smoke the problems like coughing and breathing. In year-2, 100% women respondents told that eyes problems and coughing are their problems due to smoke. Further, about 90% to 98% women respondents told that they have been facing some acute problems like air pollution, headache, breathing problem, blackening of pots/wall/roofs. In the same year, more than 99% male respondents told the problems like air pollution, eyes problems and coughing on account of kitchen smoke.

About 85% male respondents told that due to kitchen smoke the problems like tearing and burning of eyes and blackening of pots/wall/roofs has been occurring which are affecting their life adversely.

Similarly, in Kalahandi district, 91.6% women respondents told that due to kitchen smoke they are facing the problems like tears and burning sensation of eyes in year 1. But in year-2,all women respondents are of the opinion that they are confronting the problems like air pollution, eyes problems and coughing. But majority of male respondents in Kalahandi in year-2 have given their views that they have been facing many acute problems like air pollution, eyes problems, coughing, headache and breathing on account of kitchen smoke.

Table 12 Evolution of issues stated as related to smoke (district wise)

Awareness on health problems ICS better than traditional cooking (Multiple Choice)	Kalahandi			Kandhamal			Odisha
	Year1 N (%)	Year 2 N (%)	Year 3 N (%)	Year1 N (%)	Year 2 N (%)	Year 3 N (%)	Year 3 N (%)
Eye problems	34 (20.5)	166 (100.0)	161 (31.9)	26 (15.7)	NA	125 (20.3)	286 (71.5)
Coughing	86 (51.8)	166 (100.0)	43 (8.5)	88 (53.0)	NA	77 (12.5)	120 (30.0)
Headache	83 (50)	160 (96.4)	50 (9.9)	72 (43.4)	NA	97 (15.8)	147 (36.8)
Breathing problem	41 (24.7)	150 (90.4)	63 (12.5%)	31 (18.7)	NA	108 (17.5)	171 (42.8)
Blackening of walls, roofs & cooking devices	125 (75.3)	147 (88.55)	168 (33.3)	146 (88.0)	NA	61 (9.9)	229 (57.3)
Lung disease	NA	NA	8 (1.6)	NA	NA	55 (8.9)	63 (15.8)
Heart disease	NA	NA	9 (1.8)	NA	NA	56 (9.1)	65 (16.3)
Vision impairment in children	NA	NA	2 (0.4)	NA	NA	37 (6.0)	39 (9.8)
Burns during cooking	NA	NA	1 (0.2)	NA	NA	0	1 (0.3)
Others(specify)	NA	NA	0	NA	NA	0	0
Total			505 (100.0)		NA	616 (100.0)	

3.3 Knowledge of Value Chain (VC) actors

The women's knowledge on ICS value chain actors like suppliers and manufacturers, technicians, market, banks/ MFIs and individual or SHGs is explained in the following table.

Table 13 Evolution of women's knowledge on ICS value chain actors (District-wise)

Knowledge on Value chain actors	Kalahandi						Kandhamal						Odisha	
	Year 1		Year 2		Year 3		Year 1		Year 2		Year 3		Year 3	
	N	%	N	%	N	%	N	%	N	%	N	%	N	$
Suppliers and Manufacturers	8	4.8	61	36.8	81	40.5	2	1.2	12	2.4	50	25.0	131	32.8
Technicians who can help on technical issues	4	2.4	33	19.9	36	18.0	1	0.6	6	1.2	101	50.5	137	34.3
Market to purchase ICS	4	2.4	33	19.9		0.0	0	0.0	NA	NA	0	0	0	0

Banks/ MFIs for loan	7	4.2	9	5.4	7	3.5	0	0	4	0.8	23	11.5	30	7.5
Individual or SHGs doing ICS business	7	4.2	36	21.7	153	76.5	1	0.6	NA	NA	20	10.0	173	43.3

The above table shows that more than 4.8% women have the knowledge about the value chain actor i.e. suppliers and Manufactures of ICS in Year -1 which has increased to 40.5% in Kalahandi. Similarly about 25% of growth can be seen in Kandhamal. They have least knowledge on the VC actors like Banks/ MFIs for loan, technicians who can help on technical issues and suppliers and manufacturers. These types of knowledge on different types of value chain actors have also shown in the graphical representation below.

3.4 Attitude related indicators

Household energy information sharing within households – The above table shows the status of women's confidence in discussing household energy information has increased from baseline to endline. Total 61.5% respondents in Kalahandi district and 76.5% in respondents in Kandhamal district said that the SHE school sessions are discussed with spouse and other family members. Similarly, total 90.15% respondents in Kalahandi district and 93% in respondents in Kandhamal district said that use of ICS is recommended. The SHE school session attended is also increased by 23% and 48% respectively, as respondents in both the districts.

Table 14 Women's confidence in discussing household energy information vs. Bachat project's profile

Household information	KAP	Endline	KAP	Endline	Odisha	
	Kalahandi (KL)		Kandhamal (KD)		Overall	
	Total respondents N (%)		Total respondents N (%)		Total respondents N (%)	
SHE school sessions are discussed with spouse and other family members	73 (42.9)	130 (65.0)	66 (39.8)	176 (88.0)	139	306 (76.5)
ICS are discussed with spouse and other family members	87 (51.2)	121 (61.5)	88 (53.0)	153 (76.5)	175	274 (68.5)
Use of ICS is recommended	75 (44.1)	181 (90.5)	73 (43.9)	186 (93.0)	148	367 (91.8)

Table 15 Evolution of men and women's interest in ICS (District-wise)

knowledge on ICS value chain actors (District-wise)														
Knowledge on Value chain actors	Kalahandi						Kandhamal						Odisha	
	Year 1		Year 2		Year 3		Year 1		Year 2		Year 3		Year 3	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
ICS is comfortable for cooking	5	3	66	39.8	70	35	156	94	NA	2.4	70	35	140	35
ICS are discussed with spouse	79	47.6	88	53.0	104	52	131	78.9	NA	1.2	50	25	154	38.5
Willing to use / bring an ICS home	150	90.4	166	100	200	100	145	84.9	NA	48	200	100	400	100

The above table shows that in year-2 in three districts both the men and women respondents have a strong willingness to use and bring ICS home. In Kalahandi districts in year-2 and in Kalahandi district in year-2 the willingness is 100% and same were observed in endline study.

3.5 Women's preference on ICS

The table shows the responses by the women respondents on adoption of cook stove and preference of cook stove in different villages. The first priority has been given to Agnika cook stoves and for the rest, the adoption rate are very low. Overall adoption penetration of cook stove is 30.2% at the intervention villages.

Table 16 Village wise women's preference on ICS

Village	District	Purchase of ICS	Adoption	Agnika	Fonex	PCSN	Phonex
Ambjor	KL	1	5	1			
Chancher	KL	5	25	4		1	
Dalguma	KL	1	5				
Dalibadi	KH	8	40	5			
Dandikia	KH	19	95	17			
Dangarapada	KH	1	5	1			
Delarpada	KH	0	0	0			
Dharavata	KL	3	15	3			
Jargipadar	KH	6	30	6			
Karandagada	KH	1	5	1			
Nagjhari	KL	12	60				
Padapada	KH	3	15	1			
Pokharihgat	KL	3	15	3			
Ratanga	KH	1	5	1			
Sargiguda	KL	12	60	9		1	
Seskajodi	KH	3	15	3			
Sikerguda	KL	9	45	5	1		
Talarachuguda	KL	9	45	7		2	
Tandalnaju	KH	18	90	18			
Uper Rachuguda	KL	6	30	5			1
Total		121	30.25	90	1	4	1
							N=20 per village

3.6 Change in women's preference for ICS

Table 17 District-wise comparison of women acquiring and using ICS at home

Acquiring and using ICS	Kalahandi						Kandhamal						Odisha	
	Year 1		Year 2		Year 3		Year 1		Year 2		Year 3		Year 3	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Have ICS at home	17	10.2	34	20.5	60	30	3	1.8	78	15.5	61	30.5	121	30.3
Using ICS regularly at home	14	8.4	32	19.3	50	25	1	0.6	71	14.1	59	29.5	109	27.3

Taken loan to purchase ICS	0	0	1	0.6	74	37	0	0	0	NA	183	91.5	257	64.3
Participated in decision making to purchase ICS	0	0	18	10.8	143	71.5	0	0	315	62.7	173	86.5	316	79
Decision taken to purchase independently	0	0	5	3.0	100	50	0	0	0	NA	135	67.5	235	58.8

The above table shows that how many women are actually acquiring and using ICS at home. In Kalahandi district 3.0% women respondents said they have taken decision to purchase independently in year-2 which increased to 50% in endline. While 62.7% women respondents in Kandhamal said they have participated in decision making to purchase ICS in year 2, has increased to 86.5 % in endline assessment.

Table 18 Awareness of Women on different types of Stoves in Kalahandi district (Odisha)

Type of stoves	Kalahandi					
	Year 1		Year 2		Year 3	
	Frequency of "yes" response	%	Frequency of "yes" response	%	Frequency of "yes" response	%
Women can influence to take decision independently to purchase ICS	77	46.4	70	42.2	194	97
Decision taken to purchase jointly	0	0	26	15.6	153	76.5
Female member will take decision to purchase ICS	132	79.5	20	12.0	170	85

The above table shows that about 97% women respondents can influence to take decision independently to purchase ICS in Kalahandi district in the endline, where as it was 76.5 % in Kandhamal Female member who poised to take decision to purchase ICS in Kalahandi was 85 % in the endline.

3.7 Women's agency with ICS VC actors

Table 19 Evolution of women's agency with Value Chain Actors (district-wise)

Value Chain Actors	Actions	Kalahandi			Kandhamal			Odhisha		
		Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Manufacturers	Interaction	0	0.6	2.0	0	0.9	2.5	0.0	3.6	2.3
	Negotiation	0	0.6	2.	0	0	4.5	0.0	6.6	3.3
Suppliers	Interaction	3.6	38	95.4	1.2	2.4	55.5	4.8	47.0	75.5
	Negotiation	0.6	35.7	84.3	1.2	2.4	44.5	1.8	43.4	64.4
Financial institutions	Interaction	0	1.8	0	0	0	0	0.0	1.8	0.0
	Negotiation	0	5.4	0	0	0	0	0.0	1.8	0.0
Others (Ever Negotiated with ICS VC actors)	Interaction	5.4	0	0	0	1.39	0	5.4	4.2	0.0
	Negotiation	0	0	0	0	0	0	0.0	0.0	0.0

The table shows that in which way the women respondents have interacted and negotiated with the value chain actors like; manufacturers, suppliers and financial institutions. About 95% women respondents have interacted and negotiated with the suppliers in Kalahandi where Kandhamal 55.5%, a value chain actor. It has represented through the above table and below displayed graph.

Table 20 Evolution of nature of negotiation with VC actors (District-wise)

Nature of negotiation	Kalahandi			Kandhamal			Odisha		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year1	Year 2	Year 3
Pricing	1.8	36.1	55.3	0.6	2.19	42	2.4	42.8	48.7
Financing	0.6	0.6	4.1	0.6	0.59	10	1.2	2.4	7.0
Design	1.2	13.9	0.5	0	0.79	0	1.2	16.3	0.3
Repair	0	24.1	0.5	0	0.39	0	0.0	25.3	0.3
Others	0	0	1.0	0	0	0	0.0	0.0	0.5

The above table shows the nature of negotiation with VC actors for two districts. In Kalahandi and Kandhamal district about average 55% and 42.00 respectively; respondents, negotiation power has increased for both Pricing and Financing part.

3.8 Interest in ICS business

Table 21 Women's willingness to take ICS business vs. Bachat project involvement status in % (District-wise)

	Kalahandi			Kandhamal		
	Total Respondents			**Total Respondents**		
	Year-1	**Year-2**	Year 3	**Year-1**	**Year-2**	Year - 3
Willing to take ICS business as entrepreneur	**NA**	**NA**	**NA**	**4.8**	**1.2**	**5.6**

This table shows that there is a slight improvement in the respondents who are willing to take ICS business as entrepreneur. This result is quite similar for both the districts in both the years.

3.9 ICS Usage

Table 22 Evolution of ICS use vs. Bachat project involvement status

Nature of negotiation	Kalahandi (Odisha)			Kandhamal (Odisha)			Odisha		
	Y-1 (%)	**Y-2 (%)**	**Y-3 (%)**	**Y-1 (%)**	**Y-2 (%)**	**Y-3 (%)**	**Y-1 (%)**	**Y-2 (%)**	**Y-3 (%)**
Women with ICS	10.2	20.5	30.5	1.8	15.5	30	12.1	67.5	30.2
Women using regularly ICS	8.4	19.3	34.0	0.6	14.1	24.5	9.0	62.1	29.3

The above table shows that in Kalahandi 1st year only about 10.2% women have ICS and about 20.4% women are using ICS regularly whereas in the endline it has slightly increased, i.e. 30.46%. But in Kandhamal district for both the cases (women with ICS and Women using regularly); consistent increased has been noticed.

Period of usage	Kandhamal (%)	Kalahandi (%)	Odisha (%)
1 Year	1.0	0.5	0.75
2 Year	22.5	30.5	26.5
3 Year	9.5	2	5.75
Total	33.0	33	37.7

Table 23 Women's participation in SHE school sessions/activities

Women's participation in SHE school	Kalahandi (Odisha)			Kandhamal (Odisha)			Odisha		
	Year 1 N %)	Year 2 N (%)	Year 3 N (%)	Year 1 N %)	Year 2 N (%)	Year 3 N (%)	Year 1 N (%)	Year 2 N (%)	Year 3 N (%)
Trained as SHE champions	6 (3.6)	8 (4.8)	11 (5.6)	0	34 (6.17)	21 (10.5)	6 (1.8)	42 (12.7)	32 (8.0)
Interacted with SHE champions	81 (48.8)	114 (68.7)	0	39 (23.5)	NA	NA	120 (36.1)	114 (68.7)	NA
Attended SHE school sessions	78 (47.0)	123 (74.1)	127 (64.5)	52 (31.3)	189 (37.5)	176 (88)	130 (39.2)	312 (94.0)	303 (75.8)

The above table shows the comparative status of women in the two districts regarding the women's participation in SHE school. In Kalahandi and Kandhamal districts 64.5% and 88.3% women attended SHE school sessions respectively in third year.

3.10 Key highlights from the end line study

Decision related indicators – The table below shows that out of two districts women's influence to recommend ICS is higher in Kandhamal district as compared to Kalahandi. More specifically, in Kandhamal district, 51% women are able to take decision independently to purchase ICS which is 48.5% in Kalahandi.

Table 24 Women's influence on household cooking decision vs. Bachat project involvement status (District wise)

Activities	Kandhamal		Kalahandi		Odisha	
	N	%	N	%	N	%
Would you recommend ICS	183	91.5	180	90.0	363	90.8
Discuss with your spouse and other family members about SHE school's sessions	180	90.0	191	95.5	371	92.8
Discuss with your spouse and other family members about ICS?	179	89.5	172	86.0	351	87.8
Influence or take decision independently to purchase ICS	102	51.0	97	48.5	199	49.8

Table 25 Willingness to use ICS

District	Willingness to use ICS	
	N	%
Kandhamal	199	99.5
Kalahandi	179	89.5
Odisha	378	94.5

Respondent are enthusiastic and willingness to use ICS in Kandhamal and Kalahandi districts which is 99.5% and 89.5% respectively.

Also, responses received from both the districts were mixed on affordability. In Kandhamal, most of the respondents wanted to become early adopter for ICS. Nearly 40% in Kandhamal and 67% in Kalahandi showed an interest to purchase ICS immediately if ICS cost is reduced.

Table 26 Affordability of ICS at individual level

Affordability		
District	**N**	**%**
Kandhamal	72	40.0
Kalahandi	180	67.0
Odisha	252	63.0

Practice - Total 92% respondents in Kandhamal district and 97% in respondents in Kalahandi district are interested to recommended ICS to others and neighboring villages for healthy cooking practices. At the same time, respondents were demanding to reduce the cost of ICS stove and having local ICS maintenance center within the reach of villages similar to LPG cook stove.

Table 27 Recommendation of ICS to Others

Recommend ICS		
District	**Number**	**Percentage**
Kandhamal	183	92
Kalahandi	194	97
Odisha	377	94.3

Table 28 CARE Programme knowledge gain by the respondents from different sources

CARE Programme Knowledge	Kandhamal		Kalahandi		Odisha	
Activities	**N**	**%**	**N**	**%**	**N**	**%**
Regular SHE Schools	176	88.0	128	64.0	304	76.0
ICS Demonstration	97	91.5	190	95.0	287	71.8
Male Change Agent	167	84.0	161	81.0	328	82.0

The above table shows that both district respondents are regular attendee of SHE school where Kandhamal (88%) respondent are more regular than Kalahandi (64%) and participation of ICS wherever programmes has been initiated to promote. In both the districts, the percentage change in male participations is also high with 81% of attendance.

Table 29 Respondents negotiated with ICS VC actors to buy ICS

District	Ever negotiated with ICS VC actors	
	N	**%**
Kandhamal	19	9.5
Kalahandi	45	22.5
Odisha	64	16.0

Broadly speaking on over all effects of the project on the key change areas can be listed as following:

- In endline assessment, in both the districts 30.5% are aware about the ICS. Similarly, the other types of stoves like LPG and Kerosene Stove the number of women aware about these types of stove are 5 and 97 which is 3.7% and 71.3% respectively.
- The awareness of women on the negative impact of Traditional Cook Stove has been improved to 100%.That is, all the respondents in the study are aware about the traditional cook stove. Also in case of Solar Stove and Charcoal Stove the level of awareness has been improved considerably.
- In Kalahandi district in first and second year average 88.55% women respondents have heard about ICS and average 81.95% men respondents in the district have given their views that they heard about ICS. But in year-3 in Kalahandi district 100% male respondents have given their views that they have heard about the ICS and in the same year the 99.4% women respondents have given their views that they have heard about the ICS. It indicates that the level of awareness in the Kalahandi district in year-3 is significant.
- With respect to the women's knowledge on "optimal use of fuel can contribute to better forest management" characteristics requirements for proper ICS functioning, it is observed that Kalahandi and Kandhamal districts are 100% and 98.5% respectively. Women respondent told to ensure only fuel dryness as a requirement of fuel characteristics in Kalahandi and Kandhamal districts stand at 32% and 39% respectively due to non-users of ICS. But in case of the fuel characteristic i.e. adjust size to smaller piece only the responses of women respondents in Kalahandi and Kandhamal districts are 33% and 33% respectively.
- Similarly, in Kalahandi district in both the years and both men as well as women respondents have responded that the main attribute of the ICS is that it emit less smoke, though they have cited other attributes like time saving, cooks fast, low maintenance, portable, fuel saving/ reduction of fuel, reduced blackening of walls/ clean walls, easy to use, reduced blackening of vessels and soon.
- More than 76.5% women in Kalahandi district have the knowledge about the value chain actor i.e. individual or SHGs doing ICS business, secondly they are aware of suppliers and manufacturers, Market to purchase ICS. They have very least knowledge on the VC actors like Banks/ MFIs for apply and getting loan for ICS.

Attitude related indicators:

- So far as the women's confidence on household energy information is concerned, a total of 42.9% respondents in Kalahandi district and 39.7% in respondents in Kalahandi district said that the SHE school sessions are discussed with spouse and other family members during KAP study. The interaction level has increased to 65% in Kalahandi district and 88% in Kandhamal at endline assessment.
- Similarly, total 61.1% respondents in Kalahandi district and 53% in respondents in Kandhamal district said that ICS are discussed with spouse and other family members during KAP study. This is increased by 10% and 23% in respective districts. Furthermore, the Use of ICS is recommended by more than 90% respondents in both the districts.
- Further, while interview during endline assessment men respondents in both the districts are very much interested to bring ICS to home. But in Kalahandi district 100% respondents are interested to bring ICS home and it is comfortable for cooking.
- About zero women respondents can influence to take decision independently to purchase ICS in Kalahandi district in year-1 which has increased to 50 % in Kalahandi and zero respondents told that respondents participated in decision making during Year 1 which has increased to 71.5%. Similarly, in both the districts in year-3 about 50% women respondents told that they are using ICS regularly at home.
- So far as the purchased ICS are concerned, women preferences are changing, and it has reached to 30% in both the survey districts. During interviews, respondents also told that they would like to

adopt the ventilation practices taught in SHE schools.

Practice related indicators:

- In both districts women's influence on household cooking decision went up from 46.4% in year 1 to 97% in endline.
- More specifically, in Kalahandi district 85% women influencing to take decision independently to purchase ICS. In case of Kandhamal districts it is 30.1%.
- Further, 0% women in Kalahandi district in Year-1 discussed with their spouses and other family members about SHE school session.
- In Kalahandi district only 0% of the women are taking decision regarding purchase of ICS in year 1. Even it is less than 5% in all the two districts. But when joint decision is considered, it is 71.5% in Kalahandi district and 86.5% & and Kandhamal districts respectively
- Regarding the women's participation in SHE school, in Kalahandi and Kandhamal districts, 65%, and 88% women attended SHE school sessions respectively. But only 5.6% women in Kalahandi district have trained as SHE champions. But there is no such SHE champions in Kandhamal district.

Beneficiary response on training and capacity building programme:

The respondents rated the benefits from training and capacity building programme in three categories i.e. Excellent, Very good and Good. Some programme has still some chances to modify more to attract more people for scalability and outreach of the programmes. Respondents requested such programmes need to be done in regular intervals and it needs to be informed well in advance. Many respondents were also informed that travelling and reaching to venue is also difficult that can also be considered. Few respondents, wanted to be in touch with retailer and distributors to buy ICS where retailer and distributors have shown limitation to serve the ICS in village level less than 30 pieces. Some of the retailer respondents in the community received the cook stoves at CARE, India office or Bhubaneswar.

Some programmes need to be more oriented to be needs of local community and ICS programmes need to be linked up with MFI, recent forest development programmes or venture or carbon credit funds where access to finance and accessibility of cook stove can be reached on time. Programmes can be refined with user prospective such as SHE School, Door to door IEC campaign, ICS- VC actors, and promotions of male change agents. A brief summary of all programmes and learning outcomes is mentioned in table 43.

Table 30 Respondents' response on capacity building programmes

Activities	Excellent	Very good	Good	Not so Good	Poor
SHE Schools	147 (36.8%)	49 (12.3%)	46 (11.5%)	72 (18.0%)	84 (21.0%)
SHE school sessions	142 (35.5%)	98 (24.5%)	159 (39.8%)	1 (0.3%)	0
Training & mentoring SHE Champions and Bachat Sathi	90 (22.5%)	232 (58.0%)	68 (17.0%)	10 (2.5%)	0
Interactive session between SHG members and Manufacturers / Distributors	48 (12.0%)	193 (48.3%)	145 (36.3%)	12 (3.0%)	0
Cooking camps	18 (4.5%)	149 (37.3%)	217 (54.3%)	16 (4.0%)	0
Door to Door IEC Campaign	99 (24.8%)	100 (25.0%)	151 (37.8%)	30 (7.5%)	7 (1.3%)
Awareness sessions in SHE Schools	97 (24.3%)	157 (39.3%)	127 (32.8%)	15 (3.8%)	1 (0.3%)
SHE Field Days	20 (5.0%)	154 (38.5%)	159 (39.8%)	67 (16.8%)	0

Felicitate SHE School members emerging as SHE influencers	1 (0.3%)	136 (34.0%)	178 (44.5%)	84 (21.0%)	1 (0.3%)
Facilitate Interactive session between SHE influencers and women	62 (15.5%)	142 (35.5%)	148 (37.0%)	46 (11.5%)	2 (0.5%)
Sharing of user's experiences on ICS with manufacturers/distributors	60 (15.0%)	137 (34.3%)	149 (37.3%)	48 (12.0%)	6 (1.5%)
Meet of ICS VC Actors	71 (17.8%)	84 (21.0%)	147 (36.8%)	73 (18.2%)	18 (4.5%)
Dialogue with frontline health workers	5 (1.3%)	57 (14.3%)	202 (50.5%)	136 (34.0%)	0
Discussion about ICS in normal meetings of h e a l t h f r o n t l i n e workers (ASHA & AWW)	13 (3.3%)	86 (21.5%)	154 (38.5%)	147 (36.7%)	0
P r o m o t i n g M a l e Change Agents and facilitate discussion/ dialogue with men in the village	42 (10.5%)	118 (29.5%)	121 (30.3%)	81 (20.3%)	38 (9.5%)
interactive sessions between SHE School members and Men & ICS Value Chain Actors	77 (19.3%)	205 (51.3%)	78 (19.5%)	40 (10.0%)	0
Organise men women energy interface meeting	88 (22.0%)	196 (49.0%)	76 (19.0%)	40 (10.0%)	0
Conduct awareness sessions in men's collectives like - Farmers club, Youth club, Jati Samaj (Caste Society)	72 (18.0%)	199 (49.8%)	90 (22.5%)	39 (9.8%)	0
Discussion about ICS with PRIs/ Community leaders/ Teachers/ male leaders	90 (22.5%)	232 (58.0%)	68 (17.0%)	10 (2.5%)	0
Orientation of men on varied ICS models	66 (16.5%)	198 (49.5%)	95 (23.7%)	41 (10.3%)	0
Engage with Other Collectives like Vana Samrakshyan Samiti, Forest Protection Committee	7 (1.8%)	124 (31.0%)	153 (38.3%)	115 (28.8%)	1 (0.3%)
Share information on ICS testing process	49 (12.3%)	174 (43.5%)	113 (28.3%)	64 (16.0%)	0
Use the platform of local festival to dialogue with men	57 (14.3%)	140 (35.0%)	109 (27.3%)	94 (23.5%)	0

Table 31 Respondents' remarks on capacity building programmes

S. No.	Cohort wise Inputs	Remarks from the participants
1	SHE Schools	• Learning driven platform • Concentrated approach • Easy and informative training • Clear and short information accessing the platform on clean cooking • Before SHE School cooking was a normal day to day activity but SHE School and the project had made it more interesting as we have to share our cooking experience in the SHE school
2	SHE school sessions	• Received Information on various Natural resources • Understood importance of gender natural household decision process • Made aware of the impact of Household Air Pollution (HAP) and its ill impact on household's health • Informed about ICS as a clean cooking device
3	Training & mentoring SHE Champions and Bachat Sathi	• Impactful training • Enhanced leadership skills • Boosted Confidence • Increased convincing skills

4	Interactive session between SHG members and Manufacturers / Distributors	• Give our feedback on the design of the ICS • Bargained for the better rate • Understand the effective way of using an ICS
5	Cooking camps	• Received hands-on experience on various ICS models • Compared to each ICS models with another • Cooked our traditional food to test the efficacy of the device • Shortlisted 5 models as per price, design, and overall efficiency of the device
6	Door to Door IEC Campaign	• Got aware of the ICS as a clean cooking device • Informed about HAP and its ill impact • Men from my household sensitized on the issues and challenges women face during cooking • A lot of informative IEC materials were on displayed and I got to know about saving the forest and how ICS can help us in that
7	Awareness sessions in SHE Schools	• It was a good experience sharing platform • Before SHE is cooking was a normal day to day activity but SHE School and the project has made it more interesting as we must share our cooking experience in the SHE school
8	SHE Field Days	• Various ICS models were on display • Men from our village got aware of the challenges and drudgery women undertake during cooking • Men understanding on the importance of the device and ease of cooking triggered the household decision of purchasing an ICS
9	Felicitate SHE School members emerging as SHE influencers	• Got recognition in the Buyer-Seller meet • The recognition helped influence more households to switch to ICS • Getting an additional felicitation also motivated my neighbours to switch to ICS
10	Facilitate Interactive session between SHE influencers and women	• Sharing the individual experience of ICS adoption has helped inspiring other women to switch to ICS • My personality has improved and recognition as SHE influencer has also increased my credibility in the community
11	Sharing of user's experiences on ICS with manufacturers/ distributors	• Feedback on design and cost has gone to the manufacture • Although the cost factor remained unchanged but few design level changes have happened based on the feedback given by us. • Manufactures made aware of our cooking culture and local food habit
12	Meet of ICS VC Actors	• Availability of ICS at our doorstep • Local centric design
13	Dialogue with the frontline health worker	• Help to spread the awareness on HAP
14	Discussion about ICS in normal meetings of healthfrontline workers (ASHA &AWW)	• Help to spread the awareness on HAP • Health challenges led by HAP • Increment on family health expense
15	PromotingMale Change Agents and facilitate discussion/	• Prioritised clean cooking in men to men conversations • Helped adoption to take place in non-project villages • Prioritised purchase of ICS in the Household decision-making process

	dialogue with men in the village	

CHAPTER-4 STATISTICAL ANALYSIS

3.11 Willingness to adopt ICS

Measuring and analyzing public perceptions of the community in two districts of Odisha and Switch Programme are becoming core elements in promoting Improved Cook Stoves (ICS), which is a key goal to be understood in Forest Dependent Household in India. The consultant is used as a one-dimensional measure to understand community attitudes in order to measure the overall relationship between community and the increase in the awareness level during the programme. A high to medium score is associated with high eccentric orientation of adoption of ICS. Further, the analyses has aim to measure and to establish adoption score with Awareness, Affordability, Attitude and Availability (4A). Overall, the statistical analysis indicated the existence of the 4A scales, and has shown increased community awareness among the respondents and revealed that the respondents' score is correlated with the area of residence and ready to adopt ICS. Implicitly, the score is correlated statistically significant level with respondents' willingness to pay for ICS in expansion phase.

According to Levene's test for equality of variances result, p-value = 0.001 is used for the t-test for equality of means. Based on this, a statistically significant difference for the 4A score mean is recorded; the 4A score mean is higher in the group of respondents who declare a positive willingness to pay for ICS. To further examine the above-recorded tendency, a binary logistic regression model was constructed. In this model, willingness to pay is the dependent variable, while 4A score and respondents' demographics are the independent ones.

3.12 Independent sample t-test

The Independent Samples t Test compares the means of two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different. The Independent Samples t Test is a parametric test.

Steps to conduct Independent sample t test:

1. Scout the relevant variables which address the four pillar of the project namely, awareness, affordability, attitude and availability.
2. Nearly 4 variables were identified along with the variable for grouping. The grouping variable would be Beneficiaries who attended the training regularly.
3. Independent sample t test were conducted in order to understand due to training the level of awareness is increased which is significant, increase in the willingness to use ICS, awareness on MNRE protocol.
4. The estimation done through IBM SPSS.

Table 32 Group Statistics

Group Statistics					
Regularly attended training		N	Mean	Std. Deviation	Std. Error Mean
Heard about ICS	Regularly attend Training	393	0.8	0.3	0.02

	Not Attended training regularly	7	1.0	0.0	0.0
Purchased ICS by CARE	Regularly attend Training	393	0.3	0.5	0.02
	Not Attended training regularly	7	0.4	0.5	0.2
Willing to use ICS	Regularly attend Training	393	0.9	0.2	0.01
	Not Attended training regularly	7	1.0	0.0	0.0
Aware about performance measure protocol	Regularly attend Training	393	0.1	0.2	0.01
	Not Attended training regularly	7	0.0	0.0	0.0

Table 33 Independent samples test

Independent Samples Test										
Variables	Label	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Heard about ICS	Equal variances assumed	5.4	0.0	-0.9	398	0.3	-0.12	0.12	-0.4	0.1
	Equal variances not assumed			-7.5	392	0	-0.12	0.02	-0.2	-0.1
Purchased ICS by CARE	Equal variances assumed	1.0	0.3	-0.7	398	0.5	-0.12	0.2	-0.5	0.2
	Equal variances not assumed			-0.6	6.2	0.6	-0.12	0.2	-0.6	0.4
Willing to use ICS	Equal variances assumed	1.9	0.2	-0.7	398	0.5	-0.1	0.1	-0.2	0.1
	Equal variances not assumed			-4.9	392	0	-0.1	0.01	-0.08	-0.04
Aware about performance measure protocol	Equal variances assumed	1.5	0.2	0.6	398	0.6	0.1	0.1	-0.1	0.2
	Equal variances not assumed			4.3	392	0	0.1	0.01	0.02	0.1

Result interpretation:

As p-value is 0 which is less than 0.05 we can say that the project had impacted more in, the women are heard about the improved cook stove which impacted more which is statistically significant 0.05% (with standard error of 0.02) with the assumption of equality of variance was not assumed to be equal. Likewise, the awareness among the women in the project grounded more which is statistically significant of 0.05% significant (with standard error of 0.2). More interestingly, the women knowledge on performance measure of MNRE protocol was statistically 0.05% significant of with standard error of 0.01 was recorded with the assumption of equality of variance was not assumed to be equal. More importantly, the women purchased improved cook stove was not shown the more impact on the ground since it is not statistically significant. Since the independent t test, we assume that the normality achieved.

CHAPTER – 5 STAKEHOLDER ANALYSIS

In addition to the end-user beneficiaries, the SWITCH Asia -II Improved Cook stove Programme has engaged with multiple stakeholders, each of them representing different perspectives, interests and agendas about adoption, impacts and scaling-up of ICS promotions in Odisha and Chhattisgarh. Understanding perceptions of these non-beneficiary stakeholders can prove to be significantly enriching for the current debates on ICS options which are otherwise largely informed by rigorous, yet highly compartmentalized research. This has been brought in through in-depth expert interviews, with 44 stakeholders in different organizations involved in the ICS promotions in the above mentioned states. When analysed, these interviews presented unique insights about the divergences and convergences of stakeholder perceptions in terms of the key drivers, barriers, and impacts of ICS adoption. It also indicates how these diverse perspectives can be channelized into developing a way forward for enhancing the uptake and sustained use of stoves, eventually increasing the sectoral sustainability. In view of the present situation imposed by the COVID-19 pandemic, all the interviews were conducted telephonically. The interviews enquired a series of demand-side factors that affect stove adoption, namely (a) household characteristics and decisions; (b) awareness and behavioral change; (c) social influence and status.

Stakeholder/Region	Jashpur (Total)	Kalahandi (Total)	Kandhamal (Total)
Local PRI Member	2	2	2
Lead Bank Officer	1	1	1
Formal Financial Institution	2	2	1
ICS Supplier/ Distributors	3	2	3
Retailer/ field technician	5	5	3
Renewable energy department/ Forest Department	1		1
Others (SHG)	2	3	2

PRI - Behavioral change:

a) **Household characteristics and decisions**, PRI's from Odisha indicated that the ICS programme implementers often over-simplify or inaccurately abstract the role of a household or a SHE member's rural life, seemingly oblivious to their personal characteristics and social complexities. For instance, women are the primary target group for several awareness activities as they are likely to be the main "beneficiaries" and users of ICS. However, as males often make household decisions including the household expenditure and budget allocation, investing in a new ICS seldom becomes a priority. Although in some cases women have been seen influencing men for buying ICS, such abstractions and over-simplification may result in misconceptions about the target group (i.e. women) including who has the purchasing power in households.

b) **Awareness and behavioral change**, several stakeholders identified awareness as a major driver and barrier of clean cooking adoption as it is often the first step to any action and progress (SHE programme activities are well designed to address the same). Many potential clean cook stove users in rural areas are either completely unaware of alternative cooking technologies or ignorant about their operation, intended benefits and personal relevance to them (informed by PRIs in both the states).

c) **social influence and status**, affordable cost and good product performance are two key factors important for sustained use and adoption of ICS. Social networks such as women groups or Self Help Groups are the most common sources of information for targeted beneficiaries to learn about product functionality, recommend good products, and raise grievances about bad product performance (SHE school, retailer a d distributor meet etc.).

Community behavior:

It was perceived as a complex and yet difficult factor to catalyse new ICS practices and habits because typically ICS operate differently as compared to the traditional biomass stoves (with and without chimneys). Adopting one of the many different ICS options (even in the preferred range which is less than 1000 INR per cook stove) offered under the SWITCH –Asia II programme would require a significant shift in cooking practices and overall user behavior change. Until the new ICS becomes part of the daily household routine, this barrier should not be underestimated. ICS remains a secondary option for the end users, as most of them are using both types of stoves. For example, new recipe options and development of new cooking habits can improve adoption of ICS Issues faced with wood twigs as a cooking fuel such as dampness during rainy season also push the case for ICS as admitted by the respondents. The critical role of beneficiary education on stove usability and kitchen management (e.g. ventilation, positioning of fuel/cooking pot, fuel management) is also particularly important. One respondent shared that in some areas development agencies disseminated ICS free of cost (e.g. forest department after plantation of six trees) without explaining their benefits or mode of usage, resulting in the beneficiaries simply using them.

Overall a series of stove and fuel characteristics and performance mediate adoption and sustained use. The main themes related to (a) affordability, accessibility and availability; (b) stove design, functionality and performance; and (c) sociocultural compatibility.

Retailers:

ICS adoption is based on several factors including affordability, availability and accessibility, design and functionality, and socio-cultural compatibility which are further explained below:

a) **Affordability** - Consumer financing mechanisms must take into account the affordability of the different clean cooking options, and how it is affected by infrastructure constraints and regional differences. This is particularly important for scaling up the adoption of technologies such as LPG, electric stoves and biogas, whose reach is limited to households that afford either the recurring monthly costs or the high upfront costs as explained by the retailer. The retailers play a significant role in promoting ICS, occupying a unique position in the lifecycle chain of ICS as a 'gatekeeper' between manufacturers and consumers. The retailers and distributors in the district of Kalahandi, Kandhamal and Jashpur were interviewed using a questionnaire with structured as well as open-ended questions during 24th- 28th September 2020 telephonically. This section presents findings from these interviews along with the key themes emerging with supporting data from the end line survey.
b) **Availability –** Government agencies play a significant role by creating an enabling and coherent policy environment for lifting liquidity constraints on the supply side (particularly for local industries and entrepreneurs) and increasing the reliability of clean fuel delivery and availability in rural areas. Targeted subsidies, economic incentives and support to microfinance organizations can further strengthen this aspect. However, it is important to ensure that these mechanisms are

consistent with other financing options or wider policy goals. The current status on availability of cook stove to purchase in remote area is weak. Cooking as per communities need tested in CARE programme but it can be explored and initiated regularly which will help to review of available technologies and impacts on the socio-economic and environmental perspective. Forest officers and CREDA representative suggested in this direction.

c) **Accessibility –** Accessibility for ICS has been hindered due to several reasons including low affordability/awareness/willingness to pay for clean cooking, easy access to free traditional fuels, last mile distribution constraints, and cultural, technical, and environmental barriers etc. Particularly for vulnerable groups in Kalahandi and Kandhamal who largely belong to low-income group, lack of infrastructure (e.g. lack of road access and formal addresses) and large distance from nearby city market are two major obstructing factors significantly limiting the adoption of clean cooking options. This can be addressed with innovative ideas and better pay-back mechanisms.
d) **Design and functionality –** Design quality and good performance are often associated with convenience, ease of use and appealing appearance which was preferred by local tribal groups in all three districts. the present stove design is often assessed for enhancing convenience and meeting user needs, e.g. by allowing the preparation of local dishes and compatibility with traditional cooking utensils. Furthermore, households also value convenient stove designs that have added functions, such as space heating, portability for outdoor cooking, easy ignition, and the ability to hold larger/multiple cooking, Women (who are the most common stove buyers) also tend to value highly appearance and aesthetic appeal (e.g. modern and attractive appearance including stove colors).
e) **Socio cultural compatibility** – Socio-cultural reasons and community perceptions about indoor cooking using biomass fuel and traditional stoves in rural areas are well addressed in the Switch Asia_II Bachat Programme. Stove performance monitoring mechanisms include stove standards, quality control and enforcement mechanisms when rolling out new cooking technologies at a large-scale are weak. Labeling after installation (to know the performance in other regions) or rating can be useful in providing useful information and build consumer trust resulting in a positive effect on adoption rate in future stages.

Stakeholder perspectives on ICS cost:

Most of the respondents agreed that high, unaffordable cost is one key reason for them to not buy ICS. The price of ICS is in the range of 1400-1600 INR depending on the model. Since there is no provision to avail a grant or loan to buy the cook stove, most of the economically poor people are unable to get access to the cook stove even if they want to use it.
Responses from various stakeholders (including Forest Guard, PRI representatives, Anganwadi workers etc.) were equivocal about the cost of ICS, recommending that the cost of ICS should be reduced. Another factor which repeatedly emerged from the interview narratives was to increase the duration of the programme for a better impact and continued engagement.

Cook stove purchasing decision:

The Care India programme has been able to increase the awareness levels considerably about benefits of ICS, despite low results in building an ecosystem for large scale adoption of ICS. The open-ended questions in the survey captured the barriers for larger adoption of ICS among the households as perceived by the respondents. The table below presents a summary of the factors considered by household while making a purchase decision from the perspective of retailers and distributors:

Table 34 Considerations for cook stove purchase by the household from the perspective of rcook stoveetailers and distributors:

Consideration	% of respondents
Durability	70.0
Affordability	90.0
Fuel Saving	75.0
Capacity building	50.0
Health Benefits	60.0
Smoke Emission	75.0
Availability of financing options	85.0

Most rural households in India survive on meager income levels, thus the decision to not invest in cook stoves considering the prevailing price of the cook stoves (around > INR 1400) is a critical behavioral insight. Most of the retailers have suggested that if the average unit cost of ICS can be reduced up to 500 INR, the adoption rate will go up. However, at this price, no good model of ICS is available in the market. Thus it can be inferred that unless the ICSs are adequately subsidized under any type of convergence programme of the government or supported through part of the funding from carbon market or CSR fund, it will be challenging for large scale adoption of ICS due to limitation of affordability.

Details of the ICS businesses

While there are several types of cook stoves procured and supplied in the market, Agneekaa is the most preferred ICS by most of the households primarily due to its attractive design, product durability, low smoke emission, less cooking time due to proper guided flame and suitability of firing long wood in the ICS.

Enterprising skill

A successful retailer must possess basic skills of business management including financial knowledge, marketing and brand building skills and positive relationship building skills. In this regard, the project has greatly enhanced the skill of retailers and sub-retailers building the capacity of the various stakeholders in the ICS value chain. However, the interviewees also identified several of these basics as general hurdles to growth irrespective of the capacity building programme on business skills under the project and, hence, did not show much confidence in small retailers. About 66% respondents do not have their enterprise registered under MSME or GST and the remaining 33% have registered their enterprise under either MSME or GST. Also, about 77% respondents expressed that the trader/retailer meet organised by CARE India was very fruitful and encouraging as they find it a good opportunity for the enhancement of the business.

Managing the value chain

Most of the retailers procure the ICS either from distributors or from manufactures for selling it to the households directly or sell through the sub retailers. Initially, the distributors/manufacturers used to offer the ICS in credits and retailers in turn to sub retailers and households. Many of the retailers failed to honour the repayment schedule and/or defaulted on it because their sub retailers, did so which was further linked to non-payment or deferred payment by households. Thus, the value chain that was established through the projects failed to create a sustainable value chain due to non-payments and default associated with it. This has been also been experimented through direct linkage with manufactures but default and delayed payment is one of the critical challenges in this business ecosystem.

Access to finance

The small retail businesses are an essential component for instilling the growth of ICS market. But many of such small retailers need more assets to seize business opportunities whereas it was found that their overall access to finance through banks and other finance providers seems to be limited. Among the various financing options available, 55% of respondents mentioned that they have managed their own finance and the remaining 45% opted for loan/credit option. Overall, access to available finance, generally, seems to be a real problem for small retailers. It appeared that most retailers and sub retailers seem to struggle to access finance. There was a common thought among interviewees that the prospects from finance from the bank is limited, since retailers don't have much-proven track record, which is a hurdle to access available finance. Overall, funding support from the government or other sources can play an important role in scaling up ICS adoption. Retail business owners also expressed that if a governmental support similar to Ujjwala scheme can be considered for ICS ecosystem, it will have a much larger impact then Ujjwala scheme.

- Till date such type of business financing are yet to commence as the bankers (Private and Government) have not received any such proposal (discussed with Axis and SBI bank). However some MFIs like Cash Pro Micro Credit at Jashpur block in Chhattisgarh, Arohamand Binod Bag microfinance in Kalahandi district are not interested to finance in ICS enterprises, retailer and distributor programmes. Whereas Chhattisgarh Renewable Energy Development Agency (CREDA) and Odisha Renewable Energy Development Agency (OREDA) is interested to discuss the opportunities which are scalable and sustainable.

Number of new ICS VC actors (ICS Manufacturers, suppliers/ distributor, financiers) operating in project districts by the end of the project:

The study found following ICS brands available at the community level – Agneeka, Agneeka Premium, Sarala, Vijaya, Dutta, Vikram and Sikha. However, aside from business ventures of Mr. Padama Behera, Khusboo and Mr. Jayram Samantray enterprises, there are no other successful distributors or retailers or manufacturer operating in the project area. Others are not interested in owing to the lack of technical expertise and financial linkages that are required for ICS manufacturing. As there is no other official patronage in terms of skill development particularly for ICS manufacturing, new manufacturers are not coming forward. It is reported that the forest department also promoted ICSs at Lanjigada and Bhawanipatna in Kalahandi district. Alma Lakda, Santi Bai from Jaspur, understood the programme benefits and requested CARE India for further extension and focusing more on livelihood-based entrepreneurship programme.

Khusboo Enterprise-the ICS enterprises
Mr. Padama Behera is the owner of M/s Khushboo Enterprise (KE) who has been in the ICS business for the last 4 years and has successfully sold almost 4000 improved cook stoves out of which 2500 through Care India channel and its own network selling and rest was govt order in bulk. He has been trained under the project by Care India for development of business enterprise and strategy. His initial business model was based on taking the ICS on credit from distributors and supplying the ICS to sub-retailer and household on agreed installment repayments options. KE used to take the ICS from distributors on credits. Many times, the households failed to honor the repayments on time or defaulted on it, which further translated to the absence or delayed payment of installment by the sub retailer to retailers and subsequently from retailer to distributors. This has resulted in breaking down of the value chain, and the distributor has stopped supplying the ICS on credits to retailers. Further, Care India brought in a few manufacturers who took the risk and supplied the material against partial payment and on credits. This model also failed to take up because of default in an installment payment. Many of the retailers didn't able to sustain the disruption associated with non-payments and deferred payment of their dues by households and barrier in access to finance. However, KE has sustained the journey, it gradually reduces its exposure on passing on credit to households. The success of his business model is his persuasion on continuing the business irrespective of numerous challenges. In addition, KE is mostly focusing on an ICS named

"Agneekaa" which has wider acceptability among the households due to its attractive design, strong and durability, low smoke emission due to use of scientific principles and latest technology in development and less cooking time due to the properly guided flame.

Interviews with CREDA

In recent five years, the government has emphasized and promoted Ujjwala scheme, which diluted their attention on ICS and thus, government support has been a missing element in creation of a successful and sustainable business ecosystem. To understand the business case for ICS, it is necessary to have support from government and other institutions particularly state nodal agencies.
Considering the same, an interaction was planned with Mr. Sanjiv Jain, Chief Engineer, CREDA on his perspective on ICS programme and future pathways on these directions. The key points which emerged from his interview are:

- CREDA has not been directly involved in any of the ICS programmes in the recent past. The Forest department has taken up some plans for distribution of ICS three years ago.
- The price of the ICS is an entry barrier for many households as it is around 1200-2000 INR. If the ICS price can be reduced, then the household will be happy to adopt the cook stoves. It is not advisable to give the cook stove at free of cost but to charge a fee for cook stoves around INR 400 -500.
- the cook stove can be sold at a rate of INR 400 -500 and can be provided through monthly instalment arrangements.
- CREDA is willing to extend its support to ICS entrepreneurs to invest in carbon finance

CHAPTER – 6 CONCLUSION & RECOMMENDATIONS

The following positive lessons learned reflect on the key strengths and achievements of SWITCH ASIA-II – Bachat Programme (SWABP):

- The concept of 'SHE Champions' enabled strong local voices in terms of communicating ICS's usefulness by way of health benefits and reducing pressure on forest, drudgery. This may be an effective strategy in creating user level impact as centrally driven 'campaigns'
- Through SWABP, the vulnerable community in forest has achieved a local platform to discuss Purchase of ICS cook stove (SHE School) that did not exist before 2016 in remote areas, with potential ability to coordinate women and child health and healthy cooking.
- SWABP has created a central pool for mobilization of retailer meet of ICS cook stove from diverse sources, dedicated to clean cooking from international and local public, private and other non-government partners at one place.
- Convening and bringing the sector together has enabled a more holistic approach at regional, national and international level. In both the states surveyed, SWABP has improved stakeholder convergence and coordination.
- Building a bridge between international development and national concerns is a key role fulfilled by the Alliance to promote ICS programme. The Alliance have created linkages from state and National emission reduction findings, technology adoption at remote areas and implementation experience with rural entrepreneurs and markets.
- SWABP's contributions to national capacity building in focus countries, with prospects of establishing sustainable institutional structures, are key sustainability factors but they also require intensive efforts.
- Funding and initiation of solid research at several levels has established an evidence base linking clean cooking and health, environment, gender and climate change. Empirical support for the relationships between clean cook stoves and fuels, and social impacts are emerging.
- The integration of access to clean cooking in humanitarian processes appears to have achieved results. The programme filled a gap where the remote sector had already recognized the importance of ensuring sustainable energy for cooking in remote areas settings, but were missing the capacity, knowledge, and solutions.
- SWABP role as champion of the international norms and standards process can contribute to transparency, reduce ambiguousness, support market sustainability and protect consumers while testing different cook stoves at their doorsteps. Bigger household and Joint family (more than 10 members), need also be given emphasis in future association.
- The networks of MFIs, Retailers, Distributors, and local representatives (PRIs) appear strong and can create trust and open doors to local ICS entrepreneurs. Building on this experience to map out the future efforts to ensure development other states or countries while maintaining leanness and efficiency will be a key challenge going forward.

On the flip side, despite good efforts, and intentions, the international community is not on track to achieve universal access to clean cooking solutions by 2030. While the issue is large and complex, CARE India may consider the following 'lessons learned' to guide its future strategy and approaches:

- The inclusion of clean cooking in both international agenda and national policies, has not translated into actual funding. The investment level is still insignificant, compared to the amounts allocated to other domains such as electrification, and thus resources fall far short of the needs in the sector.
- There is no consensus on approaches and solutions, despite an evident effect on 'convening the sector' and 'increasing international attention to the problem'. Consultant's agnostic view on technologies/fuels risks compromising the confidence of some fewer agnostic stakeholders, and the definition of 'what is clean enough' is still subject to controversy.

- SWABP has not had enough focus on the fuel side. To achieve significant impact on reduced deforestation, development of alternative fuels to reduce wood resource outtake is necessary.
- The impact level monitoring in the programme has been weak as it focused on number of cook stoves distributed. But other significant factors were missed out. Actual adaptation and the resulting impact on areas such as health, deforestation and emissions through use of clean solutions must be proven with scientific data.
- The starting points and the speed at which change happens vary substantially between districts. In theory, the programme's thematic approach is rational, but it is difficult to see how it can be followed across the board, as the level of development varies greatly from region to region particularly for forest areas. Also, the state government is also introducing parallel programme such as if one household plants six trees, they will get ICS. One can see the adoption rate and results of forest department programmes too.
- Achievements in one region do not automatically catalyse development in other regions. While the actors and activities have made meaningful contributions in Kandhamal and Kalahandi where they have worked intensively, equal intensive effort is not possible in all regions that need to address the cooking energy challenge. How scale and more regions can be reached efficiently is a key strategic challenge.
- Developing a "commercially vibrant" cook stove sector is a bigger challenge than foreseen in SWABP's five-year strategy. Due to Ujjala programme or other schemes, except a few, relatively non-mature markets with no reasonable enterprise presence which may be ready to move to Phase III, most regions still lag behind.
- Donor and impact investors have other priorities and approaches than commercial enterprises. To attract impact investor and donor capital, an enterprise must emphasise social outcomes, compared to focusing on what is most commercially compelling. This may compromise the effectiveness of funds to support business development.
- Markets have proven very difficult to penetrate with profitable business models in remote areas. Improved market intelligence and transparency, lower costs to reach consumers, production at scale, and consumer finance are all needed for markets to be attractive and profitable.
- Thus, while the different attractive channeled by SWITCH Asia have introduced such as early adopters' schemes, cook stoves plus solar lights much-needed capital. In other side, no companies can have such activities in their programme and cross the threshold of adoption to attract substantial external investment. It clearly evident that significant additional funding would be needed to decisively create a cook stove entrepreneur class even in the immature rural markets.
- Private sector and commercial challenges are not unique to the cook stove sector; fundamentally weak investment frameworks and risky business environments in many mes add to the complexity so as SWABP.
- In a market perspective and commercial orientation, clean cooking in rural settings creates particular challenges. It has been necessary to deviate somewhat from the principles of commerciality in this area. It is nevertheless an important area and CARE support the efforts going into this area. CARE also commends the introduction of principles that are inspired by the market orientation but adjusted to the reality of vulnerable and rural settings.
- Effective user-level communication and promotion of behavioural change needs local voices. One-off campaigns have not been sufficiently followed by product availability and repeated messages. Recommendations: The following overall recommendations have two purposes: to provide guidance to state government agencies or private partners with regard to the final period of the support and/or possible future support; but also to provide input to Switch Asia's current strategic review process.
- CARE India continued support to SWABP until 2020 (Phase III can be introduced) is justified. A global, cross sector convener of efforts for universal access to clean cooking solutions is still necessary and CARE, India is well placed to take that role. CARE, India has a high potential to promote dynamic and catalytic processes for change and strengthening the links between the national and the global level.

- CARE India should define its future strategy carefully with clearly pronounced priorities. CARE India can still take a broad, "agnostic" approach and aim at encompassing all actors but send clear and credible messages as to what works and what does not. In particular, the future strategy ought to focus on scale and replicability with available resources to ensure progress regionally not limited to focus markets.
- Rethinking role and work allocation also imply consideration of the strength of local retailer and distributors. CARE India can scale efforts and improve effectiveness by close coordination and alignment with large players. The use of grant funds, implementation of behavioural change campaigns etc. are examples of activities that other specialised partners might handle equally well.
- The listed lessons learned related to catalysing business viability and investments are valuable experience to build strategies and tactics in the coming Phases if possible. CARE India needs to tune in to the reality of a private business operation – and their interests, boldly targeting enterprises with the highest chance of scaling and replicability, avoiding using scarce resources on low-impact models and companies.
- Scalability versus use of resources and size of entrepreneurs should also be considered. The approach to integrate clean cooking in educational curricula, as tested in Odisha and Chhattisgarh, could prove to be an effective and efficient way to communicate the importance of clean cooking solutions to local communities. This illustrates a scalable effort that requires political will that Global Alliance can help mobilize.
- There is a need for a clear framework that should be consistent over time and differentiates advances and attribution on project level as well tracks sector-wide progress. Ideally, the CARE India, M&E framework in next phase, should create evidence of the impact that transition to clean cooking has on livelihoods programmes too. A standardized form of reporting must be able to reflect individual differences, particularly the divide between entrepreneurs vs. the existing mature enterprises.

The key priority areas that can be targeted and adopted in SWABP – next phase programme is to catalyze the large-scale adoption of stoves include more customer sensitization, technical/industrial support, multi-stakeholder collaboration and actors, enabling policy environment, and innovative funding mechanisms. However, local capabilities and contexts are equally important, so with or without forest dependent villages need to be carefully considered when developing relevant policies and interventions for ICS promotions. The programme has shown way of creating many layers of potentially successful adopters, which needs to capitalize by tailoring multi-prong strategies of scaling up mechanisms with key stakeholders and policy-makers.

LIST OF REFERENCES

1. CARE_SA Final Narrative Report
2. SWITCH ICS Interim Narrative report
3. Product details document
4. User Guide for ICS financial Product

ANNEXURES

Annexure – I List of acronyms

CO – Carbon monoxide

CO_2 - Carbon dioxide

$PM_{2.5}$ - Particulate matter

CREDA – Chhattisgarh Renewable Energy Development Agency

FDH – Forest Dependent Household

GTC – Gender Transformative Change

HAP – Household Air Pollution

HH - Household

ICS – Improved Cook Stove

IEC – Information Education Communication

IIT-D – Indian Institute of Technology - Delhi

MFI – Micro-Finance Institution

MLO – Monitoring and Learning Officer

MNRE – Ministry of New and Renewable Energy

NGO – Non-Government Organization

OREDA – Odisha Renewable Energy Development Agency

PM – Particulate Matter

SC – Scheduled Caste

ST – Scheduled Tribe

SHE – Sustainable Household Energy

SHG – Self Help Group

TIDE – Technology Informatics Design Endeavor

VC – Value Chain

NCE- No-Cost-Extension

Annexure – II Survey questionnaire

PRI Questionnaire

Strengths

- (S1) Less wood: less time spent collecting wood and/or less money buying wood.
- (S2) Smokeless cooking: the health of women and those around the kitchen is no longer affected by smoke.
- (S3) Beautiful kitchen: the cook stove dignifies the house and the kitchen ceiling and walls are left free of black soot.
- (S4) Forest and emissions reduces forest logging and decreases carbon dioxide emissions.
- (S5) Faster cooking: it cooks faster, and less time is spent cleaning the kitchen.
- (s6) SHE School Session – is its good platform for participating learning and experimenting ICS (Improved cook stoves)?
- (S7) SHG members and ICS Manufactures – Any learning?
- (S8) Men- Women Energy Interface – How the problem has understood; and solves the household cooking issues, health, smoke?
- (S9) Changes in Attitude – Conducting Men & Women Energy interfaces – What has been addressed?
- (S10) Recognitions and Awards to Early adopters – What have they received?
- (S11) Engaging with Men and Other value chain actors (Retailer, Supplier etc.) to promote ICS in the village

Weaknesses

- (W1) Wood preparation: the user must do extra work to obtain thin and dry pieces of wood.
- (W2) Maintenance: unlike traditional cook stoves, it requires weekly cleaning.
- (W3) Unable to broil meat: it is not possible to broil meat directly on the coals.
- (W4) Not portable: if people move, they cannot take it with them, and it must be built on site.
- (W5) Hard to switch on: a different method is used to light it up and some people do not learn how to do it properly.

Opportunities

- (O1) Untapped market: the product has very high acceptance in a barely touched market.
- (O2) Financial resources: international and local support to health and the environment is robust and might grow in the future.
- (O3) Strong management: there is a powerful and scalable management model that ensures product quality.
- (O4) Simple application process: the paperwork is minimal, and the cost of the product is subsidized.
- (05) Experience on Buyer seller meets to buy cook stove
- (O6) Supporting Financing mechanism, introducing government schemes, Provisioning in Self-help financing
-

Threats

- (T1) New competitors: a competitor takes advantage of the success and takes the market or damages the reputation of the cook stove.
- (T2) Money stops flowing: the financial resources stop and the cost to the user quadruples.

- (T3) Long waiting time: too much demand raises the wait time to years, and this discourages the market.
- (T4) Cheaper fuels: the price or convenience of other fuels reduces the market for cook stoves.
- (T5) Incompatible cooking habits: some cooking habits are incompatible with cook stoves.

Bank and Financial Institutions

Name
Bank Name
Address
Position in Bank/ Financial Institutions:
Q1 Have you heard about the SWITCH – Asia, CARE programme?
Q2 Have you participated any event in last five years?
Q3. Have you provided finance for retailer, producer or SHG to promote ICS programme in the SWITCH Programme village or others?
Q4, if yes, how much finance have been given in last five years? And how many people got benefited?
Q5. What are the interest rates charged from them? Is it varying with location or remote areas?
Q6 Have you faced any challenges in repayment of interest or closing of loans? If yes, how did you resolved it?
Q6. If you don't promote Improve cook stove programme through financing, why not?
Q7. What suggestions, would you like to give for small sizes loan which can support additional livelihood in remote areas?
Q8. Have you heard about pay-as-you –go models (PAYGO) for consumers live in remote areas? If yes, where? If no, would you like to promote?
[pay-as-you-go models (PAYGO) among consumers in remote areas, as well as to support access to microfinance for clean cooking options]
Q9. Have you heard from Carbon finance and business model for Improved cook stoves? If yes, have you practiced in any part of study area or somewhere else? If no, would you like to introduce in your study areas?
Q 10. Do you have any suggestion to promote similar programme like SWITCH – Asia?

Annexure – III Graphical representation of data findings

Figure 1 Awareness of Women on different types of Stoves in Kalahandi district (Odisha)

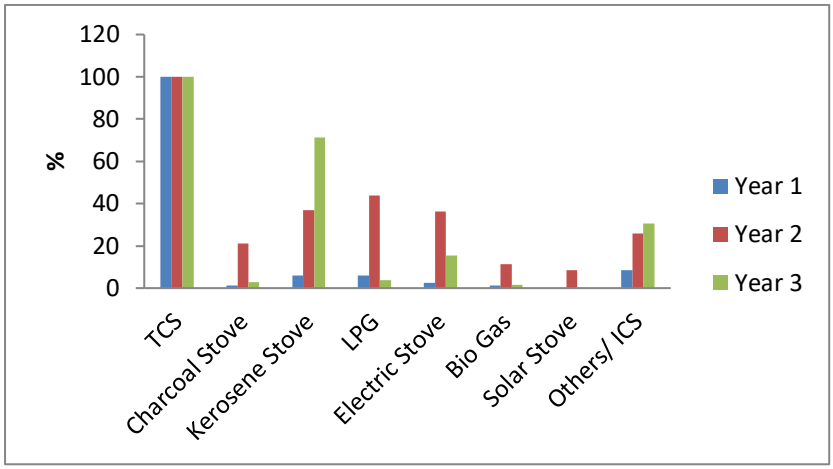


Figure 2 Awareness of Women on different types of stoves in Kandhamal district

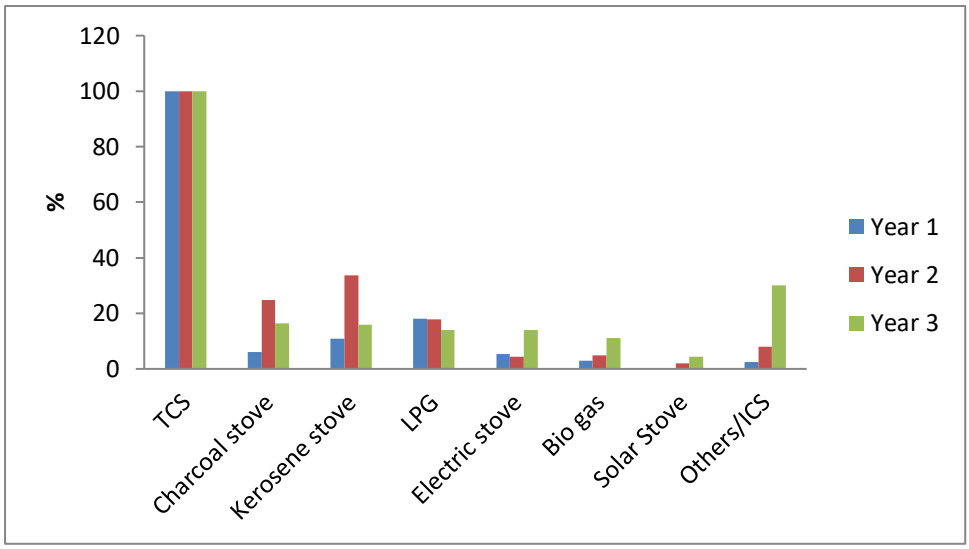


Figure 3 Inter-districts comparison on the women's knowledge of different types of stoves (States and district wise)

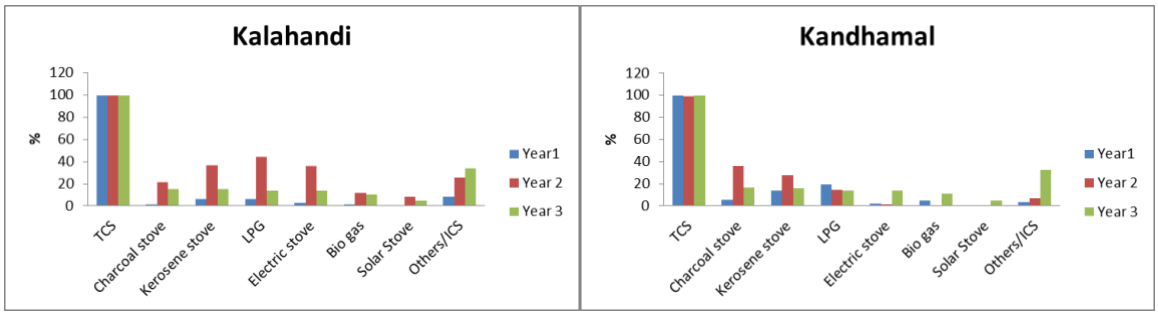


Figure 4 Evolution of respondents declaring they have heard about ICS (district and gender wise)

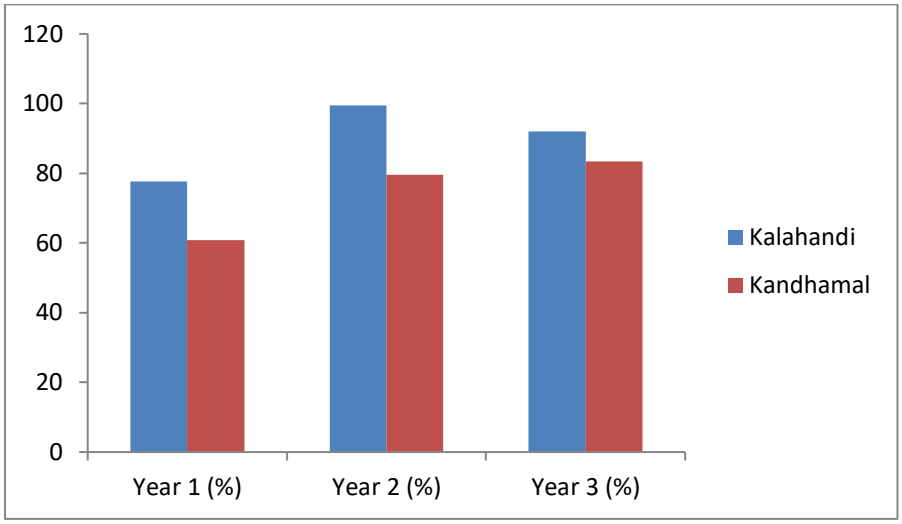


Figure 5 Inter-districts comparison on the women's knowledge of different types of stoves (States and district wise)

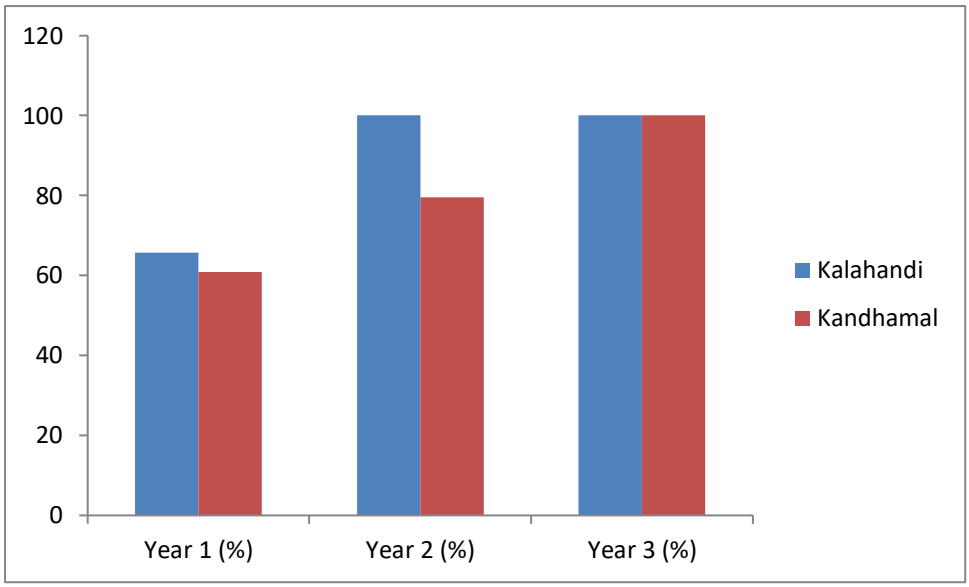


Figure 6 Women's knowledge on fuel characteristics requirements for proper ICS functioning

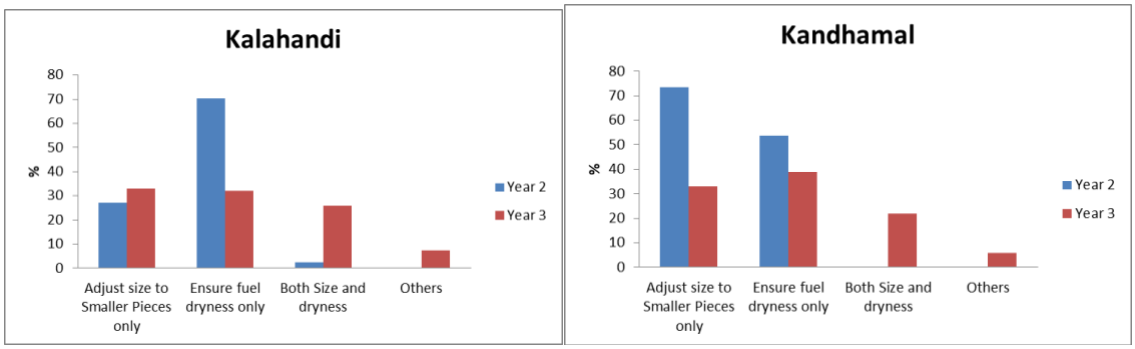
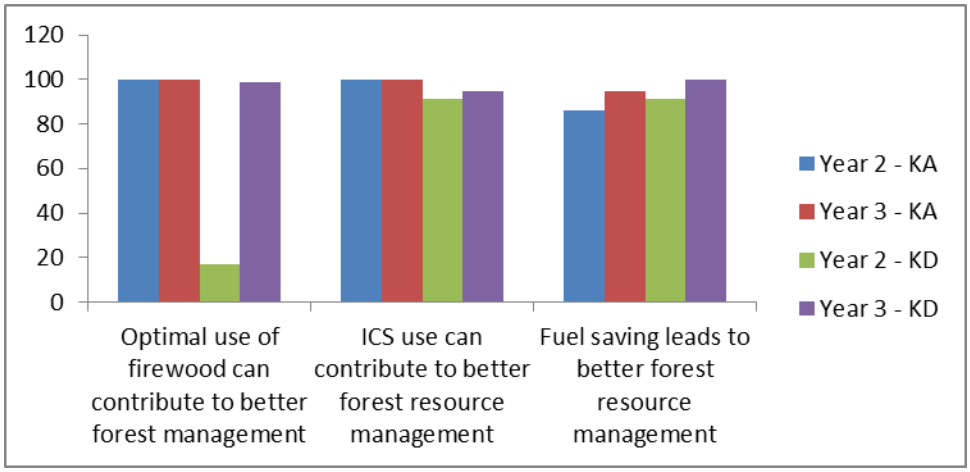


Figure 7 Women's knowledge on relation between fuel, ICS and better forest resource management



KA – Kalahandi, KD – Kandhamal

Figure 8 Women's knowledge on methods to optimize fuel use while cooking

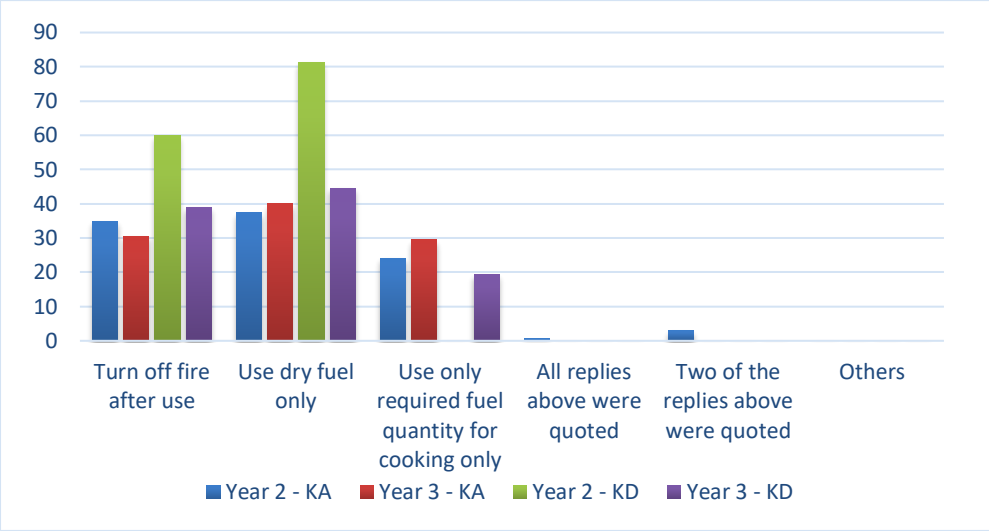


Figure 9 Evolution of issues stated as related to smoke (district wise)

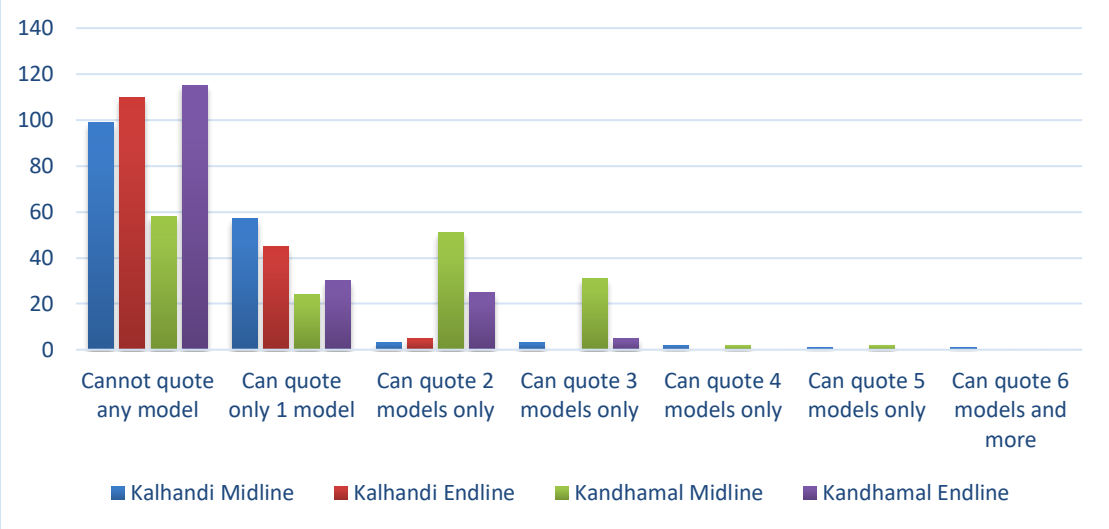


Figure 10 Evolution of women's knowledge on ICS value chain actors (District-wise)

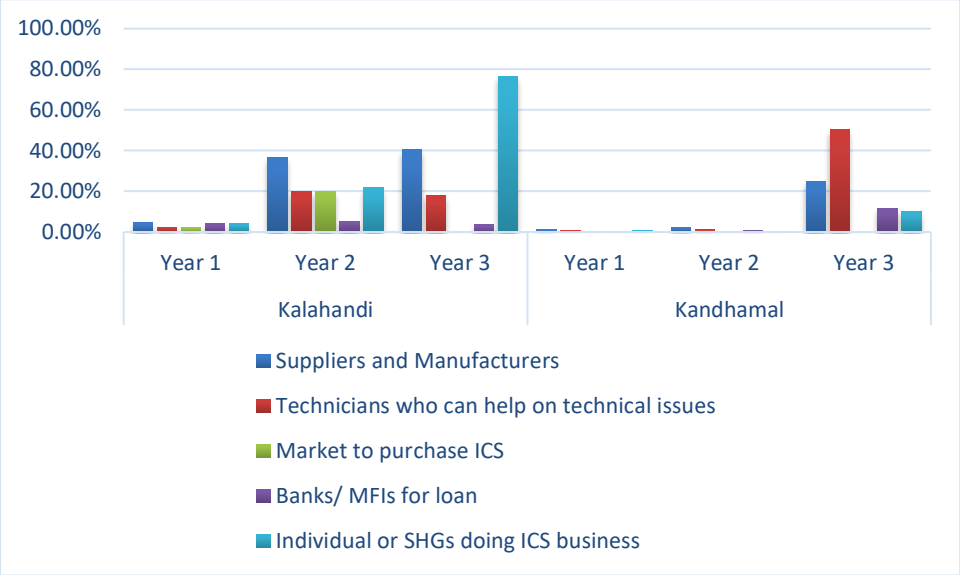


Figure 11 Women's confidence in discussing household energy information vs. Bachat project's profile (Baseline Vs. Endline)

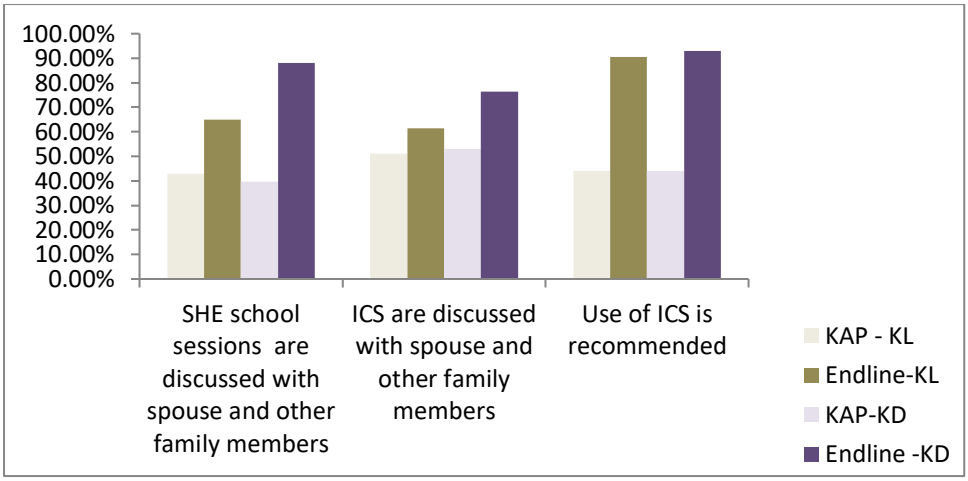


Figure 12 Evolution of men and women's interest in ICS (District-wise)

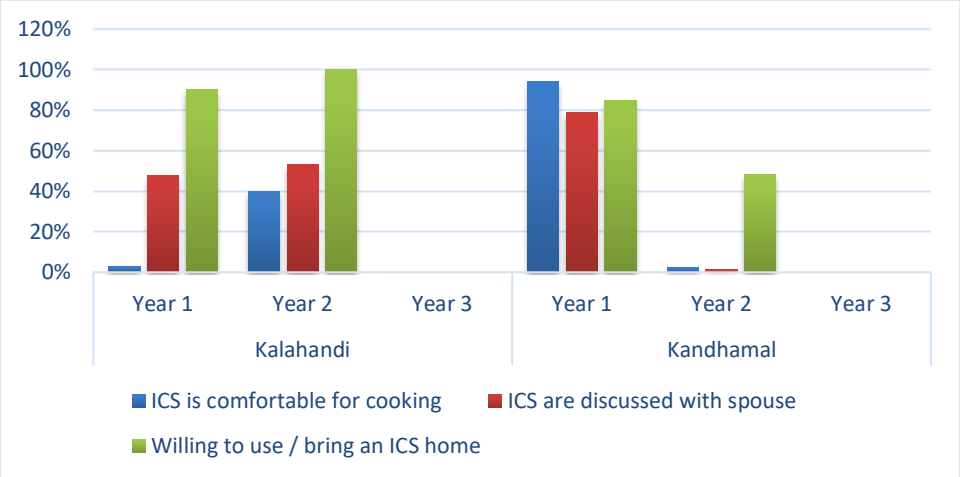


Figure 13 District-wise Comparison of Women acquiring and using ICS at home

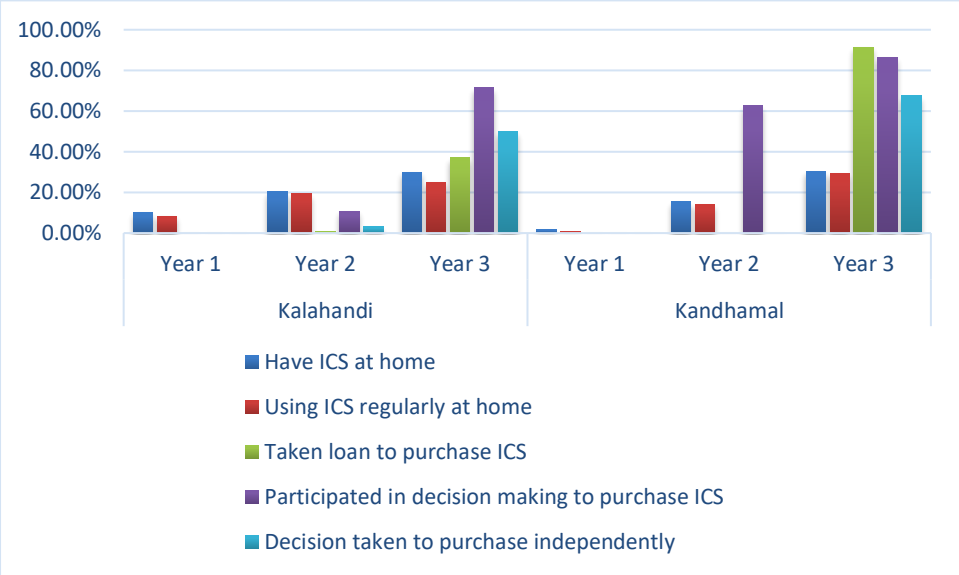


Figure 14 Awareness of Women on different types of Stoves in Kalahandi district (Odisha)

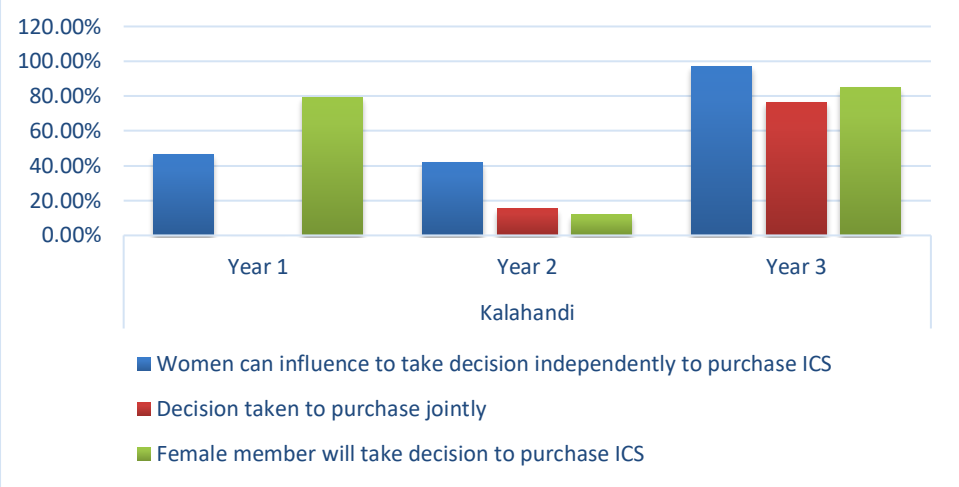


Figure15 Evolution of women's agency with Value Chain Actors (district-wise)

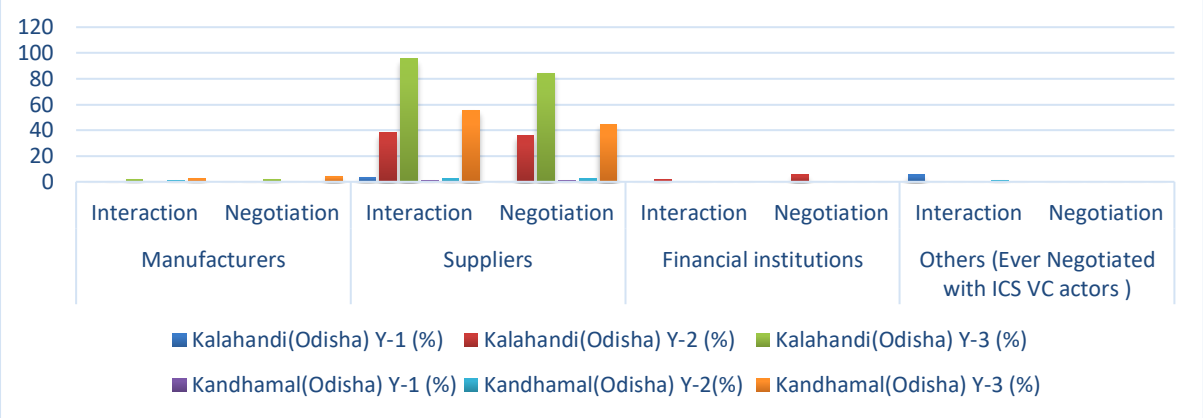


Figure 16 Evolution of nature of negotiation with VC actors (District-wise)

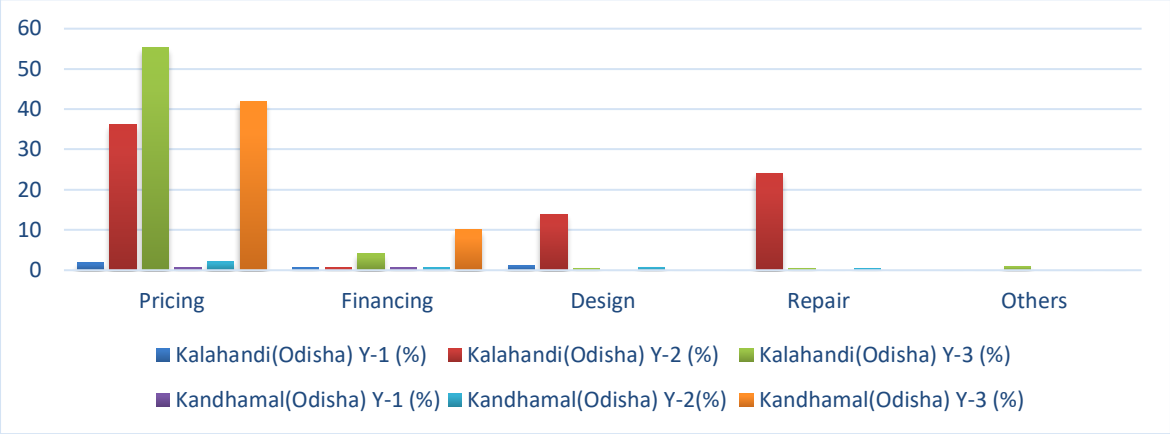


Figure 17 Women's willingness to take ICS business vs. Bachat project involvement status (District-wise)

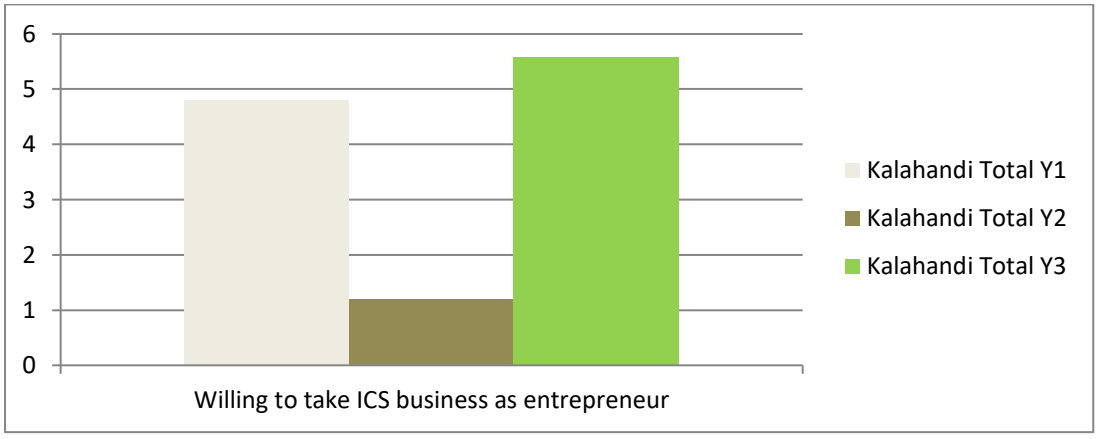


Figure 18 Evolution of ICS use vs. Bachat project involvement status

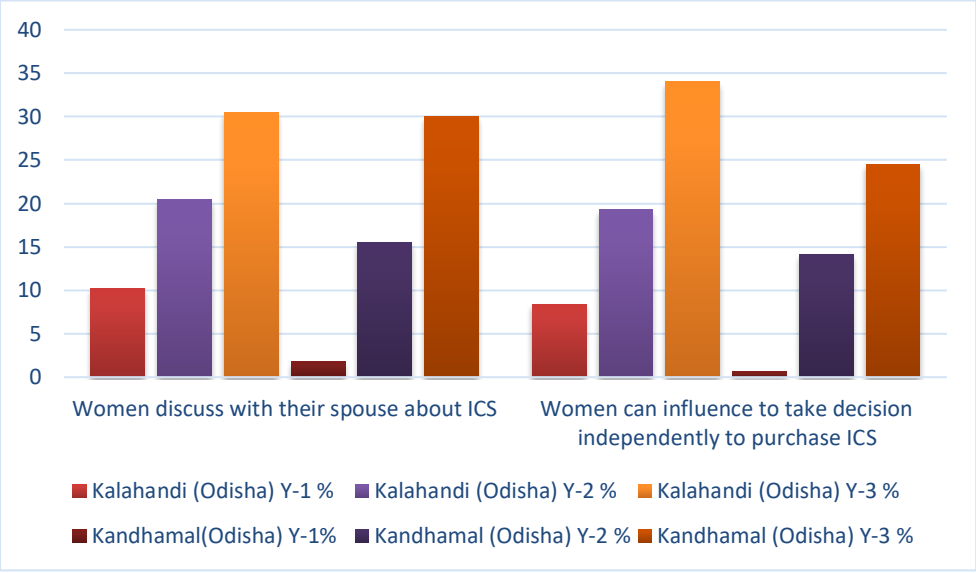


Figure 19 Women's participation in SHE school sessions/activities

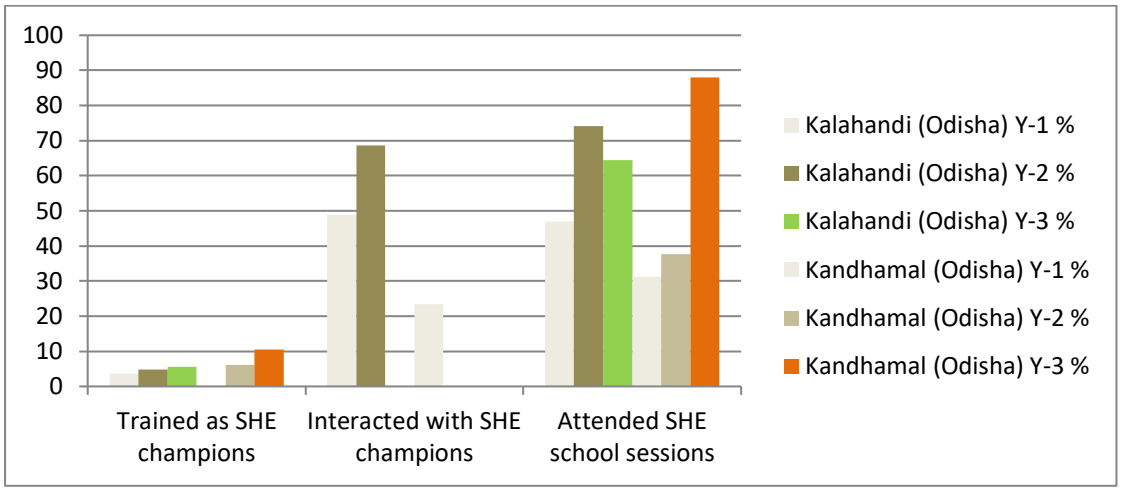


Figure 20 Women's influence on household cooking decision vs. Bachat project involvement status (District wise)

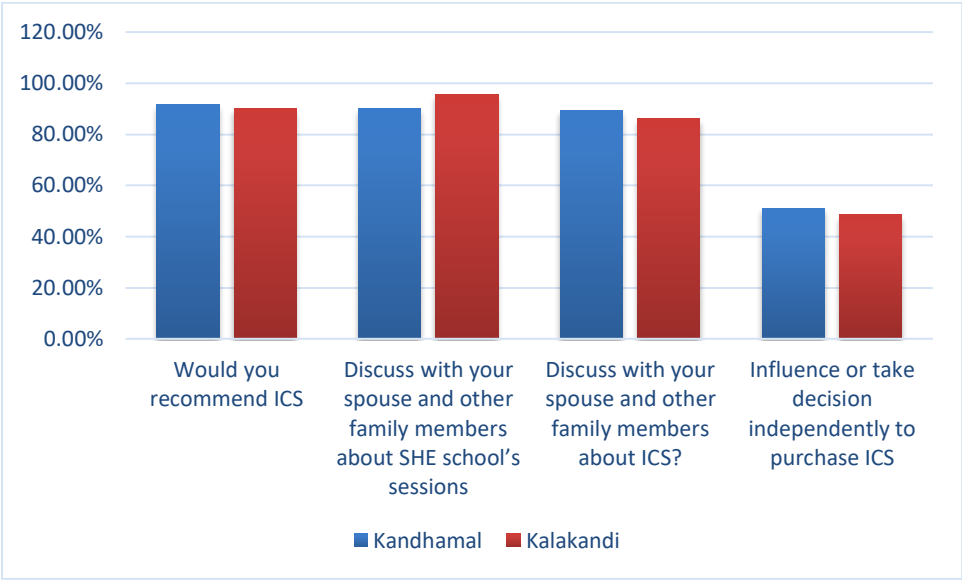


Figure 21 Willingness to use ICS

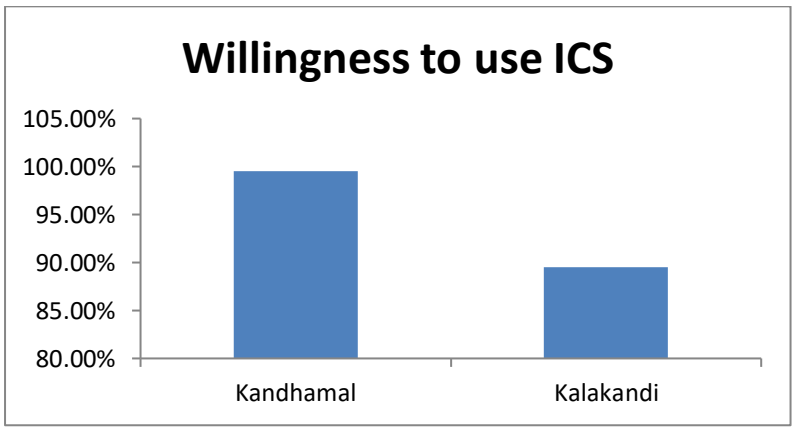


Figure 22 Affordability of ICS at individual level

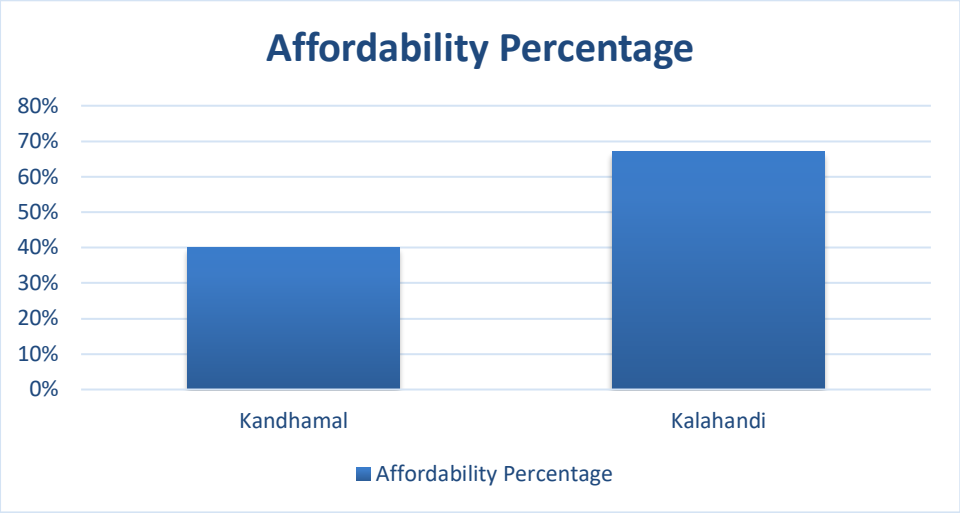


Figure 23 Percentage of recommendation of ICS to Others

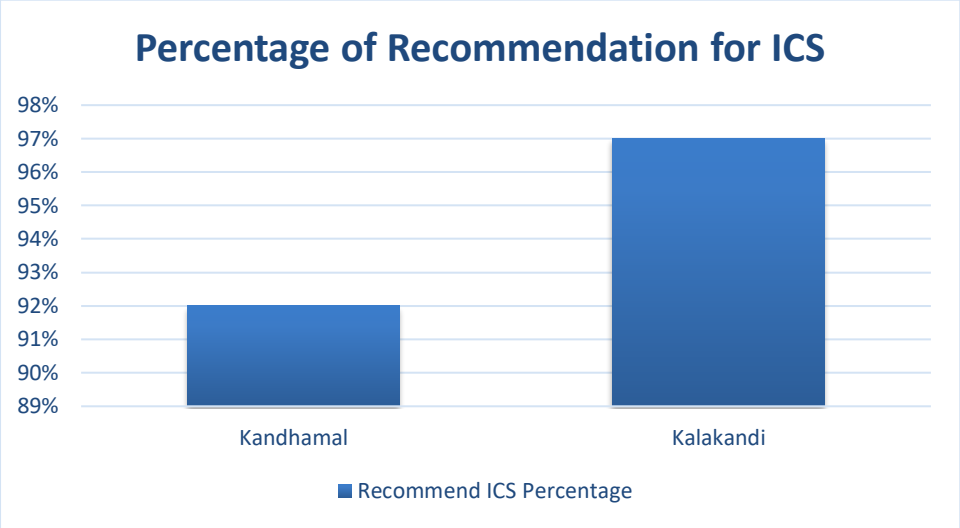


Figure 24 Care Programme knowledge gain by the respondents from different sources

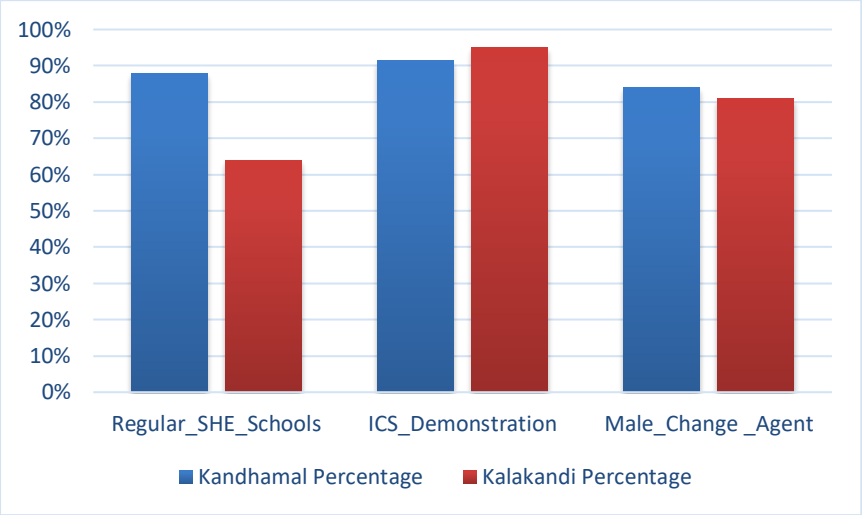


Figure 25 Respondents negotiated with ICS VC actors to buy ICS

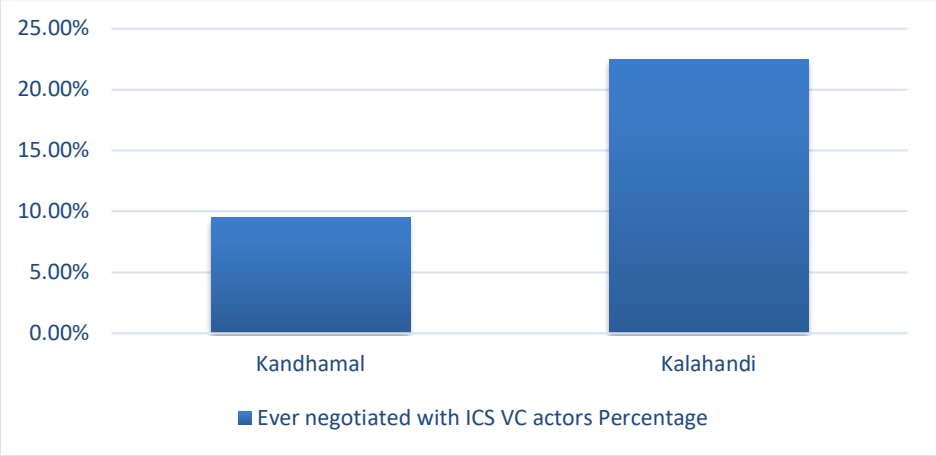


Figure 26 Awareness of Women on different types of stoves during endline assessment

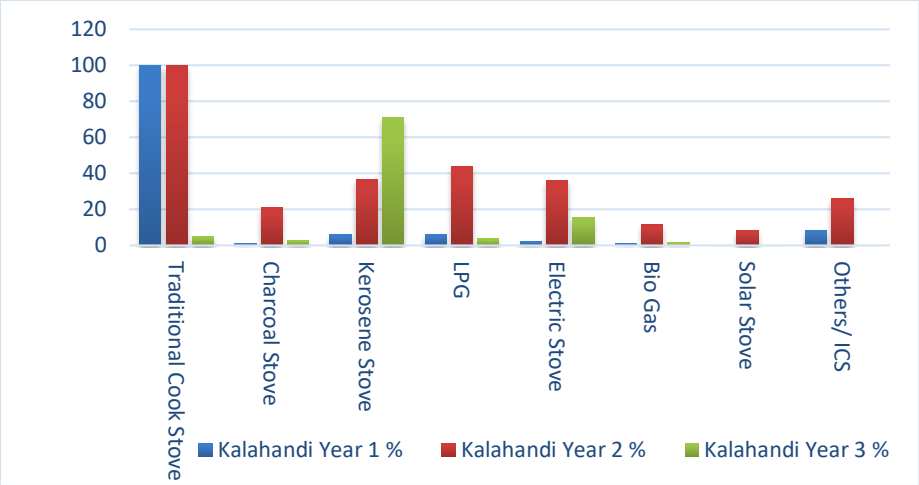


Figure 27 Evolution of women and men's knowledge on different types of stove

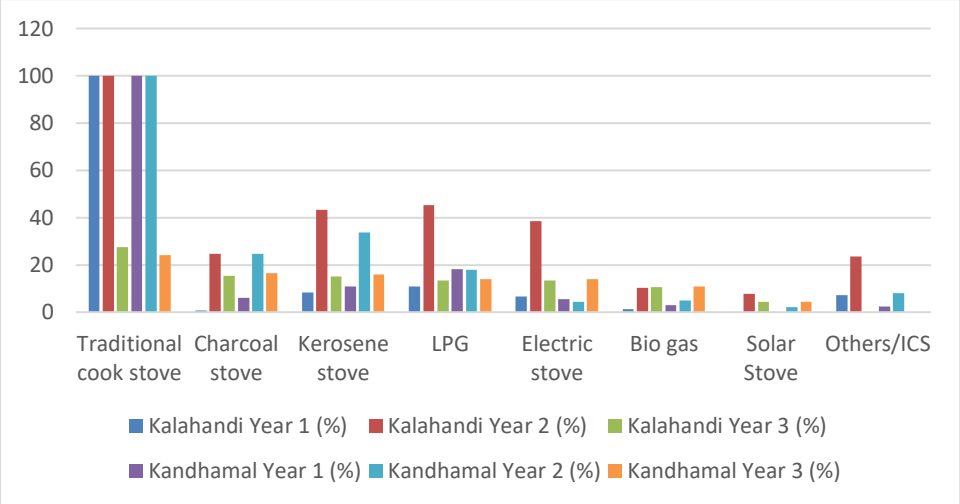


Figure 28 Women's knowledge on fuel characteristics requirements for proper ICS functioning

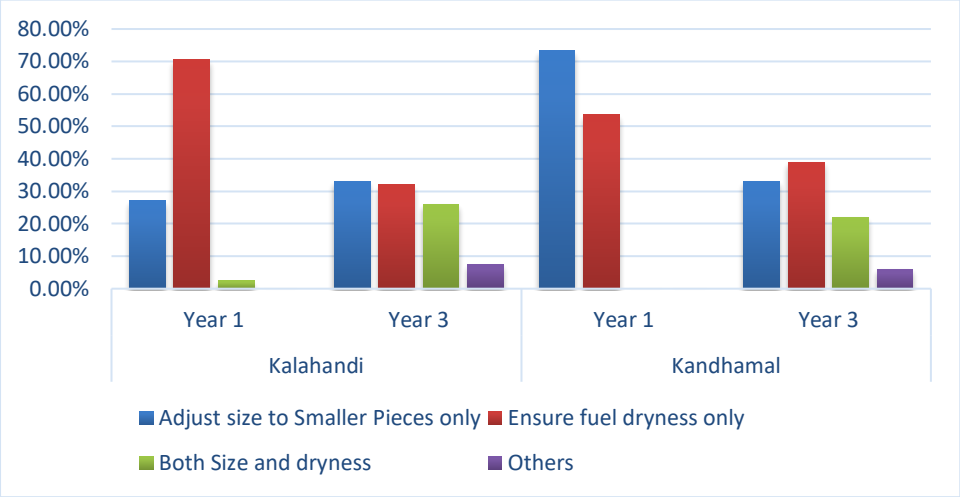


Figure 29 3Women's knowledge on forest resource management and fuel saving

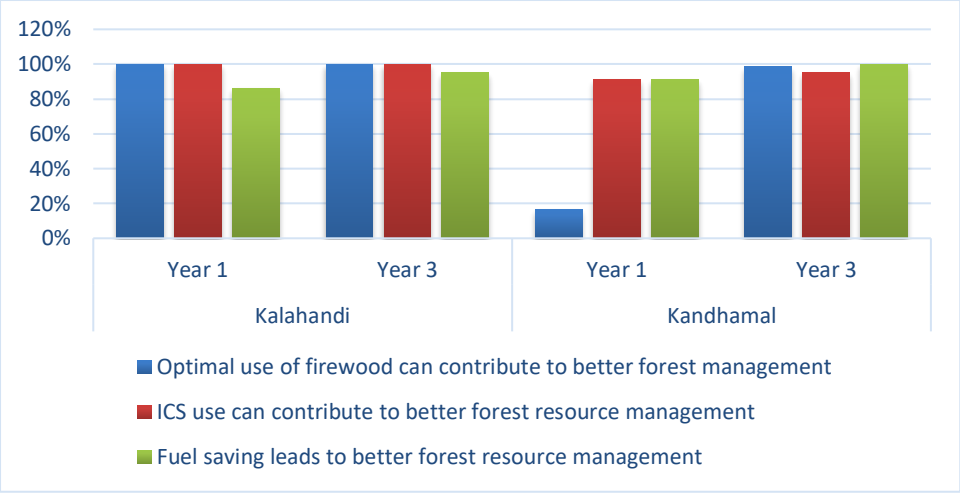


Figure 30 Women's knowledge on methods to optimize fuel use while cooking

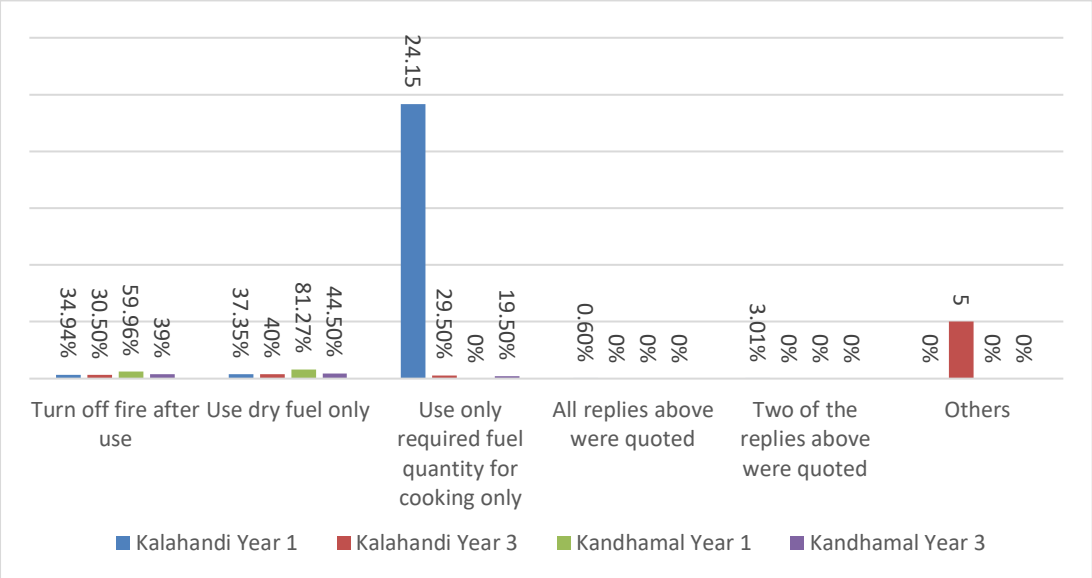


Figure 31 Women's participation in SHE school sessions/activities

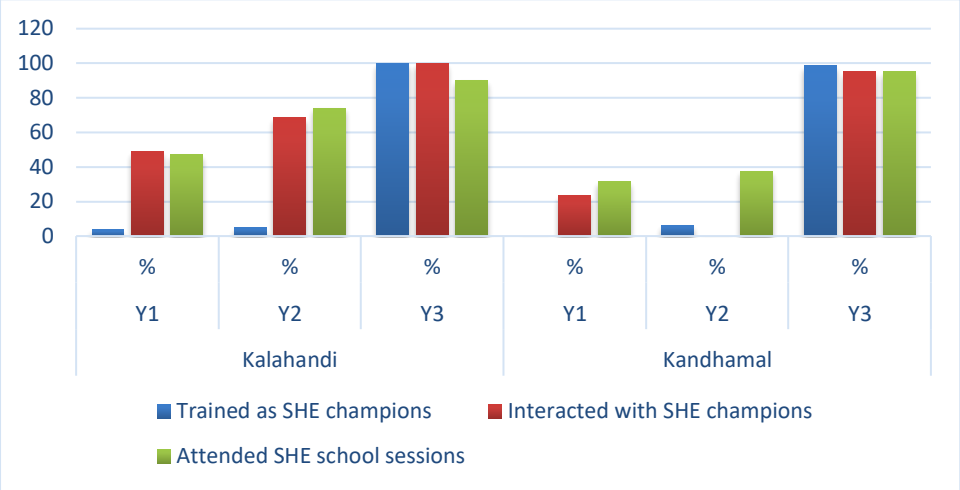


Figure 32 Evolution of women's agency with value chain actors

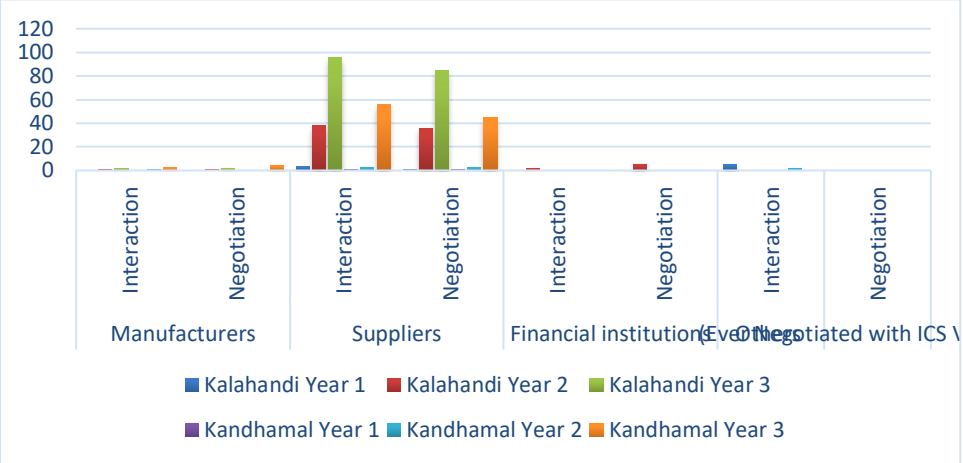


Figure 33 Evolution of nature of negotiation with value chain actors

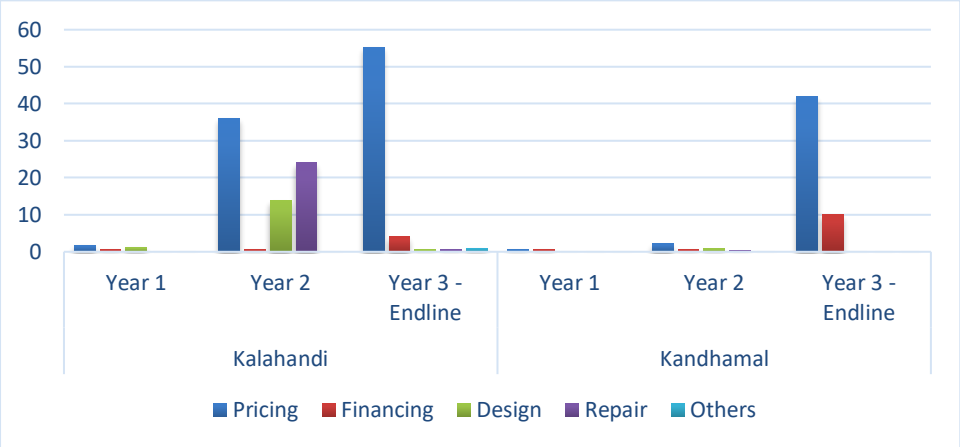
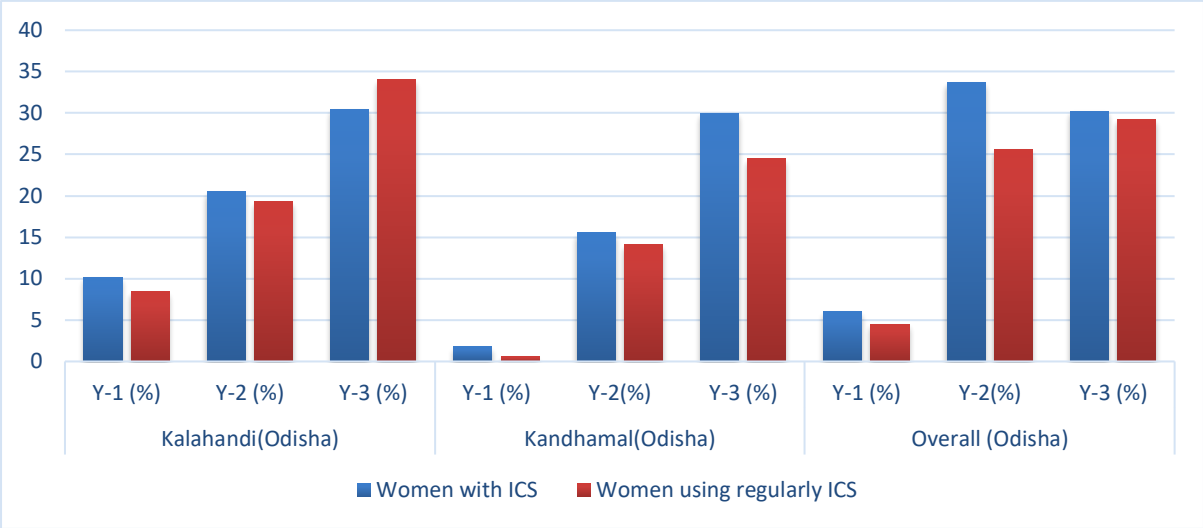


Figure 34 Evolution of nature of negotiation with value chain actors



ANNEXURE – IV Additional data tables

Proportion of households on the basis of no. of times of cooking in summer					
Districts	No of times cook in summer season	Baseline		Endline	
		No of HH	%	No of HH	%
Kalahandi	1	6	3.5	50	25.0
	2	91	53.2	59	29.5
	3	73	42.7	85	42.5
	4	1	0.6	2	1.0
		0	0	4	2.0
	Total	**171**	100	**200**	100
Kandhamal	1	2	0.4	1	0.5
	2	488	96.8	198	99.0
	3	14	2.8	1	0.5
	Total	**504**	100	**200**	100
	Grand Total	**842**		**400**	

Seasonality behaviour for average hours spent for cooking		
	Baseline	Endline
District	How many hours you spend in cooking every day	How many hours you spend in cooking every day
	Mean no of hours/day	Mean no of hours/day
Kalahandi	4.2	3.9
Kandhamal	3.5	2.9
All Districts	**3.4**	**3.4**

Fuel Use in Main Course Food Preparation			
Districts	Fuels	Baseline	Endline
		% of Households	% of households
Kalahandi	Wood-Log	100.0	96.0
	Wood shreds	0	4
	Agricultural Crop residues	0	0
	LPG	0	0
	Total	100.0	100.0
Kandhamal	Wood Log	89.0	72.0
	Wood shreds	10.4	13.0
	Electricity	0.6	0
	Agricultural Crop residues	0	0.5
	LPG	0	3.0
	Total	100	100

Fuel use in Breakfast Preparation			
Districts	**Type of Fuel**	**Baseline**	**Endline**
		% of Households	**% of Households**
Kalahandi	Wood Logs	94.5	52.0
	Wood shreds	5.5	30.5
	LPG		17.5
	Total	100	100
Kandhamal	Wood Logs	83.1	47.0
	Electric Heater	12.1	
	Wood Shreds		
	chopped wood	3.2	
	LPG	0.8	52.0
	Kerosine		0.5
	Electricity	0.8	
	Total	100	100

Activities	Kandhamal		Kalahandi	
	N	**%**	**N**	**%**
Would you recommend ICS	183	91.5	180	90.0
Discuss with your spouse and other family members about SHE school's sessions	180	90.0	191	95.5
Discuss with your spouse and other family members about ICS?	179	89.5	172	86.0
Influence or take decision independently to purchase ICS	102	51.0	97	48.5

District	**Ever negotiated with ICS VC-actors**	
	N	**%**
Kandhamal	19	9.5
Kalahandi	45	22.5

District	**Willingness to use ICS**	
	N	**%**
Kandhamal	199	99.5
Kalahandi	179	89.5

Affordability		
District	**N**	**%**
Kandhamal	72	40.0
Kalahandi	180	67.0

Practice		
Recommend ICS		
District	N	%
Kandhamal	183	92.0
Kalahandi	194	97.0

Willing to Use ICS		
District	N	%
Kandhamal	199	99.0
Kalahandi	178	89.0

CARE Programme Knowledge	Kandhamal		Kalahandi	
Activities	N	%	N	%
Regular_SHE_Schools	176	88.0	128	64.0
ICS_Demonstration	97	91.5	190	95.0
Male_Change _Agent	167	84.0	161	81.0

District	Recommend ICS to other		Not Recommend ICS to other		Total	
	N	%	N	%	N	%
Kandhamal	181	49.3	19	57.6	200	50.0
Kalahandi	186	50.7	14	42.4	200	50.0
Total	367	100	33	100	400	100

Compared to TCS, how much time is generally spent while cooking through ICS	Kandhamal		Kalahandi		Overall	
	N	%	N	%	N	%
Less	95	47.5	44	53.7	139	49.3
About the same time	105	52.5	17	20.7	122	43.3
More	0	0	1	1.2	1	0.4
Don't Know	0	0	20	24.4	20	7.1
Overall	200	100	82	100	282	100

Aware of ICS performance measurement protocol of MNRE	Kandhamal		Kalahandi		Overall	
	N	%	N	%	N	%
Aware of MNRE Protocol	0	0	18	9.3	18	8.4
Not Aware of MNRE protocol	20	100	176	90.7	196	91.6
Overall	20	100	194	100	214	100

Seen IS mark in you cookstove	Kandhamal		Kalahandi		Overall	
	N	%	N	%	N	%
Seen IS mark Cookstove	0	0	21	10.8	21	9.8
Not seen IS mark Cookstove	20	100	173	89.2	193	90.2
Overall	20	100	194	100	214	100

Activities (in percentage)	Excellent		Very good		Good		Not so Good		Poor	
	Ka	KL	Ka	KL	Ka	KL	Ka	KL	Ka	KL
SHE Schools	73.5	0	23	1.5	1.5	21.5	0.5	35.5	1.5	40.5
SHE school sessions	70	1	28.5	20.5	1.5	78	0	0.5	0	0
Training & mentoring SHE Champions and Bachat Sathi	9	36	56.5	59.5	29.5	4.5	5	0	0	0
Interactive session between SHG members and Manufacturers / Distributors	6	18	53	43.5	34	38.5	6	0	0	0
Cooking camps	8.5	0.5	51	23.5	33.5	75	7	1	0	0
Door to Door IEC Campaign	12	37.5	23.5	26.5	46.5	29	11.5	3.5	0	3.5
Awareness sessions in SHE Schools	18	30.5	42.5	36	32.5	31	7	0.5	0	0.5
SHE Field Days	4.5	5.5	39	38	47	32.5	9.5	24	0	0
Felicitate SHE School members emerging as SHE influencers	0.5	0	38	30	43	46	18	24	0.5	0
Facilitate Interactive session between SHE influencers and women	4	27	30.5	40.5	47	27	18.5	4.5	0	1
Sharing of user's experiences on ICS with manufacturers/ distributors	3	27	28	40.5	47.5	27	19.5	4.5	2	1
Meet of ICS VC Actors	2.5	33	28	14	43	30.5	23	13.5	0	9
Dialogue with frontline health workers	1.5	1	17.5	11	50	51	31	37	0	0
Discussion about ICS in normal meetings of health frontline workers (ASHA & AWW)	2	4.5	27.5	15.5	34	43	36.5	37	0	0
Promoting Male Change Agents and facilitate discussion/ dialogue with men in the village	2.5	18.5	27	32	37	23.5	29.5	11	0	15
interactive sessions between SHE School members and Men & ICS Value Chain Actors	2.5	36	43	59.5	34.5	4.5	20	0	0	0
Organise men women energy interface meeting	8	36	38.5	59.5	33.5	4.5	0	20	0	0
Conduct awareness sessions in men's collectives like - Farmers club, Youth club, Jati Samaj (Caste Society)	9	27	56.5	43	30.5	14.5	4	15.5	0	0
Discussion about ICS with PRIs/ Community leaders/ Teachers/ male leaders	9	36	56.5	59.5	29.5	4.5	5	0	0	0
Orientation of men on varied ICS models	9	20	56.5	42.5	29.5	18	5	15.5	0	0
Engage with Other Collectives like Vana Samrakshyan Samiti, Forest Protection Committee	2	1.5	40	22	40.5	36	17	40.5	0.5	0
Share information on ICS testing process	4	20.5	42.5	44.5	37	19.5	16.5	15.5	0	0
Use the platform of local festival to dialogue with men	1.5	27	22.5	47.5	39	15.5	37	10	0	0
Ka – Kandhamal, KL- Kalahandi										

Type of stoves	Kalahandi					
	Year 1		Year 2		Year 3	
	Frequency of "yes" response	%	Frequency of "yes" response	%	Frequency of "yes" response	%
Traditional Cook Stove	166	100	166	100	200	100
Charcoal Stove	2	1.2	35	21.1	4	2.9
Kerosene Stove	10	6.0	61	36.8	97	71.3
LPG	10	6.0	73	43.9	5	3.7
Electric Stove	4	2.4	60	36.1	21	15.4
Bio Gas	2	1.2	19	11.5	2	1.5
Solar Stove	0	0	14	8.4	0	0
Others/ ICS	14	8.4	43	25.9	0	0

Type of stove	Kalahandi			Kandhamal		
	Year 1 (%)	**Year 2 (%)**	**Year 3 (%)**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**
Traditional cook stove	100	100	100	100	100	100
Charcoal stove	0.6	24.7	15.5	6.0	24.7	16.5
Kerosene stove	8.4	43.3	15.0	10.8	33.7	16.0
LPG	10.8	45.2	13.5	18.1	17.9	14.0
Electric stove	6.6	38.6	13.5	5.4	4.4	14.0
Bio gas	1.2	10.2	10.5	3.0	4.9	11.0
Solar Stove	0	7.8	4.5	0	2.0	4.5
Others/ICS	7.2	23.5	0	2.4	7.9	0

Fuel Characteristics	**Kalahandi**		**Kandhamal**		**Odisha**	
	year 1	**Year 3**	**Year 1**	**Year 3**	**year 1**	**Year 3**
Adjust size to Smaller Pieces only	45 (27.1%)	66 (33.0%)	368 (73.3%)	66 (33.0%)	413	132 (33.0%)
Ensure fuel dryness only	117 (70.5%)	64 (32.0%)	269 (53.6%)	78 (39.0%)	386	142 (35.5%)
Both Size and dryness	4 (2.4%)	52 (26.0%)	0	44 (22.0%)	4	96 (24.0%)
Others	0	15 (7.5%)	0	12 (6.0%)	0	27 (6.7%)

Women's knowledge on relation between fuel, ICS and better forest resource management	Kalahandi		Kandhamal		Odisha	
	Year 1	**Year 3**	**Year 1**	**Year 3**	**year 1**	**Year 3**
Optimal use of firewood can contribute to better forest management	166 (100%)	200 (100%)	84 (16.7%)	197 (98.5%)	250	397 (99.3%)
ICS use can contribute to better forest resource management	166 (100%)	200 (100%)	458 (91.2%)	190 (95.0%)	624	390 (97.5%)

Fuel saving leads to better forest resource management	143 (86.1%)	190 (95%)	458 (91.2%)	200 (100%)	601	390 (97.5%)

Methods to optimize fuel use	Kalahandi		Kandhamal		Odisha
	Year 1	**Year 3**	**Year 1**	**Year 3**	**Year 3**
Turn off fire after use	58 (34.9%)	61 (30.5%)	301 (59.9%)	78 (39.0%)	139 (34.8%)
Use dry fuel only	62 (37.4%)	80 (40%)	408 (81.3%)	89 (44.5%)	169 (42.3%)
Use only required fuel quantity for cooking only	40 (24.1%)	59 (29.5%)	NA	39 (19.5%)	98 (24.5%)
All replies above were quoted	1 (0.60%)	0	NA	NA	0
Two of the replies above were quoted	5 (3.0%)	0	NA	NA	0
Others	0	0	NA	NA	0

Women's participation in SHE school	Kalahandi						Kandhamal						Odisha	
	Y1		Y2		Y3		Y1		Y2		Y3		Y3	
	YR	%	YR	%	YR	%	YR	%	YR	%	YR	%	YR	%
Trained as SHE champions	6	3.6	8	4.8	200	100	0	0	31	6.2	197	98.5	397	99.3
Interacted with SHE champions	81	48.8	114	68.7	200	100	39	23.5	NA	NA	190	95.0	390	97.5
Attended SHE school sessions	78	47.0	123	74.1	180	90	31.3	31.3	189	37.6	190	95.0	370	92.5
YR – "Yes" response														

Value Chain Actors	Actions	Kalahandi			Kandhamal			Odisha		
		Y1	**Y2**	**Y3**	**Y1**	**Y2**	**Y3**	**Y1**	**Y2**	**Y3**
Manufacturers	Interaction	0	0.6	2.0	0	0.9	2.5	0.0	3.6	2.3
	Negotiation	0	0.6	2.0	0	0	4.5	0.0	6.6	3.3
Suppliers	Interaction	3.6	38	95.4	1.2	2.4	55.5	4.8	47.0	75.5
	Negotiation	0.6	35.7	84.3	1.2	2.4	44.5	1.8	43.4	64.4
Financial institutions	Interaction	0	1.8	0	0	0	0	0.0	1.8	0.0
	Negotiation	0	5.4	0	0	0	0	0.0	1.8	0.0
Others (Ever Negotiated with ICS VC actors)	Interaction	5.4	0	0	0	1.4	0	5.4	4.2	0.0
	Negotiation	0	0	0	0	0	0	0.0	0.0	0.0

Nature of negotiation	Kalahandi			Kandhamal			Odisha		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year1	Year 2	Year 3
Pricing	1.8	36.1	55.3	0.6	2.2	42.0	2.4	42.8	48.7
Financing	0.6	0.6	4.1	0.6	0.6	10.0	1.2	2.4	7.0
Design	1.2	13.9	0.5	0	0.8	0	1.2	16.3	0.3
Repair	0	24.1	0.5	0	0.4	0	0.0	25.3	0.3
Others	0	0	1.0	0	0	0	0.0	0.0	0.5

Nature of negotiation	Kalahandi (Odisha)			Kandhamal (Odisha)			Overall (Odisha)		
	Y-1 (%)	**Y-2 (%)**	**Y-3 (%)**	**Y-1 (%)**	**Y-2 (%)**	**Y-3 (%)**	**Y-1 (%)**	**Y-2 (%)**	**Y-3 (%)**
Women with ICS	10.2	20.5	30.5	1.8	15.5	30	6.0	33.7	30.2
Women using regularly ICS	8.4	19.3	34.0	0.6	14.1	24.5	4.5	25.6	29.2

Annexure – V List of villages included in the study

Village	Purchase of ICS	Adoption %	Agnika	Fonex	PCSN	Phonex	Vikram	Grand Total
Ambjor	1	5	1					1
Chancher	5	25	4		1			5
Dalguma	1	5						1
Dalibadi	8	40	5					8
Dandikia	19	95	17					19
Dangarapada	1	5	1					1
Delarpada	0	0	0					0
Dharavata	3	15	3					3
Jargipadar	6	30	6					6
Karandagada	1	5	1					1
Nagjhari	12	60						12
Padapada	3	15	1					3
Pokharihgat	3	15	3					3
Ratanga	1	5	1					1
Sargiguda	12	60	9		1		2	12
Seskajodi	3	15	3					3
Sikerguda	9	45	5	1			1	9
Talarachuguda	9	45	7		2			9
Tandalnaju	18	90	18					18
Uper Rachuguda	6	30	5			1	0	6
Total	121	30.3	90	1	4	1	3	121