

**EVALUATION REPORT OF BIOGAS PROJECT
and
ADDITIONAL ACTIVITIES**



Submitted by

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Abbreviations

COVID-19

FFF Fair Farming Foundation

GS VER HELVETAS

ICSD Interco operation Social Development India

INGOs International non-governmental organization

KVIC Khadi and Village Industries Commission

LED Liquid Electronic Display

LPG Liquid Petroleum Gas

MGNREGA Mahatma Gandhi Rojgar Yojna

MNRE Ministry of New and Renewable Energy

NBF Nature Bio Foods

NGOs Non-governmental organization

PnP Partners in Prosperity

SHG Self Help Group

TAL Terai Arc Landscape

TKWs Turnkey Workers

SDGs Sustainable Development Goals

UCOB Uttarakhand Organic Commodity Board

UPNEDA Uttar Pradesh New & Renewable Energy Development Agency

UREDA Uttarakhand Renewable Agency Development Agency

VED Verified Emission Reduction

WEG Water and Environment Group

WAPRO Water Productivity

WWF World Wide Fund for nature

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Finally, I am thankful to my family - in these times of COVID and work from home, assignments get completed only because of the support provided by families, and not in spite of it.

It is my fond hope that the evaluation document will contribute to the body of learning PnP is creating in the field of climate resilience, and in its work to empower communities.

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1. Executive summary

1.1 This evaluation aimed at assessing the current activities, output and outcome of the project before PnP decides upon embarking on further extension. The primary purpose of the evaluation was for learning and accountability, and to be able to continually improve their effectiveness. The evaluation was carried out in Uttarakhand's districts of Nainital and Udham Singh Nagar, covering the blocks of Ramnagar, Kotabagh and Betalghat (Nainital), and the blocks Sitarganj and Khatima (Udham Singh Nagar). A total of 30 villages were visited by the Evaluation Team with the facilitation support of PnP's Rural Economy team.

1.2 Apart from conducting personal interviews of beneficiaries from 125 households the evaluation team met and conducted key informant interviews with representatives of the Government, Private Sector, Communities including programme participants and non-participants, contractors, masons and fitters who were involved in the construction of the biogas plants, other NGOs in the area and the staff of PnP. Out of the 125 households interviewed, biogas plants were active and functioning in about 86% households, which can be considered as a healthy percentage given several challenges.

1.3 The stakeholder mapping included a wide range of actors including the Uttarakhand Renewable Agency Development Agency (URED), private sector like the Nature Bio Foods (NBF), biogas users, and other relevant programs. This provided a good platform to validate and cross-reference information collected.

1.4 The findings of the evaluation captured the five evaluation criteria -- relevance, effectiveness, efficiency, impact, and sustainability of results. The project was found relevant to Government policies, private sector, and community interests. It was relevant to the wider goal of the climate change adaptation that worked well despite the coronavirus pandemic as the project adapted to virtual methods.

1.5 The socio-economic outcomes of the Biogas Programme has been encouraging. Around 3,900 Biogas Plants came up and started the biogas and slurry production in 5 target districts. The Biogas Value Chain presented several opportunities of growth and transformation of the biogas ecosystem. Consultation with Service Providers in the Value Chain provided evidence of such opportunities and addressing gaps such as Operations and Maintenance that the project has been trying to address through specific interventions. The biogas plants have drastically brought down fuelwood use by 20%. It provided women freedom from drudgery of fuelwood headloads, helped farmers regularly in cultivating vegetables in kitchen gardens, and significantly reduced expenses on LPG cylinders.

1.6 Additional Activities like distribution of solar torches, installation of community water filters and coolers, and rejuvenation of irrigation infrastructure (gullies, canals, syphons, drinking water sources) have made a significant difference to the lives of community members. Among other benefits: (i) solar lights were useful to communities in protecting against wild animal attacks, (ii)

farmers saved money by using improved techniques suggested by the project, (iii) irrigation infrastructure repairs through community projects, (iv) water source repairs, and (v) voluntary cleaning of canals by WEGs.

1.7 There was a good Value for Money in the project implementation. Community contribution was encouraged to some extent in cash or kind. There was an overall good Return on Investment indicated by increase in Household savings.

1.8 The environmental outcomes has been a key result area. Soil quality improved and found as scientific evidence. There has been reduction in use of firewood. Women drudgery reduced to a great extent. Farm Production increased through use of slurry. There has been a reduction in the use of chemical fertilizer from 20% to 50% in agricultural fields. On an average, the interviewed households reported about 80% reduction in use of fuelwood, which is a remarkable achievement. The number of biogas plants increased over years. Project partners became more interested and engaged with the programme. The programme contributed to improving the quality of life of households that adopted biogas. For example, the household members now get to spend more quality time with family as they do not need to go out to collect firewood. The impact of this programme on women has been positive in particular. It also created employment opportunities for suppliers and service providers.

1.9 Towards achieving sustainability, the project was successful in establishing linkages with government schemes, and service providers. As noted earlier, it reduced the drudgery of women in getting fuelwood from forests. There is an economic feasibility that can be further scaled-up. Communities are willing to contribute to their long-term development if it becomes an integral part of the project design. On the environmental front the biogas programme contributed to the Goal 13 of Sustainable Development Goals, which is Climate action, to work on emission reductions. However, the evaluation noted some problems and challenges that must be addressed for a long-term sustainability and impact.

1.10 There are important lessons learnt for the project management and recommendations for future design of the project that can address key problems and challenges faced by the project. The future design can focus on a resilience building framework that can: (i) understand community needs and secure livelihoods; (ii) develop context specific plans to increase local capacity, establish linkages with market traders, and collaboration with networks and similar interventions, (iii) apply market-based solutions, (iv) collaborate with local actors, private sector, and the government to develop a shared approach to develop the renewable energy ecosystem, (v) enhance human capital and develop market skills development, (vi) develop social capital by linking traders and communities, and (vi) financial support towards economically viable units.

1.11 Key recommendations of the evaluation suggest developing a multi-stakeholder forum for strategic collaboration with government and private sector organizations, strengthening community participation through smart incentives, creating awareness on environmental interventions. PnP is positioned to build upon its experiences and draw continued support from donors in developing a new phase that can focus on durable solutions and increasing impact on Women. Specific recommendations to make design improvements are made.

2. Background of the Project

Partners in Prosperity has taken over the biogas portfolio of Intercooperation Social Development India (ICSD), which they had been implementing in the Project area of Nature Bio-food (NBF), the social arm of Dawat Basmati Rice. The Biogas project started on 7th October 2014 as an add-on over the existing organic basmati Rice farming Project of (Nature Bio-food – NBF). NBF's major purpose for going organic with Rice was for promotion of its brand Dawat Basmati. NBF is a private company based out of Sonipat and involved in export of Basmati Rice. Its organic basmati project is registered and well known. NBF had been working in 3 Blocks in Nainital District i.e. Kotabag, Ramnagar, Betalghat with 4500 farmers for Organic Agriculture. The NBF project was also running in Udham Singh Nagar and Haridwar for Basmati farmers. NBF was already established as a trader and purchaser of farmer produce.

In the initial years, the financing cost of each biogas unit was equally shared by WWF Switzerland through HELVETAS (1/3), subsidies from the Indian government or corporate sources (1/3), and households (1/3). Later on the Government of India stopped providing subsidy to individual biogas units. The Government portion of the grant was picked by WWF/HELVETAS, and for 142 units in UP by NBF.

The Organic Basmati Rice producing Farmers were organized and trained with the active support of WWF Switzerland, and *myclimate* in collaboration with COOP and HELVETAS Swiss Intercooperation, resulting in Gold Standard Verified Emission Reductions. This is a Gold Standard Verified Emission Reduction (GS VER) Project with a potential to mitigate/sequester CO₂ equivalent Greenhouse gases, thereby generating around 60,000 ERs/year. The process of GS VER is being supervised by *myClimate*, coordinating the activities.

The goal of the programme has been to enhance climate resilience and quality of lives in rural households in Uttarakhand and Uttar Pradesh through deployment of clean energy technology. The programme aimed at avoiding use of fuel wood for cooking by rural households by facilitating installation of 3500 biogas plants in Nainital, US Nagar and Haridwar in Uttarakhand and additional 400 units in Bahraich and Shravasti of UP. All biogas units are of uniform size (2 cu m x 3 cu m) fixed dome Deenbandhu model. The smaller sizes were designed to reach out to poorer families. The programme aimed at selling 10,000 ton CO₂-e/annum verified C credits generated from these 3500 plants during the 7-year project period through the micro-scale scheme of the Gold Standard Verified Emission Reduction (VER) Certification Process.

Deen Bandhu Model of Biogas – ICSD chose the Deen Bandhu Model for this programme. In the newer model i.e. Deen Bandhu Model, the structure is divided into three parts – (1) Inlet pipeline, (2) The Dome that acts as a digester. The dung from the inlet goes into the spacious dome made of concrete and cement with a volume of 3 Cu M. (3) Outlet - Gas generated in the dome is then let into the outlet. The rest of the gas stays in the dome.

The project engaged with few additional activities over and above the installation of biogas units including: (i) biogas slurry management by installing biogas slurry pits, training farmers in its use,

(ii) water infrastructure including filters and coolers in schools/hospital/households, renovation of canals/tanks, (iii) levelling of paddy fields, protection of fields from animals through distribution of long range solar torches, and (iv) renewable energy through solar street lighting, LED bulbs, fuel efficient biomass cooking stoves.

This evaluation aims at assessing the current activities, output and outcome of the project before PnP decides upon embarking on further extension. (Cf Terms of Reference for the evaluation). The primary purpose of the evaluation is for learning and accountability, and to be able to continually improve its effectiveness. The evaluation report can be used to:

- aid project management decisions,
- keep project true to its goal and target,
- assess the past and plan for the future,
- ensure that project activities reflect the organization's mission and goals,
- stay accountable to stakeholders and donors by keeping them informed,
- assess and test the feasibility of different activities, and refine existing approaches, and
- record and disseminate best practices, areas for improvement and results.

3. Methodology

The methodology of the evaluation was designed with the project geographic coverage in the consideration. Tools were developed and agreed with the project team. Consultation with the control group was also considered.

3.1 Framework: As a framework towards building resilience in the target communities, the following approach (see **Figure 3.1** below) was considered to analyse the findings.

The framework helped to keep the community needs and context in the centre of the program implementation within the core principles of inclusive growth, community participation and partnerships. It pays due attention to a market-based approach balancing demand and supply side support by the programme internally and by other actors externally. Some key support areas will include finance, human capital development, local capacity enhancement, market linkages and collaboration with govt and private sector organisations.

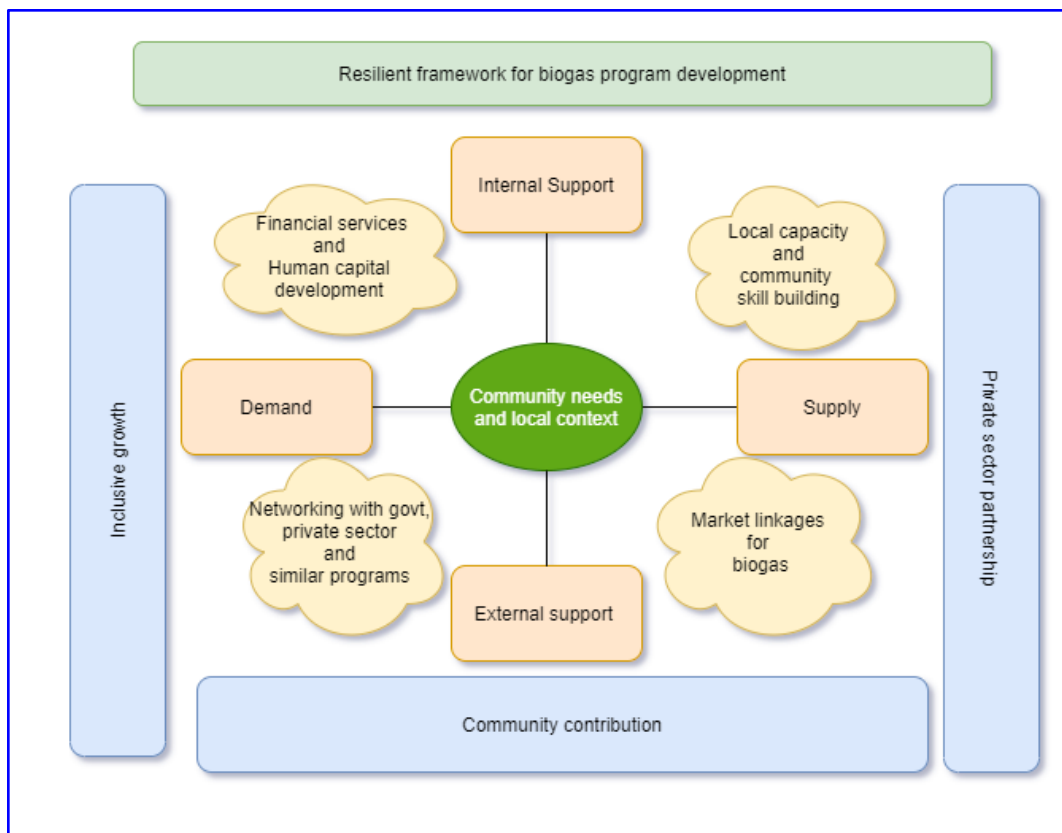


Figure 3.1 Resilience framework for the evaluation

3.2 Geographic coverage: The evaluation was carried out in two districts of Nainital and Udham Singh Nagar. In Nainital, the blocks of Ramnagar, Kotabagh and Betalghat were covered, while in Udham Singh Nagar, the blocks of Sitarganj and Khatima were covered. A total of 30 villages were visited by the Evaluation Team with the facilitation and support of the Rural Economy team of PnP.

3.3 Limitations: The study has been limited by the sample size. Due to considerations of time and resources, it was decided to take up a sample size of 125 for the universe of 3,500 potential respondents. This sample size has a margin of error of about $\pm 8\%$.

3.4. The control group: The control group comprises thirty farmers who are non-participants in PnP's Biogas Programme, from whose fields the soil samples have also been collected. A total of 30 such farmers are part of this group, from whose fields the soil samples were collected.

4. Findings

4.1 Stakeholder Analysis

4.1.1 Government: The Uttarakhand Renewable Agency Development Agency (UREDA) is the principal government agency supporting the setting up of Biogas plants all over the state. UREDA gives subsidies to family size plants constructed by households. The subsidy used to be Rs11,000 per plant for biogas plants of capacity 2-6 cubic metres in 2014, which is currently at Rs13,000 for 2-6 cu M capacity plants. In addition, UREDA currently gives Rs1,000 per plant to Turnkey Workers (contractors responsible for construction of biogas plants), and Rs 200 per plant per year for maintenance of biogas plants for five years.

The Uttarakhand state office of Khadi and Village Industries Commission (KVIC) used to provide subsidy for construction of biogas plants, which they have stopped. Currently the KVIC only provides training in operations and maintenance of biogas plants, in addition to providing training in making organic manure.

The Uttarakhand Organic Commodity Board (UCOB) came into existence in 2003. The main aim of UOCB is to make Uttarakhand 'The Organic Capital of India'. The main objective of UOCB is to provide training to farmers, extension workers from government line departments, NGO's in the field of production, certification as well as marketing. UOCB organizes exposure visits for farmers, middle and senior level officers for seminars, exhibitions and other gatherings in the Organic sector. UOCB has converted a few blocks in select districts to be completely organic, though this is still a developing process.

4.1.2 Private sector: Nature Bio Foods (NBF) is an important ally of PnP in its work with organic farmers. The partnership between PnP with NBFs extends from Uttarakhand to Uttar Pradesh to Haryana. NBF has picked up a lot of new ideas from its relationship with ICSD/PnP and scaled them up, as captured in the section on Sustainability. The role of NBF in the Biogas and Additional Activities programme has been to support some part of the cost of setting up biogas plants in Uttar Pradesh. NBF have mainly picked up significant costs Additional Activities, including setting up the Organic Agriculture Service Centres (OASCs), and paying for some of the equipment in the OASCs set up by PnP.

There is a Mahila Mandal or women's self help group run by Mrs Savitri Garjaula (See case study on her in **Annex 1** below), existing in Kotabagh since 1993, which has a lot of experience of collective productivity, and which specialises in production of value added organic products.

As part of the Biogas Programme and Additional Activities, the programme set up a Spice Grinding group in a village called Patrani in Ramnagar block, inside the core area of Jim Corbett National Park. A case study of the group is presented as part of this report (See Annex 1).

The Contractors, masons and fitters who were involved in the construction of the biogas plants are an important set of stakeholders for this programme. A number of traders, dealers, brick kiln operators and shopkeepers have collaborated with the programme during the construction phase, and now during the operation phase of the Biogas and Additional Activities. The construction

materials for biogas plants was sourced locally from many of these small businesses. Currently, the repairs and maintenance needs of the running biogas plants are partly served by shops that stock the spare parts and fittings of the biogas plants and the gas stove that need to be replaced from time to time. Similarly, the solar torches and water filters requiring any repairs or replacement of parts are again serviced by many of the entities in the same group.

4.1.3 Communities: The users of Biogas (see Case Study on biogas user Anita Devi in **Annex 1**) and Additional Activities are spread across the three districts of Nainital, Udham Singh Nagar and Haridwar in Uttarakhand, and Bahraich and Shravasti in Uttar Pradesh. They include participants of the Organic Rice Programme of PnP, as well as those who are non-participants, and became beneficiaries of the Biogas Programme. The Additional Activities have been carried out for the Organic Rice farmers mainly. Some of the participants of the Biogas programme, apart from receiving biogas stoves, also had the programme construct slurry pits for them. For each of these activities, some partial contribution was taken from beneficiaries. Among Additional Activities, water filters, with or without coolers have been installed in primary schools, inter colleges, community health centres and primary health centres. The beneficiaries have been organised into Water and Environment Groups (WEGs) by PnP. A WEG comprises the water users and biogas users. WEG is a community based organisation formed to develop social capital, to help communities manage precious resources like water, for greater farming productivity (See a Case Study on a WEG at Dhamola, Ramnagar in **Annex 1**).

4.1.4 Other programmes, NGOs, INGOs, Govt projects, UN programmes in the area: Suvidha, Fair Farming Foundation and WWF India are prominent NGOs operating in the same area. PnP has a partnership with Fair Farming Foundation (FFF), which is a sister entity of Nature Bio Foods. In fact, the leadership and primary functionaries of FFF and NBF are the same. Suvidha is the NGO with which ICSD had set up as an implementation partnership for the Biogas Programme, which did not work. WWF India was a predecessor to the ICSD/PnP project, having set up 120 biogas plants under their Terai Arc Landscape (TAL) programme in the same area next to Jim Corbett National Park, with the intention of reducing human pressure on the wildlife reserves.

Role of partners for this programme: In this context, it is useful to mention the roles performed by the partners of PnP in the Biogas and Additional Activities programme.

- The role of WWF and myclimate is to fund this programme (myclimate has another role described below). WWF India had carried out a study of the impact of the 300 biogas plants it had set up in and around the Jim Corbett National Park, between 2008 and 2010. As a result of three years of operations, it was seen that the fuelwood utilization had reduced substantially amongst the HHs from 24 kg/day to less than 6 kg/day. This successful experiment became the basis of the current programme. WWF Switzerland has covered one third of the total programme cost as an upfront payment for the generated carbon credits¹.

¹ GS3906 1st Monitoring ReportV2.1, myclimate, 2020

- The role of myclimate is to also take the emission reduction credits from setting up the Biogas Plants, and monetize them in the carbon sequestration market. myclimate does this by preparing for certification, and then ensuring the certification of the 3,900 biogas plants set up under the programme. As part of the certification process, myclimate also prepares, with inputs from PnP, the Gold Standard Verification Report, and does the calculation of emission reductions. myclimate filed its first monitoring report for the period 19/12/2016 to 31/12/2017 (both days included) on 9th April 2020. For this report, they used the Gold Standard Methodology: Technology and Practices to Displace Decentralized Thermal Energy Consumption.
- Helvetas – the Swiss Intercooperation is the organisation with whose support ICSD set up the Biogas and Additional Activities. As the primary agency through which this project was granted for implementation by its Indian counterpart, Helvetas provides technical backstopping to the programme.
- The role of ICSD/PnP is to implement the programme, monitor the activities in the field, report to the donors, including providing inputs to myclimate from the field for the preparation of the Gold Standard Verification Report. PnP manages the database, checks the quality of the installed plants, ensures after sales services through pre-qualified companies and manages the contribution from Indian government and from the HHs.

4.1.6 PnP staff: Another important stakeholder that the evaluation has interacted with are the management and field staff of PnP. Of these, there are some who were there from the time ICSD was running the programme, to some who joined during the transition, and some who have joined recently. Based on the time they have spent on the programme, a diverse set of views has emerged from the Key Informant Interviews (KIIs) conducted with them.

4.1.7 Control group: A few farmers from the control group were interviewed by the evaluation team, to get a sense of how those not supported by the programme run their lives, and interact with the circumstances and environment around them.

- a. They indicated that they too use cow dung in their fields, after storing it for a year. They normally add it to their fields during summer, when they plough their fields.
- b. They plant the usual crops, of wheat and paddy. They also plant tomatoes, in addition to green fodder. Some who have bigger land holdings, say about 4.5 to 5 bighas, plant lentils like Bhat and Soyabean as well.
- c. They usually add DAP and Urea to their fields.
- d. The average productivity from their fields is about 2 to 2.5 quintals of grain, which is fairly average productivity, though the farmers themselves feel that at these figures, they are doing well.

From the above, it is clear that the farmers in the control group, who are not using biogas slurry are operating at average levels of productivity.

4.2 Relevance

4.2.1 Government Policies:

The biogas programme has nicely leveraged the policies and schemes of the Ministry of New and Renewable Energy (MNRE), and their representative agencies in the states, UREDA and UPNEDA. The programme has been able to leverage the available subsidies for the households for construction of biogas plants.

4.2.2 Private sector interface:

The programme has leveraged the existing supply chain of private sector intermediaries in the form of the chain of Contractor-Agent-Mason-Fitter-Labourer. The programme has also used the existing markets in the local areas for any after sales service, repairs or replacement of parts both for biogas plants and additional activities.

4.2.3 Community interest:

While the biogas programme has been accepted and appreciated by a large section of the population, since it actually provides an answer to their felt need (issues related to fuelwood collection and use), there is also a small section which is not interested in handling cow dung, and tending cows. For such a section, the programme does not have much relevance, but that is more due to shifting priorities. Also, with the coming of the Ujjwala Scheme of the government, some households find it less cumbersome to use LPG, rather than work on running biogas plants. That too has affected the relevance of the biogas programme to some extent. On the other hand, the assets and community equipment including the equipment for Organic Agriculture Research Centres provided under additional activities remain very relevant, and continue to be used by participating communities.

4.2.4 Climate change adaptation: Biogas and Additional Activities are all very relevant from the climate change adaptation perspective. While on one hand, biogas contributes to emission reduction and carbon sequestration, the solar street lights and solar torches save energy, and the repaired irrigation infrastructure saves scarce water, thus further supporting the environment. Biogas project design addressed the farmers' need for organic manure management through slurry from digesters and reduced the burden on pocket making it more relevant. While the slurry has potential to reduce the use of chemicals, it does a lot of environmental benefit by replenishing the organic carbon content of soil thus improving the economic and environmental value of land, and healthy food grains. The project is also relevant in the context of the state's preparedness to go organic while we have an upper hand in developing value chain, where biogas outputs can play an important role².

² KII - Mr Mustak Khan, PnP

4.2.5 Programme Delivery during COVID:

In the wake of COVID-19, with the restrictions on field visits, the PnP programme team devised some innovative ways to deliver the programme. Since physical movement was restricted, the farmers' training, refresher training and tips to mitigate issues arising in biogas units were done through the digital medium of Zoom. The staff also made contacts with over 2000 beneficiaries on telephone to learn about status of their health, condition of biogas units and if at all they needed any support³. The PnP field team set up virtual awareness workshops with the biogas beneficiaries. The innovation part was that one member of the team would reach the village for which the workshop was to be held, and set up his laptop there, while his colleague from Haldwani would run the webinar. This brought motivation in the challenging time and participants joined with interest.

4.3 Effectiveness

4.3.1 Socio economic Outcomes of the Biogas Programme:

The Biogas programme was formally launched on 7th October 2014. Under the programme, the implementing agency, Intercooperation Social Development (ICSD) was expected to ensure the completion of construction of 3500 biogas plants in two years in the district of Nainital. Initially, ICSD had taken on board a local NGO, Suvidha, who had been given the responsibility of the implementation of the programme on the ground. However, the partnership with Suvidha ran into trouble in no time. Under the MoU⁴ with Suvidha, they were expected to ensure the construction of 500 plants by December 2014. However, only 100 plants were ready till then, and there was no assurance, by when the remaining plants would be completed. Accordingly, the MoU with Suvidha was dissolved, and ICSD took on itself the role of direct implementation of the programme. The expectation, at the time of the designing of the programme, was that the existing catchment of the farmers participating under the ongoing organic rice farmers would be taken up, and biogas plants built for them. This would be a logical extension of the relationship with the organic rice farmers, adding on the input of organic manure for their farms, in addition to providing biogas as a bonus⁵.

4.3.2 Around 3,900 Biogas Plants came up and started biogas and slurry production:

Over a period of five years, a total of 3,500 plants came up in Uttarakhand state, and 400 plants in Uttar Pradesh. The majority of the construction of these Biogas plants took place in the first two years, as mandated under the MoU between Helvetas and ICSD. The distribution of the plants in each of the states is as follows:

³ KII - Mr Mustak Khan, PnP

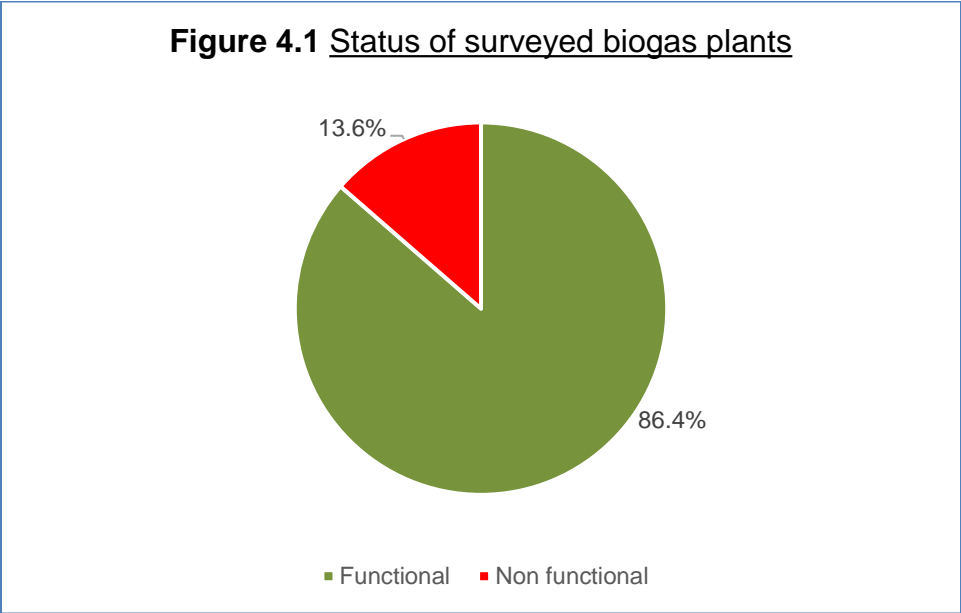
⁴ KII with Ms Sreelatha, PnP. See KII summary in Annexure.

⁵ KII with Rudolf Luethi, Helvetas

District	State	2015	2016	2017	2018	2019	Total
Haridwar	UK	216	225	20	0	0	461
Nainital	UK	735	467	652	169	0	2023
US Nagar	UK	390	626				1016
Bahraich	UP				224	170	394
Shravasti	UP					6	6
Total		1341	1318	672	393	176	3900

Table 4.1 Programme Biogas plants constructed over the years

A total of 125 households were interviewed, of which an overwhelming number, that is about 86% were active, as the **Figure 4.1** below shows.



4.3.3. The Biogas Value Chain

The entire gamut of socio-economic relations which reside around a Biogas plant have been captured in this Biogas Value Chain⁶ in the **Figure 4.2** below.

4.3.4 Service Providers in the Value Chain: In the service providers part of the Biogas value chain, the Contractor is supported closely by the Agent. A contractor typically has several agents in a number of villages, who keep looking for potential clients interested in getting a biogas plant made. Once the agent finds a client, he reports that to the Contractor, and becomes eligible for a finder's fee, which is usually Rs1,000 per client found. After that, the agent helps the Contractor with the filling up of paperwork, in the form of application, including affidavit by the client, to be submitted to UREDA for the subsidy. Once UREDA verifies and approves, the Contractor gets the construction material mobilised, and sends the mason and fitter to start the construction of the biogas plant. Often the mason and fitter are the same person. Usually a biogas plant, of the Deenbandhu Model currently prevalent, takes about one week to construct.

⁶ Value Chain Map prepared through inputs from Dharendra Tiwary, Khurram Parvez and Navin Suyal.

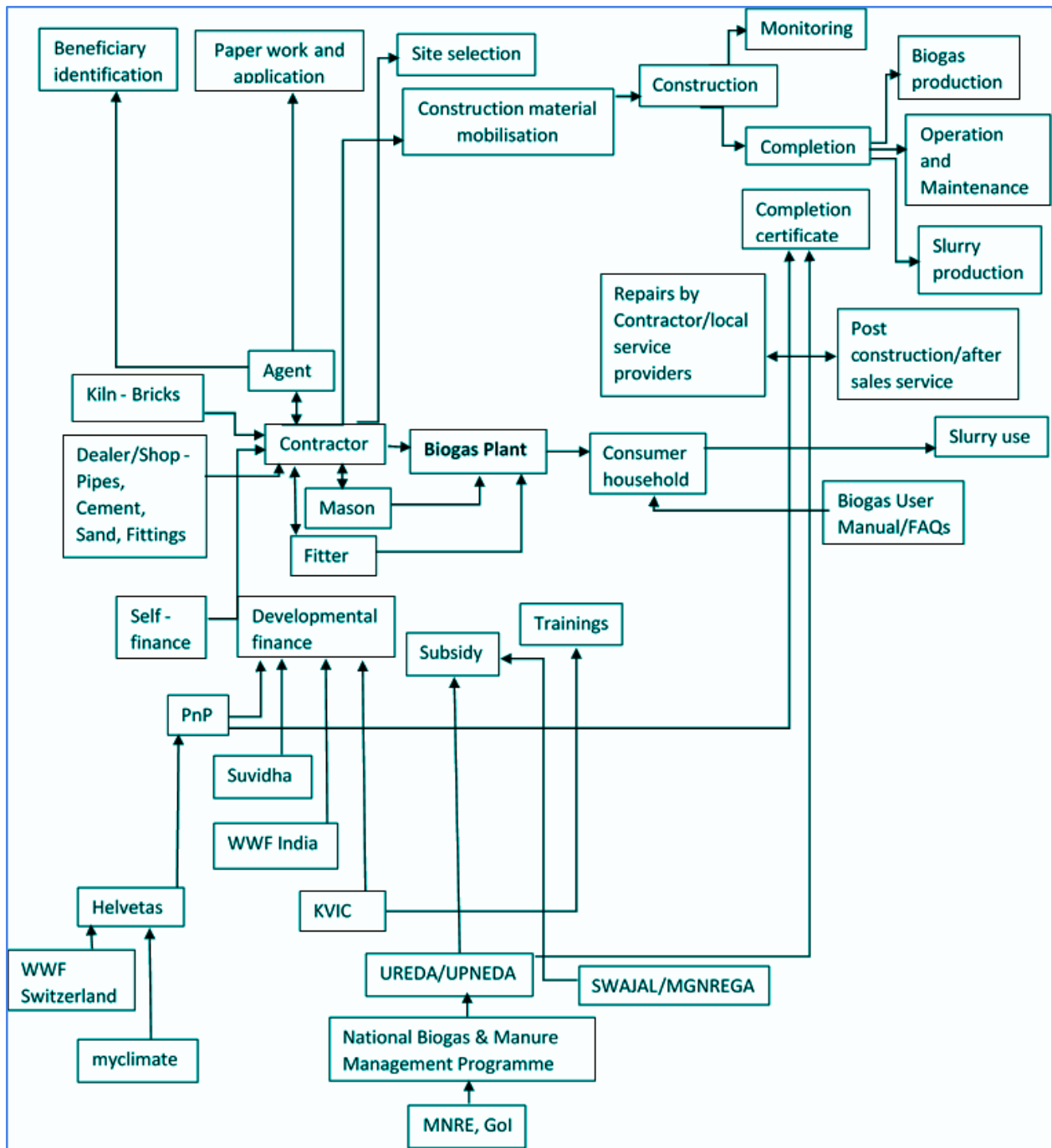


Figure 4.2 Biogas Value Chain

After the biogas plant is constructed, the Contractor needs to collect a Completion Certificate, so that the subsidy amount can be released by UREDA. During the construction of the biogas plants under this programme, ICSD/PnP would have had to also provide a completion certificate to enable payment of the ICSD part of the funding from the programme.

Once the plant is constructed, the middle part, which is the digester, has to be filled with about two trolleys of cow dung. It takes a few days for the digestive process to begin, and the biogas to be produced. Once the plant starts production of biogas, it starts producing slurry. Under the project, a number of slurry pits were constructed as an additional input under the programme.

4.3.5 Facilitators and Enablers of the Ecosystem: Among the civil society organisations, PnP, Suvidha and WWF India are the organisations active in the Nainital district of Uttarakhand for the construction of biogas plants.

Among the government service providers, the state office of the Khadi and Village Industries Commission used to provide subsidy and get biogas plants constructed, but now focuses on training related to operating and maintaining a biogas plant, as well as for organic manure.

At the base of the value chain map the funding agencies, including international organisations like Helvetas, WWF Switzerland and myclimate made a valuable contribution for the sector growth. The Government body -- Ministry of New and Renewable Energy (MNRE), Government of India, routed subsidies for the biogas plants through state bodies like Uttarakhand Renewable Energy Development Agency (URED A) and Uttar Pradesh New & Renewable Energy Development Agency (UPNEDA), who pass on that subsidy funding from MNRE to the beneficiaries setting up biogas plants.

4.3.6 Operations and Maintenance: The Value Chain map above also accounts for the operations and maintenance part, or the after sales service. In Uttarakhand, UREDA provides Rs1,500 per plant for every plant constructed by a contractor empanelled with them, for monitoring of the biogas plants over a period of five years, which comes to Rs 300 per plant per year for five years. In addition, usually the biogas plant owning households call the contractor/mason who constructed their plant, if any repair is needed. In addition, the households often get local service providers who live in their vicinity to help with any repairs.

4.3.7 ICSD/PnP Helpline: There was a Helpline number established under this programme, which has been used variously by the households. During the evaluation, it was found that the users mostly did not call or use the helpline, and preferred to use local help, or call the contractor/mason who has built their plant. The Helpline remains active at the time of writing of this report. The **Figure 4.3** below describes how the Helpline is being used by the clients.

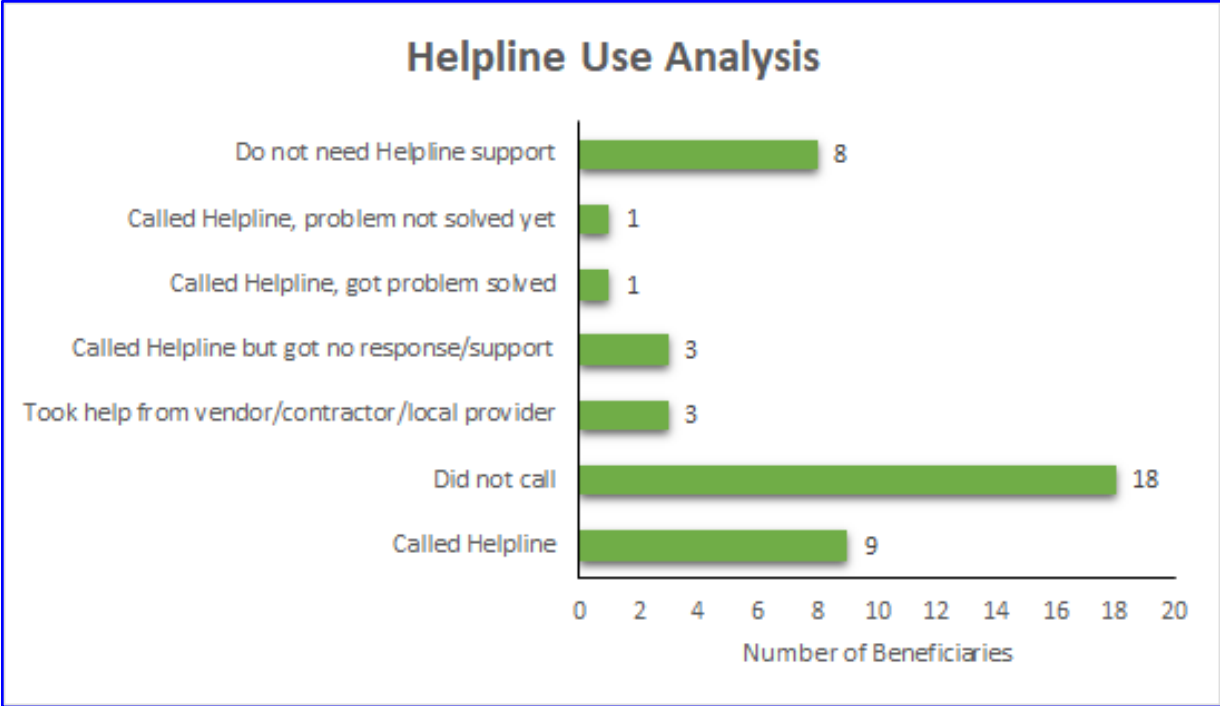


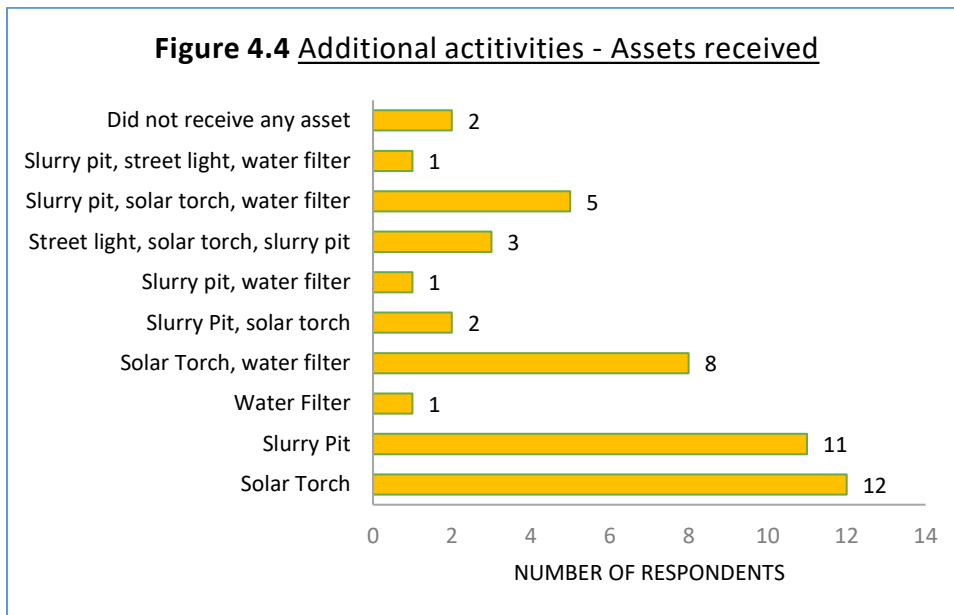
Figure 4.3 Helpline Use Analysis

As can be seen about, nearly fifty percent of the above sample, reported not calling the Helpline and about twenty percent said they did not need the Helpline. Given that the Helpline is being run by scarce project resources, it needs to be considered setting up an alternative to this Helpline, which is more sustainable.

4.3.8 Socio economic Outcomes of the Additional Activities: The additional activities under the programme include the distribution of solar torches, manual water coolers, solar street lamps, laser levelling of agricultural fields, repair of water infrastructure like gullies and canals, and equipment in the Organic Agriculture Service Centres (OASCs). [The Organic Agriculture Service Centres have been set up under the programme in partnership with Nature Bio Foods, to provide common facilities and equipment that can be used by member organic farmers (See a Case Study on one of the OASCs, at Dhamar Devi, Kotabagh, in **Annex 1**).] The distribution of assets has been mainly limited to the organic rice farmers with whom the organisation is working. In case of the water infrastructure, the Biogas Programme has worked with the WAPRO programme of organisation, for better synergy.



Pic. Solar torch received by a beneficiary
 Pic credit: Gaurav Prateek



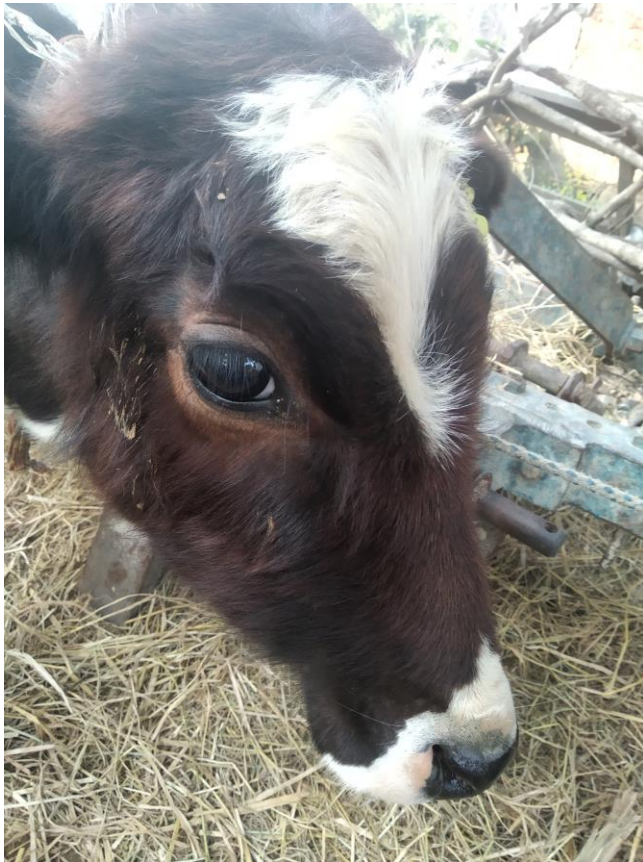
The **Figure 4.4** describes the responses from the beneficiaries in the three blocks visited in Nainital district. Since these assets were provided to the organic rice farmers with whom PnP works, none of these additional activities were carried out in the other districts visited, i.e. Udham Singh Nagar.

Most of the beneficiaries interviewed said that their torches were still working. What is important is that they get them repaired if necessary. There were some cases of water filters not working, but that was just in one case where the beneficiary had put the candle in hot water which spoilt it.

A number of beneficiaries complained that the repairs to the water filters were not possible because the brand which was distributed is no longer available in the market.

There are a number of examples of how effective the Additional Activities have been:

- Solar lights helped when a leopard attacked a calf in one of the households. Without the solar lights the calf (see pic below) would have sure been lost.
- Solar Torch is used for making wild animals run away.
- Once a couple of farmers saved their lives by rushing to stand under a street light while returning from their fields late at night, when there was a tigress in the vicinity.
- The equipment in the Organic Agriculture Service Centres are beginning to be used by member farmers, at lower than market rates, helping them make savings.



Pic. Calf saved by street light - survived leopard attack.

Pic credit: Gaurav Prateek

Of the above examples, the most remarkable is the one of using a solar torch at night. As it turns out, through the night, someone or the other among the beneficiaries gets up and flashes around the torch light. Their flash is not limited to their own farm, but those of their neighbours as well. As a result, almost throughout the night the animals are warded off, and prevented from attacking and laying waste to their fields. The quantitative effect of the saving of their crops would be astronomical if calculated.

4.3.9 Irrigation Infrastructure Repair and Community Projects: The repair of gulleys or ‘guls’ as they are called locally, and canals, has really helped the farming community with whom PnP works. While it will be useful for PnP to carry out a larger study of the kilolitres of water saved and adequately utilized in the fields as a result of these repairs, just in terms of the effect of the repair, a much larger number of farmers are now able to irrigate their fields. When the canal infrastructure was damaged, a lot of water was getting wasted. A lot of that wastage has now been stopped, due to the support from Additional Activities.

4.3.10 The Syphon near Kyari and other additional activities: The evaluation team visited a Syphon near village Kyari that had been repaired as part of the additional activities. It was a massive structure next to a small river, where water was being collected, and then directed downstream to the village. In addition, a total of 300 feet of water pipeline was laid, which is benefitting 42 families, to ensure drinking water supply for them. In the same village, gulleys and canals have also been repaired, to ensure there is no more leakage of water. Each member of the WEG got a manual water filter, in addition to which a cooler with a filter was installed in the local Inter College. All programme beneficiaries also received solar torches.

4.3.11 The Water Source Repair and Upkeep at Dhamola: This is another example of support provided through Additional Activities. The Uttarakhand Government had built a set of collection tanks, up in the hills in the middle of forest, to collect water from a source, and provide it to villages downstream. This tank was destroyed by an elephant. It was decided by the WEG that monetary support will be taken from PnP and labour support will be provided by group members, for the repair work. People carried in headloads, bricks, sand, cement and other equipment to the site all the way up the hill, a walk of almost two kilometres through the forest. As a result, the tanks were repaired and cleaned. This is a great example of community participation and ownership in a programme (See the Case Study on Dhamola WEG in **Annex 1**).

4.3.12 Voluntary Cleaning of Canals by WEGs: The WEGs use the occasion of national festivals like Independence Day and Gandhi Jayanti to come together and clean their canals, to remove any kind of silt or sediments that would have collected over months. This was noted in all locations where WEGs were visited and focus group discussions carried out.

4.4 Efficiency

4.4.1 Value for Money: For the biogas component, the programme was able to leverage subsidy support from government agencies like UREDA, to the tune of 30% of the cost of construction of the biogas plants. At the rate of Rs11,000 per plant from UREDA, for 3,500 plants, the total amount leveraged as subsidy for the farmer households in Uttarakhand comes to a whopping Rs3,85,00,000 (Rs3.85 crore or CHF491,899). That is about 28.2% or nearly 30% of the consolidated programme budget of CHF1.74 million.

4.4.2 Actual vs Estimated GHG emission reductions: According to the first monitoring report of myclimate, the estimated reduction in emission of greenhouse gases (GHG) in the first

monitoring period was 20,654 units. Against that target, the project achieved actual reduction in emission of greenhouse gases of 16,276 units. That is an efficiency level of 78.8%.

4.4.3 Community Contribution: For the biogas component, the beneficiaries contributed in different ways. The monetary contribution by the beneficiaries was of different levels in the programme, depending on the support available. There was a time in the programme, when the expected contribution from the beneficiary household was Rs11,000. Later, in the same programme, the expected contribution from each beneficiary became Rs 4,000. The beneficiaries contributed either wholly through money, or through a combination of money with labour or construction material. There were a number of beneficiaries who only contributed through construction material, or labour, or both.

There were plants where farmers said they did not have money, but would give labour. In Betalghat, some farmers towed the materials on their backs up the mountains, instead of paying for using mules. The farmers requested contractors that they would dig the ditches for the plant, and they be charged less out of their contribution/share.

Thus, the beneficiaries contributed to the Biogas programme in various ways through contributing labour or material or both labour and material. The participants have also contributed time in motivating neighbours or other members of the village to install biogas plants in respective households.

The **Figure 4.5** below shows the contribution by participants within the evaluation sample.

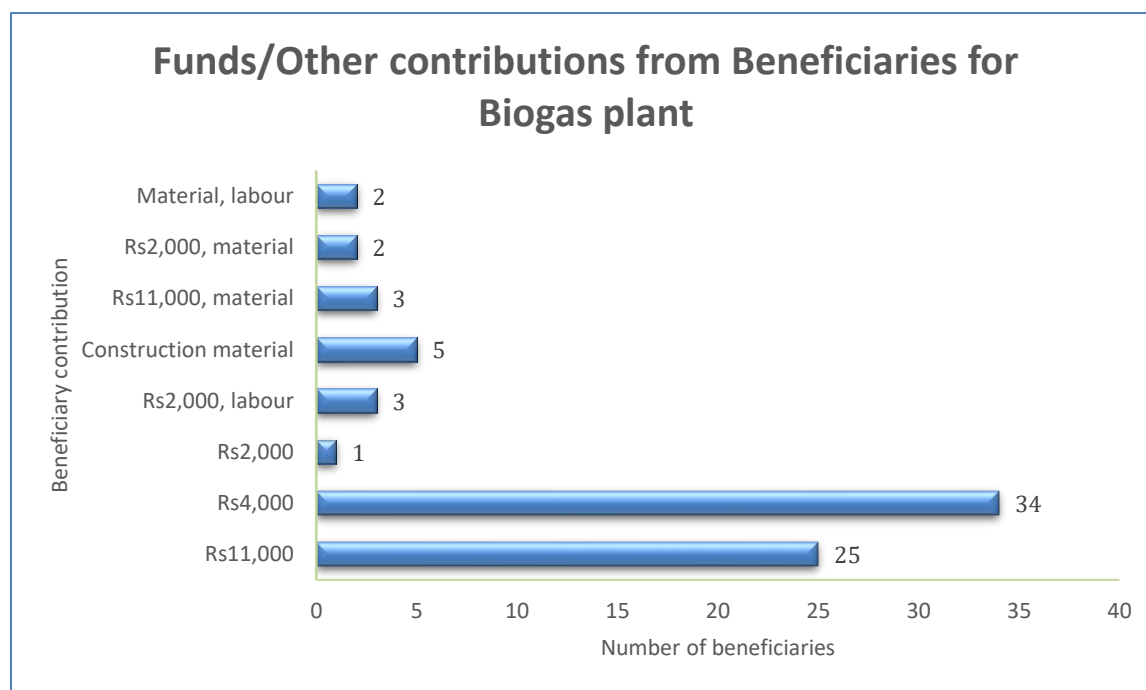


Figure 4.5 Contributions from Beneficiaries for Biogas Plant

For the additional activities component, the beneficiaries, through the Water and Environment Groups created under the sister initiative, Water Productivity (WAPRO) programme, ensured that the beneficiaries contributed through their time for the maintenance of the irrigation infrastructure. The WAPRO programme has also given community projects to their WEGs, which have further made savings in project cost, as the community groups have carried out these projects at lower costs than if these were given to external contractors, who would need to spend more to mobilise resources to these often remote locations, and hence their costs would be higher.

4.4.4 Return on Investment

Household savings increased: The households have been able to save on the money they would spend on LPG cylinders. There is a drop in the average number of cylinders per household as reported in the evaluation, as shown by **Figure 4.6** below.

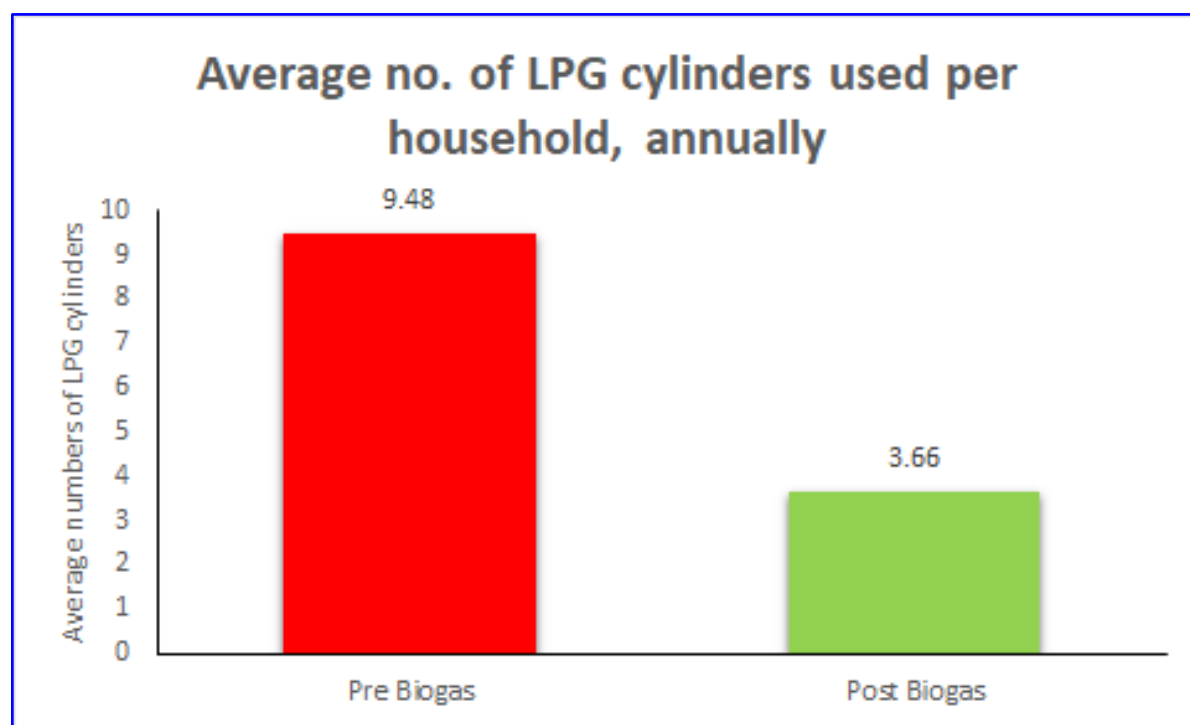


Figure 4.6 Change in LPG cylinder use

The above shows a reduction of 5.82 cylinders on an average per household per year, for the whole survey sample. Taking the average price of Rs700 per subsidised LPG cylinder, that shows an annual saving of Rs4,074 per household per year. For a small or medium sized farming household of Uttarakhand, that is significant saving. Its significance can also be gauged by the fact that it is nearly 70% of the Rs6,000 contribution being made by the Government of India in the form of bank transfers of the Kisan Samman Nidhi to individual farmers under the PM Kisan Scheme (<https://pmkisan.gov.in/>).

4.5 Impact

4.5.1 Soil quality: The environmental outcomes has been a key result area of the project. As part of this evaluation project, soil analysis is being carried out at the Soil Science Department of the GB Pant Agricultural University at Pantnagar. 30 samples have been collected from the fields of beneficiaries of PnP who are using biogas slurry in those fields, and 30 samples have been collected from a control group, comprising farmers who do not use biogas slurry in their fields. The samples were collected at a time when there was a standing wheat crop in the fields, and the University has cautioned that in such a situation, the results might not be very reliable. They have advised that the samples be collected after the current standing crop has been harvested, say by the end of March or by April/May. The current sample is to be used as baseline data, on the basis of which new soil samples can be taken and their analysis compared.

However, anecdotal evidence suggests that in the fields where the biogas slurry is being regularly used, for instance in Betalghat, which is a declared 100% organic block, there is a significant shift in the quality of soil. One farmer reportedly shared that in the field where he used to spend 5 days to get the field ploughed, he now needs only 3.5 days. That is a saving of 1.5 days of labour, which is a 30% lower cost.

4.5.2 Reduction in fuel use as reported by the first Gold Standard (GS) monitoring report: From the baseline figure of 3.80 ton per year per stove, the project was reported to have achieved the fuel consumption of 0.32 ton per year per stove, which translated as savings of 3.49 ton per year per stove, or a 91.8% reduction. The second GS monitoring report is due soon, and the positive trends in the impact are expected to continue.

4.5.3 Other Aspects of Impact: Some prominent aspects of the programme impact are as follows⁷:

- 70 to 80 percent reduction in use of firewood
- Women drudgery reduced to a great extent
- Man animal conflict possibility reduced
- Members getting to spend more quality time with family
- Health and environmental benefits
- Reduced out of pocket expenditure on cooking gas
- Better nutrition for children with cattles present (availability of milk and milk products)

⁷ KII, Mr Mustak Khan, PnP

4.5.4 Farm Production

increase: Biogas has helped increase crop production through use of slurry. The farmers used to get 2 quintals in conventional farming, now get 3 to 3.5 quintals. In the case of organic farming, they used to get 1 to 1.5 quintals, and now get 2 to 2.5 quintals per bigha⁸. These changes can be further underlined by the annual study carried out by the Rural Economy team of PnP. In the case of the kitchen gardens maintained by farmers, many farmers have started using only biogas slurry to grow

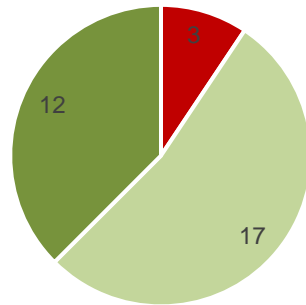


vegetables as shown in the section below. The results have been excellent, as the picture of one such kitchen garden shows, with a really healthy onion crop.

4.5.5 Chemical fertilizer use decrease: There has been a reduction in the use of chemical fertilizer from 20% to 50% in the fields. In one bigha, earlier, 1 katta (sack) or 50 kg of DAP and 50 kg of Urea were used. Now these have been reported by farmers to be reduced to 40 kg or even 25 kg in a number of cases. There are a number of farmers who report completely stopping the use of chemical fertilizers, but these are probably mostly in case of Betalghat, the block of Nainital declared completely organic by the state government. **Figure 4.7** shows the change that is under way in the programme area. Out of the 32 respondents who answered this question, just about 3% reported no change in the quantity of DAP/Urea used by them. 17 persons, or over 50% reported using slurry, and reducing the use of chemical fertilizers, and about 38% reported using slurry to exclusively grow vegetables or crops.

⁸ KII, Surendra Singh Bhakuni, PnP

Figure 4.7 Changes in Chemical Fertilizer Use



- Use slurry but no reduction in DAP/Urea use
- Use slurry, with reduction in DAP/Urea use
- Use slurry for vegetables/crops

4.5.5 Savings of Fuelwood: There is a dramatic shift in the use of fuelwood. It is quite incredible to see households that have used only fuelwood for centuries, now move away from the use of wood as the only fuel source. It is not that the use of fuelwood has become completely zero, as it will never be, and given the Indian cultural context, it is unrealistic to have such an expectation. 100% of the households interviewed under the evaluation reported reduction in the use of fuelwood. On an average, the interviewed households reported about 80% reduction in the use of fuelwood (see **Figure 4.8** below), which is a remarkable reduction by any standards.

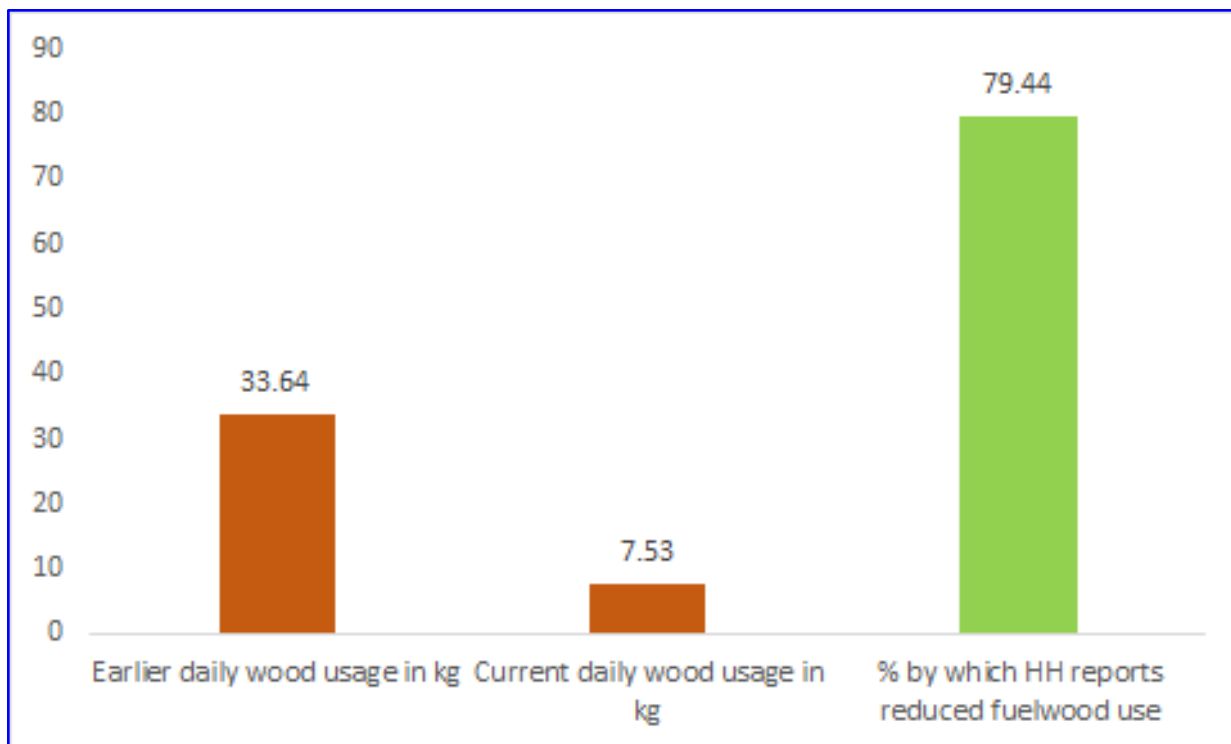


Figure 4.8 Reduction in fuelwood use

4.5.6 Scaling Up: Thanks to Helvetas, WWF and myclimate, the years 2015 to 2017 saw more biogas plants built in the history of the fledgeling state of Uttarakhand, and also the region, as part of this programme. The normal annual target/performance of UREDA for Nainital district barely crossed 500 biogas plants⁹ over the past ten years. The UREDA target for 2020-21 for Nainital is 100 plants¹⁰. Given this scenario, the construction, under the aegis of this programme, of respectively 1,341 plants, 1,318 plants and 672 plants in years 2015, 2016 and 2017 was of a humongous scale, at least 200% above the normal target for these districts, of Nainital, Udham Singh Nagar and Haridwar, for which this programme should take a pat on its back.

4.5.7 A partner gets inspired: The most interesting impact of scaling up due to this programme has actually been outside of this programme. There was an additional activity by the name of laser land levelling in the programme, which was to be done in partnership with Nature Bio Foods (NBF). The two organisations did it only to a pilot scale. After that, NBF, having seen the benefit of this measure, and also getting high demand due to the benefits accruing to farmers, has scaled up laser land levelling to 5,000 acres, and they plan to do more in the new financial year, due to the ever increasing demand. NBF also scaled up their operations to Bahraich on the request of PnP. In addition, taking a cue from their Biogas partnership with ICSD/PnP, NBF has gone ahead and built many more biogas plants in other areas of their operations, like Madhya Pradesh, and other districts of Uttar Pradesh. In addition to funding Organic Agriculture Service Centres, NBF

⁹ <https://ureda.uk.gov.in/pages/display/139-family-size-biogas-plant>; Year-wise and district-wise installed number of biogas plants

¹⁰ KII, Mr SR Gautam, Senior Engineer, UREDA, Nainital

is planning to provide more machinery and equipment to the OASCs in consultation with farmers¹¹.

4.5.8 Quality of life: The programme has clearly led to better quality of life among the households that have adopted biogas. The biggest impact is that the household members now get to spend more quality time with family. Earlier, there used to be a huge strain on the household members due to the compulsory nature of almost daily visits to the forest to collect fuelwood. At that time, there was also a lot of danger of being attacked by wild animals. The number of incidents of animal attacks have gone down. The risk of death and injury due to landslides has gone down drastically, since many of these forests are on mountains, which are very prone to landslides during the rainy season¹².



One interesting intervention was the manual water filter provided in the homes. Before these filters were provided, the respondents reported having regular stomach ailments, which, while not costing much by way of medical expenses, ensured that the household members were uncomfortable through those days. The manual filter has removed that regular discomfort, and thus contributed to a better quality of life.

The use of solar torches, the streets lit with solar street lights, the water filters in schools and hospitals have further raised the quality of life in these areas.

Pic. Manual filters improve quality of life

4.5.9 Impact on Women: The impact of this programme on women has been huge. There used to be a lot of tension among women of the family about who would go to the forest to get fuelwood - between mother in law and daughter in law, mother and daughter, sisters, sisters in law - so much full of drudgery was this activity seen as.

In this context, the PnP field team member shares an incident: “There was a case I saw where in a household the biogas stove had stopped working, and after two days, there was a need to go get fuelwood from the forest. At the time I was visiting the household, the mother of the house was berating her child, who had passed his intermediate exams and spending free time at home,

¹¹ KII, Mr Amit Singh, Nature Bio Foods

¹² KII, Mr Jagdish, PnP

as to why he was not going to get fuelwood, as he was free, and she had so much work on her hands!"¹³

The biogas programme has clearly reduced the drudgery the women mainly were subjected to, perhaps for centuries. In addition, the women used to cook in a smoke filled environment, and were vulnerable to respiratory diseases. All that is now a thing of the past.

Typically, at seven in the morning, villages next to forests would see a procession of women marching into the jungles to get fuelwood. In their homes, before leaving they would very hurriedly get their children ready for school, and sometimes leave the task of getting the child ready to their mothers-in-law, so worked up they were about the task of getting the fuelwood. Several hours later the reverse procession of women with the headloads of fuelwood would be seen coming out of forests to their homes. That too is a thing of the past.

Women now have more time for their functions of care, as well as for any productive activity they might like to engage themselves in. This has increased the possibility of additional income in the household.

4.5.10 Employment Opportunities

The setting up and running of biogas plants as well as the additional activities have also increased employment opportunities. At its peak, when the project constructed 1341 plants in a year, or more than 200 plants per month, that would mean at least 100 persons getting regular employment through the year, building at least 50 plants per week during that time. It can be safely said that each plant that was constructed, generated income at an average of Rs400 per day across categories, of $Rs400 \times 20 \times 12 = Rs96,000$ per person per year, or Rs8000 per person per month.

In addition, with these nearly 3,200 functioning additional plants in Uttarakhand, that has created a regular demand for technicians and fitters. A technician typically charges Rs200-300 per visit per household for any breakdowns. Each block of Nainital where these plants exist, now has 2-3 regular service providers for these plants. That means between 10-15 persons for the whole programme area under evaluation, having regular employment opportunities. What is more is that since there are newer biogas plants always coming up, there is further increasing demand for the services of these service providers.

4.6 Sustainability

4.6.1 Linkage with Government Programmes: There has been a strong linkage in the programme with the government. At Rs11,000 per plant, the programme has been able to leverage from , for 3,500 plants, Rs3.85 crore, or Eur444,332, which is quite a significant sum of money. In addition, the programme has been able to leverage trainings from the KVIC, as well as the State Training and Research Centre for Organic Farming at Majkhali in Uttarakhand. It

¹³ Mr Surendra Singh Bhakuni, PnP

appears that there is a greater potential for partnership with the GB Pant Agricultural University, Pantnagar.

4.6.2 Private Sector for Services: The programme has successfully leveraged the existing supply chain of biogas service providers like Turnkey Workers (usually Contractors) empanelled with UREDA, the biogas plant agents, the masons, fitters and labourers. In addition, there are shops selling the spare parts and fittings for the biogas plants in all the block headquarters.

There is Mr Yugal Boniyal who has set up his shop of organic produce at Hanuman Dham, a major pilgrimage centre, after getting trained under the programme. There is the presence in the area of Mrs Savitiri Garjola (see Case Study on her in **Annex 1**) who runs a successful SHG of women for the last 28 years, and whose skills are available as a trainer and domain expert, to be utilized by the programme for its training. There are also the facilities of NBF, which are available for leverage by the programme participants. NBF has just set up a bus with LED screen and wifi, for capacity building and digital soil testing, to be based in Kotabagh. They are going to have a tie up with District Administration to run it. They have also set up a training centre for farmers in Bahraich.

4.6.3 Usefulness to Women: The biogas remains useful to women, in terms of reducing their drudgery of getting fuelwood from forests. However, the evaluation also heard voices within the programme, who expressed concern about the unwillingness of the younger generation to take up work of tending cattle, and run the biogas plant, including stirring the dung-water mix daily. There is a need for greater awareness raising and sensitisation, in a language that younger people, including women, understand, how it is in their interest to continue running the biogas plant, both from the economic and environmental perspective.

4.6.4 Economic Feasibility - Willingness to Pay: Given that there is a long standing tradition almost, of subsidy payment, it would appear that the subsidy on new biogas plant construction would continue. There would also be from time to time, other government departments, programmes and agencies who would trump the renewable agency development agencies to continue providing ever higher subsidies, as is currently happening under the SWAJAL programme. In association with the rural employment guarantee programme, MGNREGA, the Swajal programme is building biogas plants in Uttarakhand virtually for free. So the real issue is not willingness to pay, but the capacity to pay, when these higher subsidies go away, and there is a significant portion of the cost of a biogas plant still needed to be paid by the householder. Usually the farmer suffers from lack of cash when it is needed. There is therefore a need for some solution that can help the farmer bridge this gap. The same is discussed in the section on recommendations.

4.6.5 Environmental Sustainability: From an environmental perspective, (due to the programme) the deforestation/cutting of wood has reduced, as this was harming the environment and destroying the carbon content¹⁴. The biogas programme contributes to the attainment of the

¹⁴ KII, Khurram Pervez, PnP

Goal 13 of Sustainable Development Goals (SDGs), which is Climate action, to work on emission reductions.

5. Problems and challenges

5.1 Shortage of Organic Rice Farmers: While being conceptualized, the Biogas programme was expected to work with the existing catchment of Organic Rice Farmers with whom ICSD was already working. However, the number of farmers involved in organic rice in Nainital district with ICSD was perhaps nowhere near 3,500, as originally estimated. The number was actually 1,300¹⁵, as shown by the Final Update Report of ICSD, published in May 2017. Thus, ICSD was faced with an unexpected situation of having only about 30% of the originally estimated number of expected beneficiaries at programme design stage. The programme team had to work hard to recruit more farmers in the region, outside of the existing programme.

5.2 Low burn rates: In 2019, against a budget of Rs90,76,830, the project was able to spend Rs32,56,149, or 36% of the budgeted amount. In 2020, with the ensuing lockdown, the burn rate went down to 14% (Rs11,98,121 against the budgeted Rs83,84,880). In 2019, the lower burn rate was due to the transition from ICSD to PnP that was still under progress, while the reason in 2020 is obvious.

5.3 Other challenges: Other challenges of the programme include: (i) low adoption of slurry users, (ii) fluctuating number of cattle in the households affecting the efficiency, (iii) response time in addressing the complaints, and (iv) undertaking repair and maintenance where plant owners own the responsibility. All these were addressed through differential strategies to reach out¹⁶ to communities. Staff turnover contributed to the project challenge.

6. Lessons learned

6.1 The success of biogas program links to various interrelated factors such as: (i) risk mitigation mechanism, (ii) importance of review meetings, (iii) community participation mechanism, (iii) importance of a community participation strategy and mechanism at the institutional level, (iv) beneficiary identification, and inclusion of vulnerable sections, and (v) importance of mechanisms for accountability, community grievance and learning.

6.2 Targeting a sector can improve the use of biogas intervention. Initial approach to build units around the export belt of Basmati Rice (with Udham Singh Nagar and Haridwar Basmati farmers) seems a useful approach. A sector targeting approach or provide information about farmers and their needs. Impact of production and soil quality improvements can be monitored and developed through planned interventions.

¹⁵ Biogas Project Final Update Report, ICSD India, 01 May 2017

¹⁶ KII - Mr Mustak Khan, PnP

6.3 Interaction of farmers with various units can be useful in cross-learning, motivation and addressing common problems such as repairs and maintenance or accessing services. Collaboration among plants in Nainital, US Nagar and Haridwar in Uttarakhand, and Bahraich and Shravasti of Uttar Pradesh through exchange visits may increase learning opportunities and address mutual problems by helping each other and learn techniques of installation of biogas units and slurry management.

6.4 Learning of various organisations and partners about the program is useful in developing coordination mechanisms and joint plans to support the sub-sector. Biogas partners have shared interesting lessons for others. The program has learnt the importance of a proper needs assessment and complexity of working on household level for biogas. Significant social capital was built through WAPRO.

6.5 A number of players have joined the biogas sub-sector which is useful for its growth and transformation. Learning from key agencies such as UREDA, KVIC and UCOB are useful references for designing a biogas programme. Participation in learning events including seminars, exhibitions and other gatherings can help communities and stakeholders in relevant knowledge gathering.

6.6 International organisations like Helvetas, WWF Switzerland and myclimate made a valuable contribution for the sector growth. Such cooperation together with government schemes can make a meaningful change in climate change adaptation scenario in India.

6.7 Socio economic benefits, additional activities and motivation of communities are crucial factors for the success of the programme. Disseminating learning on economic and environmental benefits which is often medium to long-term can be useful than concentrating on short term gains like subsidies.

6.8 Soil quality improvement and production increase has brought important learning to the programme. More such learning through research and collaboration with local universities would be useful for program growth and motivation of communities and investors.

6.9 Monetary benefits in terms of reducing household spending and increase in savings means a lot to a poor household. Research studies on this factor and documentation of case studies to learn more about such changes can help role-modelling community champions to advocate for biogas programmes and present a clear picture to other participants.

7. Recommendations

7.1 Building upon experiences: The Partners in Prosperity has gained a solid experience in implementing biogas programme, has learnt a range of lessons in implementation in Uttarakhand and have developed relationships with communities and stakeholders in the private sector and government. These factors are very valuable and come after a number of years of hard work. PnP

should consider utilizing them for expansion of biogas programs that are more long-term and self-sustaining. The success of future design can be based on economic feasibility and social acceptance of the intervention of setting up biogas and slurry production.

7.2 Continued support from donors: The donors of the biogas program have shown a steady support to a good cause that is contributing to the climate change adaptation in the Himalayan foothills. These experiences can draw lessons for developing similar interventions. The impact of the program and benefits to the communities can be utilized for planning a scale-up phase in India or elsewhere.

7.3 Private sector linkage: Linking with the private sector has been an area that needs further attention and follow up for higher quality of results. However, the limited collaboration with private companies has already set-up good example for developing interventions in the future. The biogas value chain provides information on a range of market actors. PnP can coordinate with market actors to improve private services in the ecosystem towards a durable solution. Issues related to repairs and maintenance of units can be addressed by improving such cooperation. Insurance companies can be considered to ensure repair and maintenance support of units.

7.4 Strengthening relationship with government: The program has experienced interface with various government schemes facilitated by NBMMP/MNRE, UREDA, and UPNEDA. Given the policy of the government of India more opportunities for such collaboration can be explored. PnP can undertake research to explore such opportunities and use the findings in developing interventions that are based on cooperation and mutual understanding rather than just availing subsidies. The collaboration can aim for addressing wider gaps, skills development, linking traders and communities and providing financial support to communities. Partnering with the government to achieve that will be a strategic approach in this direction.

7.5 Strengthening community participation: Going forward, the organisation needs to revisit its community strategy to bring it more in line with PnP's organisational mission (which is, 'Developing multi-stakeholder partnerships with governments, communities and other enterprises to alleviate poverty and to build a healthy, poverty-free environment'). Putting communities at the centre and developing a better understanding of community needs and securing and enhancing livelihoods would help in developing context specific plans to increase local capacity, establish linkages with market traders, and collaboration with networks and similar interventions, and apply market-based solutions for renewable energy.

7.6 Incentive for communities: Supplementary activities benefited communities in different ways. Use of solar, solar torch, streetlight and improvement in irrigation infrastructures were all very popular and well appreciated by communities. Efforts of WEGs played a positive and facilitative role. This provides an opportunity to continue with such additional activities in biogas programme for keeping community motivation and ensuring their participation and contribution.

7.7 Facilitating multi-stakeholder forum: The success of renewable energy programme in general and biogas intervention in particular has multiple layers that require efforts and contributions from various players. Collaboration with local actors, private sector, and the

government to develop a shared approach to develop the renewable energy ecosystem is crucial. The sector transformation should be a joint effort of actors like UREDA, UCOB in the govt. and Nature Bio Foods (NBF), Dawat Basmati Rice in the private sector and agricultural universities, FFF, WAPRO and TAL programme in the civil society sector. PnP can consider convening a multi-stakeholder forum with relevant actors for improving coordination in the sector and addressing various gaps and issues such in a collaborative manner. For example, exploring collaboration with local dairies, Goshalas and Ashrams can increase demand. This can be one of the activities in the future phase.

7.8 Awareness on Climate change adaptation: The program learning, and achievement can be utilized for publishing and messaging to create awareness and share information for capacity building of communities and other stakeholders. This can be done by documenting case studies on impact of technology on the environment like improvement in soil quality, production increase, and benefits to communities in terms of reducing costs, increase in savings and quality of life. PnP can identify and coordinate with media partners to communicate it widely through electronic and social media. Messaging on harmful use of chemicals and need to conserve nature can be planned for general masses and young people.

7.9 Developing a durable solution: A lot has been achieved and there are several nuggets of success to cherish. However, the biogas programme needs to work towards a durable solution that is self-sustaining economically and can provide guaranteed return to communities and investors. The program design should consider a market-based approach where people can invest into it and get benefits in the medium and long-term. This can be done by utilizing the subsidies and concessions available from the government, community contributions and increasing the interest of new investors. Innovative ways of financing like crowdfunding and public bonds can be explored for stimulating investments. Another alternative that could be considered is financing of biogas plants (and additional activities) through microfinance institutions (MFIs).

7.10 Increasing focus impact on Women: Positive examples of impact on women are captured as lessons. More in-depth studies can be conducted to understand how these changes can be scaled-up, sustained and be utilized as a key focus of biogas programme. These are important results and should not be seen as a by product or a good thing to have rather the program design can consider this as an objective and plan specific activities for women to increase their participation in the program, increase their skills to take part in different activities in the value chain and create employment opportunities for young women who can visit other women and popularize the initiative and support services like repair and maintenance.

7.11 Strengthening project management: Learning on project management raises important issues to consider and research further. PnP can look more deeper in developing a model for engaging with private contractors for implementation and expansion of biogas programme. Private collaboration is a positive thing and can be promoted with proper accountability mechanisms in place. Use of standards in terms of unit size by contractors and participation of communities in implementation will provide a shared accountability to the program and can be

considered in the future phase. Communities can be involved in budgeting and informed about the total costs of the units.

7.12 Developing a manual: Based on the experience the biogas program can develop a Manual or Standard Operating Procedures for users and implementers. This can capture areas including: (i) conducting needs assessment, (ii) information on stakeholders and their schemes, (iii) Project/programme progress/review mechanism, (iii) community participation mechanism (community participation strategy may vary from one programme to the other), (iv) beneficiary identification mechanism, (v) accountability mechanisms, (vi) community grievance redressal mechanism and (vi) institutional learning mechanism.

7.13 Making other design improvements: Considering interventions to improve future design may include activities such as: (i) needs assessment and stakeholder analysis as part of program design, (ii) involve farmers in the design process to ensure there are enough farmers to support interventions such as Organic Rice farming, (iii) facilitation of use of technology demonstration centers and farmer schools for motivation and improved technology to improve the adoption of slurry users, (iv) conduct cattle surveys as a part of baseline and plan an appropriate number of units in a catchment area and managing fluctuating number of cattle in the households affecting efficiency, (v) set-up a complaint redressal system supported by multi-agency network e.g. hotline for support, and (vi) reduce response time in addressing unit repairs making it a paid private service, than a free service.

Annex 1 Case studies – Successes and learnings from the interventions

- Savitri Garjola
- Anita Devi
- Dhamola WEG
- Dhamar Devi Organic Agriculture Service Centre

Case Study 1 An extraordinary entrepreneur - Savitri Garjaula



Savitri Garjaula is an enterprising and gutsy lady from the village Makanthur, in Kotabagh block of Nainital district. She started her journey as an entrepreneur by organising a Self-Help Group named Durga Self Help Group in the village, way back in 1993. The group had 15 members in it. The group at that time was given a revolving fund of Rs 15,000 under the Development of Women and Children in Rural Areas (DWCRA) scheme of the Government of India. At that time the group did not have a bank account and there was fear among the female members about even touching the money

allocated to the group by the government. Under her leadership, the group started working with the Integrated Child Development Programme (ICDP) in 1996-97 where Savitri ji and the Vice President of the SHG used to teach kids in the Anganvadi Centres. The group participated in the activities of Swarna Jayanti Gram Swarojgar Yojna from 1999 and started carrying out financial transactions within the SHG. The Group started saving a small amount per month and opened a bank account in the same year, 1999. In the group, there were 10 members below the poverty line and 5 members above the poverty line. With reluctance, for continuance of government schemes, she had to remove the APL women from the group, and retain only the BPL women. However, she remained on the lookout to devise ways in which she could continue collaboration of the APL women with the SHG. In 2002-03, for milk production loan of Rs 2,30,000, or Rs23,000 to each member was given to 10 members, which was to be returned in 3 years. Each member purchased buffaloes and the through profits they made, they returned the loan amounts on time.

After 2005, a number of NGOs like WWF, government departments, NABARD, and Mahila Mandals started frequenting her place for collaboration and for taking up other initiatives. With all these collaborations she was able to build an understanding of farming, conservation, and women's empowerment. In 2005-06 she formed an organic producer group under the aegis of the Uttarakhand Organic Certification Board (UOCB). Her group was trained by the Board on

organic farming activities. To support her 5 APL members of SHG, she had maintained an extra register who could not be part of the group according to the rules. This shows about her love and commitment she has for her neighbours and fellow villagers. She has also been able to devise a successful way to balance between the APL and BPL members. She ensures that the BPL members get support from the government, and the APL members get support from NGOs.

As she has gained further experience, she has been traveling to different districts of Uttarakhand as a trainer, to deliver training for government programmes.



Durga SHG has been identified as an organic produce source in the region. They grow crops like wheat, rice, maize, black gram, lentils, and Fenugreek, etc. She has collaborated with the training centre for herbs at Gopeshwar, and is now working on products utilizing herbs like Shatavari, Tej Patta, and Aloe Vera. Flowers like Chamomile are being packed and sold as Herbal Tea. All the products are being grown locally and packed with help from Uttarakhand Board. She takes some help from local people whenever there are big orders. For instance, Ragi (Madua), for the Madua flour, is grown in mountains in large amounts. She connects with them in case of requirement.



She has been living a life full of challenges, near the forest, where one has to keep oneself on one's toes for the protection of crops against wild animals. Conservation of nature and progressing collectively is always at the back of her mind. She says she does this by staying happy and working hard. With support from the government departments, the products through exhibitions reach New Delhi and other parts of the country. Her products are now reaching abroad as well. For her work, she has been recognized by many organisations in the state and around the country. The Uttarakhand state government has recognized her work and she was felicitated by the CM himself. The story of Savitri Garjaula inspires everyone - with only a high school degree and early marriage, she has achieved a lot in her life.

Case Study 2 Anita Devi - A potential Trainer from the Community



Anita Devi is a homemaker from village Semalkhaliya in Ramnagar. She is part of a farming household living on the edge of India's Jim Corbett National Park. Anita is one of the 3,900 programme participants in the biogas programme run by Partners in Prosperity (PnP) in Uttarakhand and Uttar Pradesh. As part of the programme, a family sized biogas plant producing 3 cubic metres of biogas per day was built for her, for which her household paid Rs4,000 as their contribution. Anita has two cows and three calves. She mixes the required quantity of cow dung with water in the inlet tank every day. Since the plant is in cooler climates of the terai region of Uttarakhand state, it means that the biogas plant functions less than optimally during winter months, due to the lower microbial activity in the digester at lower temperatures. At that time, she uses the LPG cylinder, or uses some fuelwood to cook at least one meal. She however uses 3 LPG cylinders in a year, compared to using 1 cylinder per month, were the biogas not available for cooking.

She has, in a story repeated in family after family in these parts, drastically reduced fuelwood use, down to 20% of the original levels. This is a far cry from the days when she and her neighbours and relatives would be visiting forests daily to forage fuelwood. Those used to be difficult times, as these women ran the risk of being attacked by wild animals, as well as injury or even death

due to landslides during the rainy season. Now all that trouble is a thing of the past, giving Anita and her counterparts the leisure time to be with family.

Anita is like any other average homemaker in these villages. What separates her is her knowledge and understanding of slurry as a source of manure. Unlike many of the beneficiary families in this biogas programme, who believe that the slurry coming out of the biogas is less potent, Anita believes the opposite. She rightly understands the role that microorganisms play in creating the potential fertility in the slurry, as it transforms into organic manure. Each biogas plant produces about 120 litres of slurry mix each day, which is available to be spread into fields by introducing it in the irrigation channels, or by keeping it in slurry pits and drying it up, to be used as manure later.



Pic. Biogas slurry. Pic credit: Gaurav Prateek

Given the large number of organic farmers in the area, as also the fruit orchards, there is a growing need for organic manure. Incidentally, even many of the orchard owners/managers believe that the slurry out of the biogas plants has 'lost its potency' after moving through the digester. There is indeed an urgent need to educate both the participants of this programme, and those outside it, like the orchard owners, on the truth about biogas slurry, and how it is the source of the best

possible organic manure. The orchard owners, as the potential buyers of any surplus biogas slurry, are an important potential target for these trainings.

Anita is quite confident of her knowledge, and should she be asked, she is happy to act as a resource person to train other villagers on the proper use of slurry for their fields. She would of course need to go through a training of trainer course, after which she could duly start educating her fellow farmers.

Case Study 3 Water and Environment Group (WEG) Dhamola

Dhamola is a village flanking the low hills near the very last of the terai plains, in Ramnagar block of Nainital. It is another village that is in one of the forest ranges that mark the core part of Jim Corbett National Park. The Water and Environment Group in Dhamola that PnP works with, was formed by its predecessor ICSD in 2017. Then the villagers used to face the problem of having dirty water for drinking. The reason was that the water source up in the hills serving the village had been very badly damaged by elephants, and needed urgent repair. It was decided that PnP would provide monetary support, and labour would be provided by WEG members.

The trouble was that the water source needing repair was in the middle of a dense forest. Getting the material up there was also going to be a huge logistical challenge, since there was no approach road, and the repair site was only approachable on foot. The newly formed WEG decided to take up this challenge, with the full support and participation of all its members.

The WEG members head-loaded the bricks, sand, cement, and other types of equipment to the sites. Tanks were repaired and cleaned. There is a series of small 5-6 tanks from the source of water for purification and run the water to the bigger tank next to the canal. For purification, coal and sand is normally used, so these were replaced in the syphon tanks. The members worked



for 15 days. Male members helped with loading the material at the road and dropping it at the site. While the female members helped with cleaning the site and the route.

The result, seen in the pic above, is something that serves the village well, and the WEG members are proud of their achievement.

The group has carried out other works as well: They have revamped 900m to 1 km length of canals or gullies for irrigation purposes. They have created 15 culverts or pulia with monetary support from PNP, to protect the repaired canals.

The water from the source tanks they repaired up in the hills is carried down by a pipeline down to a large tank at the foot of the hill. The WEG now maintains and repairs this tank, shown in the picture below, as well.

The proof of how good and reliable the system of repairs by the WEG members has become is that next to the tank in the pic above, there is now an abandoned quarter of a person who had been kept by the Water works department of the Uttarakhand government to look after this water infrastructure. The WEG members go up the mountain and into the forest every 15 days for the cleaning and maintenance of the water source.

There are also 33 biogas beneficiaries in Dhamola. Solar Torch and manual water filters have also been distributed to members. The members of the group regularly practice organic farming, having received training in organic farming. Vermi Compost and natural insecticide are also being prepared by group members. The use of urea and DAP in the village has lessened.

Empowerment shows...

The Dhamola WEG has collected more than Rs1 lakh for maintenance of their resources. Recently, they collected Rs100 per member for replacement of a part of the tank cover and lock. They carry out documentation of their accounts as well as their repair and maintenance works very properly, with every description provided. They paste photos of before and after of every activity in the file they have created for such documentation.

The WEG presents a sustainable model where the benefits of their social capital now go into other areas as well. For instance, in the case of biogas, small problems like line and stove repairing are solved locally.

Some problems and challenges for the group remain though, the primary issue being of wild animals. The WEG now needs installation of solar lights along the jungle. They have made an application and multiple requests to the Forest Department, but red tape is prolonging the wait incessantly. About Rs8 to 10 lakhs required for the project.

Case Study 4 Organic Agriculture Service Centre of Dhamar Devi

In the year 2011, a private company, Nature Bio Foods (NBF) entered the area for organic agriculture, and started the Organic Rice Programme. ICSD entered into a collaboration with the sister concern of NBF, which was the Fair Farming Foundation (FFF).

Through this partnership, an Organic Agriculture Research Centre (OASC) was established in Village Dhamar Devi in Nainital's Kotabagh block. The governance structure of the OASC is supported through a Programme Execution Board (PEB), which has 12 farmers as board members. Mr Bajwal has been the President of the body since 2011. In between, he also got elected to the Fairtrade Labelling Organisation as its Board Member for Rice for 2014-2018.

Nature Bio Foods sells to Two foreign buying companies, RMB and Coop, who buy the organic rice from the farmers served by OASC. The foreign buyers give US\$2 per metric ton as premium. The OASC last got Rs1.50 crore in premium amount. In addition, earlier ISCD and now PnP support through equipment. The money has been used to buy various equipment for the OASC. The equipment includes a tractor, paddy thresher, wheat thresher, rotavator, harrow, cultivator, seeder, trolley etc.



The OASC Board passes the project and then the funding is allocated for the projects benefiting the association of farmers. No individual funding is given. Currently, the OASC is funding two local government schools in Kotabagh by redecorating it, building smart classes and some other infrastructure. For utilizing the premium amount, some additional activities have been carried out too. 135 street lights have been installed in the village community, OASC infrastructure has been increased and canal repair has been done. In addition, the OASC has supported solar fencing in Dhela (Ramnagar) and 1.2 to 2 km of fencing amounting to Rs10 lakh in Betalghat.

The equipment can be hired by member farmers at rental rates lower than market rates. The OASC can only support the farmers registered with it. The OASC gets regular verification visits by external audit teams.

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