

## Flood to Drip



Irrigation is the core for communities practicing agriculture. Flood based irrigation continues to be the key driver for watering farmlands in India. Dhabhda is one such village in Dahod district of Gujarat where farmers extensively practiced flood irrigation with the help of diesel pumps which consumed 1.5 litres of fuel in an hour which cost around Rs. 100 per litres.

The farmers here are traditionally maize growers with few people undertaking vegetable and fruit cultivation. The water source for cultivation of the fields are wells which since 2021 are pumped through solar based systems.

Like every other new technology, farmers were apprehensive about the technology . After a few meetings and exposure to a nearby village, a 7.5 hp solar pump was finally installed in the village in July 2021 with only 5 farmer members in the user group. This later became 11 households being part of the group, irrigating around 12 acres of land.



Jasoda Ben is a progressive farmer of Dhabhda who recalls how resistant they were towards the solar pump and drip irrigation system. “Bharti Ben came to our village and told us about the pumps and drip system. We have been doing flood irrigation ever since we started doing agriculture. How could we irrigate by small water droplets? But then Manhar Bhai and Dabhi Bhai explained the technology to us. Even then we tried it out with a lot of hesitation.” says Jasoda Ben.

Earlier Jasoda Ben could earn only Rs. 28,000 to Rs. 30,000 from 1.5 acres of land whereas the same 1.5 acres of land now has helped her in earning INR 120,000 in two seasons. Today, like Jasoda Ben, the other 10 farmers of Dhabhda not only grow maize but have also started growing brinjal, chili and tomato. Cultivation of creeper vegetables such as sponge gourd and ridge gourd has also become a common practice in the village.

The farmers run the pump for 6 hours a day and try to manage with the existing water table so as to meet the water requirements of every user. In order to have better management practices and operations of the solar system, the farmers collect Rs. 60 per farmer per hour which gets collected in the group for meeting the maintenance costs and repair costs of the system.

Looking at the changes in her village Jasoda Ben adds, “With the help of Sadguru and CInI's trainings and Sustain Plus Energy Foundation's solar interventions, we could improve our income and also influence 150 other groups.” While leaving the discussion room, she further asked laughing, “I want to run my tractor on solar, is it possible?”

People like Jasoda Ben are examples of how important it is to think out of the box and are the true source of motivation for us to search for better DRE solutions that can help improve their lives.

habda has also been one of the villages where system thinking sessions and causal loop diagrams have also played a very important role in development of the farmers perceptions. From high value crops to usage of irrigation water to sustainability of groundwater. This workshop was done with the help of Desta where two loops were designed namely; reinforcing loop and balancing loop.

Under reinforcing loop increase in land showed an increase in vegetable cultivation which increases the income of farmers. But also showed that if supply increases the demand then income will be less and also exploitation of groundwater was also seen as a negative effect in the loop. The simulation models helped farmers in developing Groundwater and agriculture protocols for the village acknowledging their aspirations and respecting the ecology.

# Biogas Slurry



Biogas slurry is a by-product obtained from the biogas plant upon anaerobic digestion of dung or other biomass for generation of methane rich gas. It contains appreciable amount of organic matter (20 to 30%), easily-available plant nutrients and is also considered to be a good source of organic fertilizer as it contains considerable amounts of both macro (N, P, K) and micronutrients (Zn, Fe, Mn, Cu, B etc) that are necessary for plant growth. Biogas slurry also enhances water holding capacity, soil aeration, accelerates root growth and inhibits weed seed germination. It can be used to build up health of soil for higher crop production, as opposed to chemical fertilizers, providing a sustainable way for agriculture, environment and farming communities.

There are plenty of bottlenecks to use manure in the form of biogas production and bio-slurry at national scale; however, it could be achieved by leveraging existing dairy cooperative network. NDDDB conducted a pilot project in Mujkua village in Ankalav taluka and Zakhariyapura village in Borsad taluka of Anand district by providing flexi biogas plants to 417 women dairy farmers creation biogas clusters.

Biogas, a mixture of different gases produced by anaerobic fermentation of organic matter from methanogenic bacteria, mainly constitutes methane (50–65 %) and CO<sub>2</sub> (25–45 %). The gas is being used by women to satisfy their cooking needs and while saving over Rs.3000 every month from saving on cooking fuel and selling surplus biogas slurry. Women use the captive slurry for their own agricultural use and sell the surplus through their own all women manure cooperative. The cost of bio-slurry varies and is arrived on the basis of its Electrical Conductivity and Brix Index Values as quality parameters.

The surplus slurry procured from these women farmers is processed to produce bio-fertilizers. Beneficial microorganisms or microbial inoculants are carrier-based ready-to-use live formulations, which on application to plants or soil helps in mobilization of various nutrients by their biological activity. Biological organic fertilizers add nutrients through the natural processes of fixing atmospheric nitrogen, solubilizing phosphorus and stimulating plant growth through the synthesis of growth-promoting substances.

Thus, the enriched SuDhan biogas slurry-based products have played a vital role in enhancing the nutrients availability for better plant growth as well as yield.

## Stories from the field

1. **Parman Meena Dasrath** is one of the progressive farmers from Mandir Phaliya in Moti Umarvan who invested in a biogas unit with support from Sustain Plus in March, 2021. She used an earthen chulha and cooked with wood fuel collected from the forests. She later on applied for LPG under government subsidy but due to its high cost, she couldn't use the facility much. She has 2.3 acres of land of which 0.5% of land is under slurry application. She had contributed for the biogas set and has encouraged 42 more farmers to adopt the technology.

Along with biogas she is also an owner of a solar insect trap which has helped her control the attacks of insects. Also, she used to spend Rs. 600 to 700 per batch on pesticides and had to apply the medicine around 6-7 times which has now reduced to 1-2 times in other crops and zero pesticide application in maize.



*“My income has increased by 15%. Earlier I could hardly earn Rs. 30,000 to 40,000 from agriculture in an entire year. But from my last batch of vegetables I earned Rs. 60,000. It is because of CInI's training on better agriculture practices and encouragement to grow vegetables that my income has risen.”* says **Meena Ben**.

2. **Parwat Bhai Alsingh Bhai Rathwa**, is from Gauchar Phaliya in Moti Umarvan village. He had heard about biogas first over the radio and made several attempts to find the technology locally, before CInI initiated the biogas cluster program in this village. He readily accepted to be a part of the program as he wanted to move to organic farming from chemical based farming. It has also helped in creating a healthy and safe kitchen environment.



*“My family has 7 members. It used to take nearly 2 hours to cook food but now cooking is completed within 1 hour. Plus, the smoke emitted from chulhas caused eye irritation, cough and breathing problems. Now the kitchen feels less stuffy and the air is clean too.”*

Parwat Bhai collects the slurry and dries it to make it into powdered form which makes it easier to carry to the field. He owns 1 acre of cultivable land and has taken an additional 2.5 acres of land on lease. Slurry application is done in the entire 3.5 acres of land. After joining CInI's program, he sells vegetables worth Rs. 300-400 every day. He always follows TV and radio updates on agriculture and new technologies. He excitedly shared his experience of slurry application

*“I used to apply DAP and urea in Bajra which affected its height up to 5 ft but with slurry, bajra grows up to 8-10 ft tall. Chilli gives at least 3-4 fruiting after 1st picking. Slurry has reduced insect infestation on the field and has increased production.”*

3. **Suresh Bhai Sevji Bhai Ratwa** cultivates crops for mainly household consumption as he wants to avoid market sold products since most of the produce available in the market are chemically treated. He has 2 acres of land which is completely treated with slurry and grows chilli, watermelon and turmeric. He processes turmeric on an order basis and has a high production of chilli.



*“We used chulha previously but it used to affect the health and was very time consuming considering the amount of time taken to collect the wood. I love to cook on biogas. I can complete my work within an hour without having any eye irritation or breathing problems.”* says **Savita Ben Suresh Bhai Ratwa, Suresh Bhai wife.**

Suresh Bhai further shares how slurry has affected production, *“The quality of produce has improved. We have turmeric at home right now. The smell is really strong and so is the colour. Also, earlier I had to apply pesticides 5-6 times in a batch of crops. That has reduced by 50% approximately.”*

# An Influencer and Entrepreneur



Ranjit Bariya is one of the early adopters of biogas unit in Dhankua Village of Halol, Gujarat. His family of four depended on firewood from the forest situated 1 km away from the village. Members of the family spent 3-4 hours every week collecting firewood to cook with. Women and girls also spent more time cooking and suffered from inhalation of smoke and burning eyes while cooking with firewood.

Ranjit's family switched over to using biogas to overcome these challenges. The family no longer relies on firewood for cooking and cooking with biogas has given them more time, and cleaner and healthier living conditions.

Ranjit Bhai and his wife practice agriculture on their farmland of 1.5 acres. They grow roses in one-third of the area, and maize is cultivated in the rest. The biogas produces slurry, a type of bio-fertilizer, as a byproduct of anaerobic digestion of dung. Ever since they have been using slurry as a fertilizer for their rose farm, they have seen an increase in production and quality. The production of rose has

“I have been selling flowers for a long time now but I had never received feedback like the one I received in my last batch. There is this customer to whom I regularly supply flowers thought I had supplied him someone else's roses. Even the clients have seen the change. I also see an improvement in the soil health.”

That is when I realised that slurry has impacted the quality of the flowers and also improved soil health.” shared Ranjit Bhai.



increased from 7kg to 12kg and their regular customers have noticed a considerable improvement in the quality of roses.

Ranjit's family has spearheaded a change in his village. 10 households overcame the distrust of biogas technology after seeing their experience and purchased biogas units. He is an early adopter of decentralized renewable energy and also owns a 7.5 HP solar irrigation system and sells water to adjacent farms. He invested over 2.5 lakhs on the pipeline and borewell, while the solar panel and the pump was installed by a Sustain Plus grant. The solar pump irrigated about 15 acres of farmland, benefiting over 12 farmers. He runs the irrigation system for 6 hours irrigating over an acre and charges farmers Rs. 50 for every hour of irrigation. In the last season alone, he earned Rs. 30,000 to 35,000 from selling water and about Rs. 1 Lakh from selling roses.

Sustain Plus has supported Ranjit's family adopt improved cultivation practices by supporting a solar insect trap for pest management. Prior to this, every season his family used chemical pesticides 6-7 times every season. After investing Rs. 1000, the insect trap has reduced chemical pesticide application by one-third. The insects are attracted to UV lights and pheromones, trapping insects and preventing pest infestation. Other animals like Nilgai and boars are also afraid of the light and prevent crop loss.

# Cold Storage, Dahod & Panchmahal, Gujarat



## KANKADKILA, DAHOD (Sustain+)

The cold storage facility in Kankadkila was established in October of 2019 which is owned and operated by a farmer producer organization. The 6MT facility is being used to store the high value crops, mostly vegetables from around 150 farmers of nearby villages in 2-3km periphery, like Kankadkila, Mandore and Gangdifaliya. The facility is being used for around 15 days in a month on average basis with the maximum going up to 20 days in a month. As per our evaluation in 2021, average of 800 kgs of vegetables has been stored in the facility on a daily basis. In November itself vegetables like Brinjal, Chili, Cluster beans, Fenugreek, Flat beans, Garlic, Mint, Pigeon pea, Radish, Spinach, Sponge gourd, Tomato, Taro root were stored in the solar cold storage. Farmers use the facility to increase the shelf life of the seasonal vegetables and have also had a significant learning curve. Vegetables like sponge gourd and tomato are stored in lesser quantity as they are prone to discolouration and thermal shock. Some leafy vegetables such as fenugreek, mint and taro root leaf are kept in the facility for maximum days which prolongs to 3-4 days. Other vegetables are kept for 2 days on average basis. In summer mango is kept for storage for longer duration, last year, 2 ton of mango was kept and sold in the Bombay market which fetched the double price than that of the local market i.e., RS 120/KG whereas in local market it is sold at the price of around RS 60/KG. The FPO earns their revenue by charging farmers Rs 1/kg. The cold store has been used to store over 96,240kg of vegetables since October 2019 to December earning a revenue of Rs 96,240. On an average the cold store has been used to store over 3,500 kg of vegetable produce.