RECLAIMING SOILS REBUILDING LIFE

ACTION AGAINST HUNGER

Success Stories from the STFP Project

Land Reclamation through Saline Tolerant Fodder Production in Sindh Program

Action Against Hunger (ACF)

In partnership with Embassy of France in Pakistan and Sindh Agricultural University Tando Jam

January 2020

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PROJECT INTRODUCTION

Sindh's agricultural land is facing the debilitating effects of salinity and water logging. Pakistan Council of Research in Water Resources (PCRWR) revealed in a regional workshop in 2017[1] that about 53 percent of the total irrigated area in Sindh is suffering from their devastating effects. Since 1991, in addition to salinity due to irrigation practice, the coastal belt of Sindh has seen increasing sea water intrusion. The production of not only fodder but of all the crops has decreased significantly.

Leguminous green fodders have the quality of nitrogen fixation into soils, thereby reclaiming the soil. Given this, Action Against Hunger has implemented a soil reclamation program through promotion of salinity resilient fodder crops in Taluka Mirpur Sakro of District Thatta. The title of the programme was 'Land Reclamation through Saline Tolerant Fodder'. It was funded jointly by Action Against Hunger and the Embassy of France in Pakistan.

The project was completed in a location near to the coastal belt of Sindh: an area where salinity is playing havoc with the fertile lands, limiting earning and food security options for the local people. The land reclamation program was designed to combat salinity and thereby improve the livelihoods, food security and nutrition security of people from this area. It was designed as a pilot study with close involvement of the Sindh Agricultural University and the Agriculture Extension Wing, Govt of Sindh. The National Rural Support Programme also supported the programme through community facilitation.

In terms of the specific activities, the plots were identified through scientific research and community appraisal tools. All of the beneficiaries were women farmers whose socio-economic status indicated high levels of poverty. Each of these 22 women were provided with formal training, field level support, seeds and small funds to cover land preparation. The women farmers contributed in seed sowing, irrigation, weeding and harvesting. These seeds were open pollinated seeds identified with support from the Sindh Agricultural University from seed banks across Pakistan. The types of produce included both fodder and food.

While this was a short term programme, the learning has been extensive. These case studies are documented as part of the program to share learnings and successes of the program with relevant stakeholders. We hope that through this sharing, salinity control measures can gain strategic importance and action among the stakeholders.

[1]Daily Dawn, Sep 12, 2017

RECLAIMING SOILS- REBUILDING LIFE

Zarina, a 40 year old widow, is living in a thatched material hut in village Anb Ratto. She has 7 children, the oldest is a 12 years boy. Their village is located some 5 kilometers from Mirpur Sakro Twon in Thatta district, though it seems nearer to the town, but lacks even the basic amenities of life, such as the electricity, roads, safe drinking water, sanitation and the school.

Her husband died around 6 years ago, leaving her and the kids at the mercy of God. He died of a chronic blood disease. After the death of husband, her in-laws compelled her to leave the house along with kids. She once again moved into her parental family, who welcomed and gifted her one-acre piece of agriculture quite near to their hamlet.

Reflecting on the difficult days after her husband's death, Zarina said, "I had to live for the months on donations of food and other daily need-items from the neighbours. I faced extended hunger days too. This is how I spent last six years of my life. But I never left hope", she added.

Zarina was one of the 22 women farmers who agreed to partner with Action Against Hunger under its Saline Tolerant Fodder project to reclaim salinity-affected soils. This was a joint partnership of Action Against Hunger, Embassy of France in Pakistan, Sindh Agricultural University and the Department of Agriculture, Government of Sindh.

ACF provided quality seed and fertilizer and cash grant of PKR 30,000/- for land preparation to the female farmers enabling them grow green leguminous fodders. Zarina provided labour, ensured irrigation and provided her land.

Zarina led this entire process. She borrowed a tractor for land preparation using the funds provided by ACF. After, preparing the land, she mixed cow dung into the soil to kill the saline particles and make it suitable for growing fodder. Bio compost manure was also applied onto the soil, and later she grew Sesbania (Jantar), Egyptian Clover (Barseem) and AlfaAlfa (Lussan). She has got one harvest of Barseem, approximate to 5 maunds some 15 days ago. She was able to settle this in the nearby fodder shop in Mirpur Sakro at Rs. 350/- per maund. Based on the current irrigation water and weather, she can continue her yield for the next 3-4 months, in which time she would reap six harvests. That means she will get PKR. 10,500/- on an average from the fodder sale. She has also been using this fodder for her own animals, two cows and two goats, which is further reducing her household costs. She is very impressed with the outcome of what she terms as "nutritious fodder", as she says the milk production of my cow has also doubled.

How such a highly saline land could be reclaimed! I was very confident that it can't be restored for productivity, but ACF's assistance made me able to see these lush green grasses of Sesbania (***Jantar***), Egyptian Clover (***Barseem***) and AlfaAlfa (***Lussan***), ***says Zarina***.

"If I couldn't get that assistance from ACF, I couldn't reclaim my soil, that is the only asset we have for our income. Since, I belong to a farming family I plan to continue using this land in the future, maybe moving to growing red rice or other items as the soil health increases. By planting rice, I will be able to make an income, and feed my family. I won't raise my hand for getting donated food or ask someone to help. We will be able to lead a simple but dignified life", says Zarina.

CAPITALIZING ON LIVESTOCK

Sakina is a 36 year old woman, married to Mehboob in her early age when she was hardly 13 years old. She lives in village Ghaghi, Mirpur Sakro tehsil of Thatta district, where salinity has affected almost all of the agriculture land. We used to grow rice in our lands, when I was a child, she remembers. She lives with her husband in a small house, on two acres of land inherited from his parents. One acre is saline and one is partially saline. Sakina is a mother of three boys and three girls. Two of her girls go to the Madrassah, one is in school but will leave on reaching 5th grade as is the custom. Her boys go to the local Government school.

Sakina helps her family in many ways. She has two goats on a sharing basis. Milk is taken by her family, however, the ownership of goats is with another lady – comparatively better off than Sakina. She told us that in her area, in recent times women do not prefer to take livestock on sharing basis, the reason is insufficient food for the livestock due to salinity. She is maintaining only two for this reason.

The landowners rarely prefer to grow fodder crops as cash crops are more profitable. However, the declining trend of growing leguminous fodder is also one of reasons that lead to saline lands. It is a downward and negative cycle for communities like the one from which Sakina hails.

I used to have many goats but we sold them out because the land was not adequate to meet the fodder needs of the goat in our area. The trend of giving livestock on sharing basis is also on decline. People are keeping only that number of livestock that they can feed well, says Sakina. This means there is less milk for the household, and often we go without.

ACF's support came as blessing to all those marginalized women who were struggling with livelihood challenges. The fodder seeds and other assistance provided under the STFP project have proved to be successful to fertilise the saline lands. The cash grant helped them to prepare their lands, whereas the trainings and field level support helped them to expand their knowledge.

She has reclaimed her saline land now, wherefrom she gets the food for her goats. Looking at the good health of goats, the woman with whom she shares the livestock has promised her to give more goats on a sharing basis. "This will help me in increasing my income through milk and soon I will be able to have my own livestock", she spoke with hope.

Sakina anticipates continued fodder production from the land. To be able to further contribute to her family's income, she plans to get a micro credit from NGO or any other bank to purchase goats, as she has income from the sale of her fodder from this season.

FROM HOPE TO ACHIEVEMENT

50 years old **Ms. Shahida** is confident of growing red rice crop on her land in the coming year. Previous to now, this was just a dream as her land was severely affected by salinity. She has now reclaimed the land by harvesting leguminous multi-fodders and vegetables with the assistance of ACF.

Living in village Muhammad Ibrahim Pitafi, Taluka Mirpur Sakro of district Thatta, Shahida belongs to a Baloch community where females usually are engaged in household chores. However, since the death of her husband, she strives to provide her family's income. Her husband had been a daily wage worker and a small farmer with no savings. She has to therefore find an income to manage her family of 6 children. She survived only with the help of her four cattle. For that, she used to collect dry fodder and shrubs from the fellow lands nearby, and also used to buy fodder from the market.

In the village, shortage of irrigation water and improper drainage of agriculture water has salinized the land. The main irrigation source, the Narri Chhacha distributary, faces water shortages and extended closure periods, particularly during the winter season. Besides acute water shortages even affecting availability of drinking water, the village lacks a proper road. The lack of these facilities affect the villages ability to make a sufficient income to live.

With little more than one acre of land, Shahida has taken on the challenge. Telling her story, Shahida said that "Alfa Alfa (lussan) was first time introduced to us by the technical team

of STFP project, who motivated us to grow this fodder. In my vicinity, I am the first lady farmer, who has grown this crop and now many other fellow women and men farmers visit my plot to see how I have cultivated crops on degraded land. Now we are able to give nutritious and adequate fodder to my animals from our own cultivated land".

In addition to AlfaAlfa (Lussan), she is also farming millet and beetroot assisted through Action Against Hunger's STF project. Beetroot provides a nutritious contribution to the diet and can be sold at high prices in markets. Shahida has been taught how to retain the seeds/ cuttings to plant the same crops again next year. But she has high ambitions of growing other items, such as rice.

"I will grow red rice after completing the harvesting of fodder crops, as my land has regained capacity to produce food crops', says Shahida. 'I tried to grow chilies and tomato crops some two years ago, but they could not grow due to high salinity in the land. But this support has changed that", she informs.

REALIZING EXPECTATIONS AND SATISFACTION OF TENANT WOMAN

"When I was selected by my community to grow fodder, I had no hope about a crop growing in my saline land. It was ACF's significant support that made it possible", says **Sabira**.

Sabira is a 37 years old woman tenant, wife of Muhammad Azam. She married when she was hardly 16. The ACF's support package was like a chain, every part was associated with another, she adds.

Sabira did not attend school, because there was no functional school in the village for the girls. In spite of this, she handles family matters and her household income very wisely. She lives in a joint family with the parents and siblings of Muhammad Azam, her husband, in village Yar Muhammad Katyar tehsil Mirpur Sakro, Thatta district. She has two baby-girls, 3 years and 13 months old respectively. She also raised two little brothers of her husband, aged between 10-12 years while waiting to welcome a family of her own.

Since the last few years, salinity has taken increasing acres of land in her area. It has also affected the lands of her landlord. As the land deteriorated, the dues she owed to her landlord mounted. This was because she could not afford to return the money received to prepare the land and seeds each season. She had no option of another locality, and therefore was facing the prospect of ever increasing debt.

While thanking ACF, she informed that "we were supported financially to apply deep-

ploughing in our saline lands. We were supported with quality seeds. At that time, I had developed a small hope in that work. I was pretty sure that the seeds will not germinate. But it happened. It really happened. The seeds germinated. We were given training, we used organic manure and put in our efforts. And then we got the crop. The land is quite different from its previous state. We had made a time table about when to hoe our land, when to put out weeds, when to water it. We regularly visited our land while also tending to other plots under my care. but I had special love for this piece of land".

By selling the crop of fodder grass, she has been able to pay some major part of her family's debts. "The landlord is asking us to work on same methodology on some other saline acres of land. We are in a position of negotiation with the landlord."

Sabira looks forward to replicate this method on more acres.. She expects that if her economic condition is revived she will be able to educate her girls." Education is a great barrier to early marriage" she said.

HELPING OTHERS

Ms. Khadijat is a 38 year old married woman, living in the village Yaar Muhammad Katyar in tehsil Mirpur Sakro of Thatta district. Her family owns 25 acres of land, half of which is saline. She, with her husband, works there. She originally comes from a small land holding family that had a reasonable income. However, salinity has caused her family great disaster, some 20 years before there were only 2 to 3 acres of land that were uncultivable. Now it has multiplied many times. "Cash crops are on decline in our area because of salinity. Economic conditions are going down day-by-day", she said. She relates salinity with poverty very well. She said "Less cultivable land, more poverty". She is living in a joint family and her work-load is increasing day by day but their economic condition is not improving. She is losing hope.

"Our land was uncultivable for long time, we did not worked out any solution as it was filled with saline water," says Khadijat

Khadijat was always of the view that some acres which are partially saline can be cultivable if deep-ploughing was done. Reclaiming saline lands was quite an impossible idea for us when it was discussed, but the support package from ACF and our hard work made it possible, she said. The tools were of great help, because of them Khadijat could work more and made her plot a success. Khadijat associates her successful demonstration plot with trainings. She has taken on the knwoeldge and understanding very well. "By improving the plant environment, exploiting interactions between plant roots and bacteria and fungi, and treating the plant directly with organic fertilizers, it has become quite possible that our land is ready for cash crop now. The great yield of beetroot, Lucerne, sesbania and sesbania aculeate would have been quite impossible if plant environment had not been improved and nutrient composition and concentration in the root zone had not happened."

“We took a good crop of beetroot out of our demonstration plot. I am planning to grow rice on this one acre. We could not grow cash crops due to salinity and lack of support”, she said. The land is ready for another crop now, which can help her to improve her economic conditions.

Khadijat has made a plans with other women to work on saline lands by using the agricultural tools and the knowledge they have received from the training. She has started looking at life through a different lens. She does not stop on this one acre, she plans to replicate fodder cultivation on small parts of her land and those of others. This will take time due to the affordability and availability of such seeds. But she is hopeful that she can find technical support going forward to continue this reclamation with others from her community.

SUGAR BEET PRODUCTION IN THATTA DISTRICT

Among others, salinity and soil degradation are priority issues farmers are struggling with in Sindh, Pakistan. Salinity and water logging is turning fertile lands into desert like soils. Climate change impacts further aggravate the situation. The cultivation leguminous green fodders and vegetables are some of the better biological options to address soil salinity and get produce from the affected lands. One option among these is sugar beet which through this project has proven successful on moderate to highly saline lands.

Action Against Hunger (ACF), an international organization working to end hunger has found encouraging results of the growing sugar beet in saline agriculture lands of Taluka Mirpur Sakro, Thatta. They have established that Sugar beet plants have a high tolerance against salinity and they grow very well in Taluka Mirpur Sakro, Thatta. Mr. Zahoor Ahmed Palijo, Project Manager STFP of ACF while describing his experiences informs that "we are creating an enabling environment where farmers should grow valuable and resilient crops not only to earn income but also address salinity as well through biological methods". He said "through the use of open pollinated seeds and organic fertilizers, the women we work with have successfully grown sugar beet in 15 villages of Taluka Mirpur Sakro".

Dr M.M Syed in his research article on Sugar beet has scientifically justified that the tops of this crop are also useful as green manure. Tops from one hectare add about 100 kg nitrogen to soil. Fresh or dried beet pulp, after extraction, can also be used as cattle-feed. Also, sugar beet molasses are a rich source of lactic acid and vitamins. These are used in many pharmaceutical preparations.

This area is part of the deltaic region, where due to sea intrusion, soils are highly exposed to salinity. As part of the project, soil scientists of Sindh Agriculture University Tando Jam conducted an empirical research on the soil characteristics and suggested plantation of bio-saline crops, including the sugar beet. The study revealed that prevalence of salinity is very high in the areas, particularly near to the coast. Biomass Techniques were also used for the assessment of yield per acre. Biomass production by this plant species was found to be directly proportional to their reclamation efficiency, SAU report reveals.

Leaves of the sugar beet plant are very nutritious for fodder, whereas the usage of fresh beets should be avoided as fodder, Mr. Marri suggests. Thatta's soils can produce approximately 800 to 1000 mounds sugar beet per acre, if farmers take interest and care of their crops. To get good yield, this crop should be sown from 15 October to 15 November.

Farmers from village Yaqoob Amro and Yar Muhammad Katyar informed that this is the first time they have grown this crop. They have made accessible these plots to motivate other farmers as it is grows very well in saline soils. It needs a good tilth for which necessary plowing, planking and leveling should be carried out, they said. Depending on the method of sowing, flat beds or ridges 10-12 cm high and 50 cm apart are laid out before sowing.

Mr. Zahoor Palijo further said that they have not observed pest attack on the sugarbeet crop in Mirpur Sakro. This shows this belt's environment is conducive for the cultivation this crop. He adds that this crop is also important in terms of its nutritional values. Since, malnutrition is another issue the population of this area that could also be addressed through commercial production of this crop.

Trend of cultivating sugar beet has not yet taken root in Sindh. Its market as a cash crop has yet to be established. In view of the salinity issues and increasing water scarcity in the province, the government could take efforts to promote this crop.

Marketing networks and industrial units should be established nearer to the farm areas in Thatta and farmer capacity building program should be launched to promote commercial production of sugar beet, says Agriculture expert Mr. Ali Hassan Marri, Senior Scientist at Pakistan Agriculture Research Council

REGAINING SOIL FERTILITY

Sindh's agricultural land is being affected with salinity and water logging. There are many reasons for this – underlying low quality soil, low precipitation, depleted underground water table, mono-cropping culture, absence of an efficient drainage system and increasing temperatures. All of these lead to reducing agricultural productivity and the household incomes of farming families, who are solely dependent on their lands.

Salinity related issues leave the worst impacts in many parts of Sindh, especially in the coastal areas due to sea intrusion and other climatic conditions. Some studies undertaken by the independent organizations[2] inform that around 41% of cultivatable land (2.11m ha of Sindh's total 5m ha cultivable land) is now hit by salinity. Farmers are facing food and nutrition insecurity. The coastal waters have high salinity (Regional Plan of Left Bank of Indus Delta by SIDA, Phase III report, 2012) due to high evaporation rates, combined with negligible rainfall.

Action Against Hunger (ACF), an international organization working to end hunger through innovative approaches launched a land reclamation project in Taluka Mirpur Sakro, Thatta. This programme intends to regain the fertility of soil through demonstration and promotion of leguminous green fodders, that have the capacity of nitrogen fixation into the soils. It involved equipping small and poverty-affected female farmers with the provision of cash grants, quality open pollinated fodder seeds, bio fertilizer and land management training. Through the project, 22 females

[2]Regional Master Plan, appeared in daily Business Recorder 26 Aug 2016

have reclaimed their saline lands and grew fodders. Most of them now have plans to cultivate food crops in this reclaimed land, such as red rice and vegetables.

ACF conducted an empirical research on soil fertility analysis in collaboration with Sindh Agriculture University Tando Jam, to assess soil quality and the amount of the salinity that affects crops. On the basis of research findings, scientific efforts were stepped in for the selection of appropriate green fodders that could help farmers regain soils. The study revealed that prevalence of salinity is very high in the areas, particularly near to coast. Biomass Techniques were also used for the assessment of yield per acre. Biomass production by the plant species was found to be directly proportional to their reclamation efficiency, SAU report reveals.

Through the scientific demonstrations, some 25 acres of land that was highly affected by salinity were successfully reclaimed in 20 villages of Taluka Mirpur Sakro. The crops include Egyptian clover, AlfaAlfa (Lussan), rhodsgrass and Sasbania. Salt tolerant food crop Sugar beet was also demonstrated. Sugar beet is a popular root vegetable used in many cuisines around the world. Beets are packed with essential vitamins, minerals and plant compounds, some of which have medicinal properties.

“How such a highly saline land could be reclaimed! I was very confident that it can’t be restored for productivity, as I tried many crops, but failed”, says a 45-years old widow Ms. Zarina, who lives in village Anb Ratto, nearer to Mirpur Sakro Town. After having soil reclamation of her piece of land, she plans to grow red rice and wheat in the same lands, as it has regained fertility. There are 21 more similar women, who are also confident of cultivating other crops on their reclaimed soils.

This project was a successful partnership of academia, civil society, Government departments and communities. It lays the groundwork for further problem solving for communities affected by salinity in Pakistan and around the world.

SALT-TOLERANT FORAGE CULTIVATION ON A SALINE-SODIC FIELD FOR SOIL RECLAMATION

Mother of 10 children, **Hawa**, 50 years old, living in village M. Ibrahim Pitafi, Taluka MIrpur Sakro, Thatta, is one of the beneficiaries assisted by the Saline Tolerant Fodder Project of Action Against Hunger. She has successfully reclaimed her saline-sodic affected piece of land recently. "The humble assistance of ACF enabled me to grow grasses on the land, that was abandoned for almost ten years", says Hawa.

It is very much a communal effort. "My brother-in-law, Sikandar, helped me to water the field at night time, when there is water available. There is none during the day. It was not possible for me to water the crop at night time and go to the fields", she informs.

Many experts and farmers believe that the reclamation of saline-sodic soils through chemical treatments is a cost intensive method. On the contrary, bio saline agriculture techniques are not only cost effective but environmentally friendly too. Cultivation of saline and sodic tolerant crops enables plants to mobilize calcium carbonate, the chief component of limestone. This is a widely used amendment to neutralize soil acidity and to supply calcium for plant nutrition.

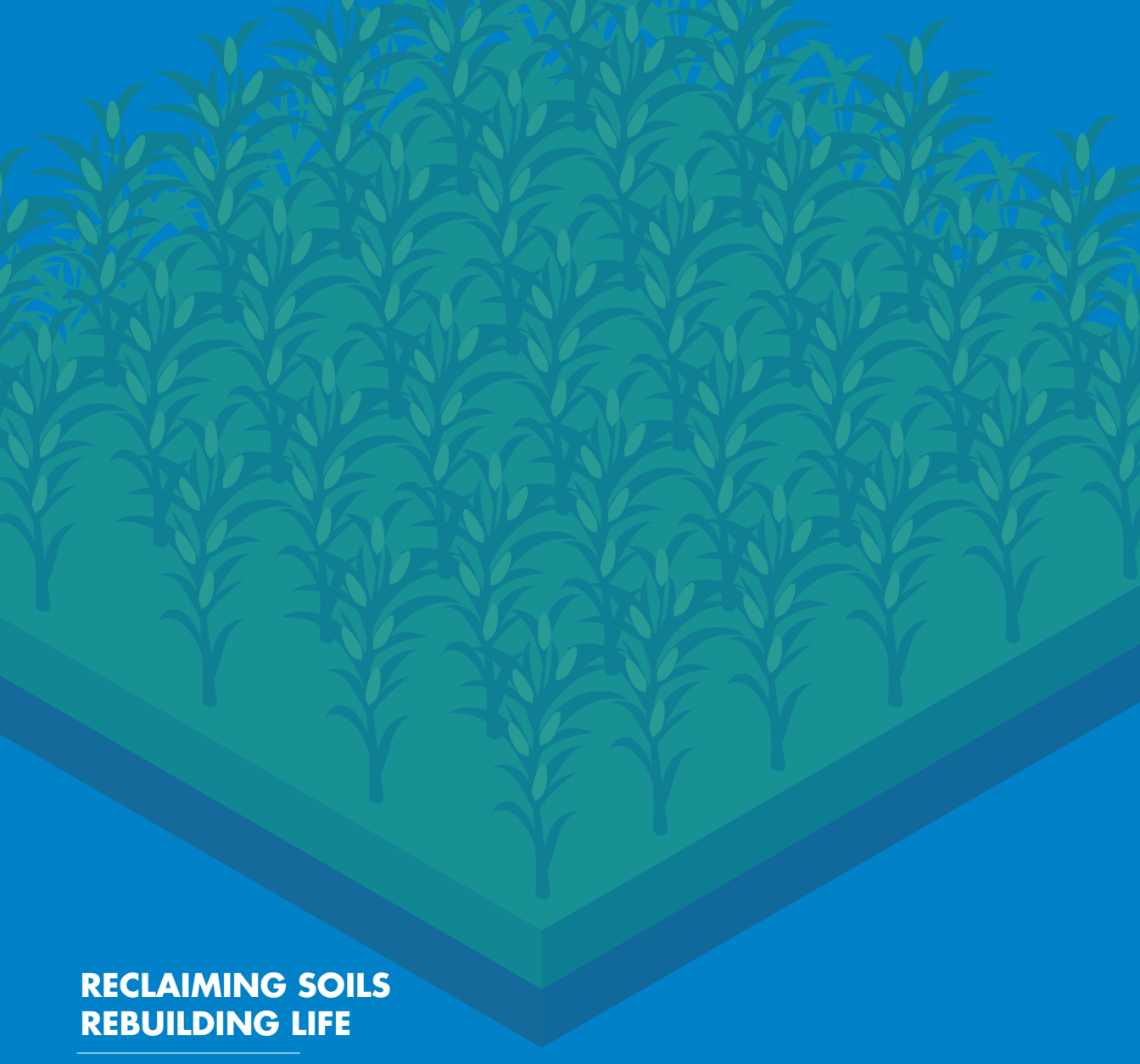
In the village, there is around 200 acres of agriculture land that is mostly saline and faces irrigation shortages too. Hawa, herself irrigated her one acre piece of land through lift machine from the Chachhi Naali (A water course of the village).

The training on saline agriculture has built her skills in understanding crop cycles as well. She says at least 3-4 cycles of Barseem/Clover cultivation would be required to completely

rehabilitate the land, as it is not only saline, but sodic as well. “Based on the recommendations of the ACF team, I have grown clover, AlfaAlfa (Lussan) and also Rodhgrass on my land. All have grown very well. This was a surprise for me as I tried to grow clover in 2019 but it did not work. Later ACF’s team advised me to use that clover as green manure on the land - that I did. Now I have reaped a further one crop of clover and I am expecting 4 more harvest this season. The production is also very good”, she adds.

ACF’s STFP project team has taken all possible measures. Biomass production by the plant species was found to be directly proportional to their reclamation efficiency.

Now, in the village the trend of cultivating clover and AlfaAlfa is taking place, as farmers have witnessed rapid recovery of saline lands through green grasses cultivation. It is an encouraging results achieved by ACF. However, the results need to be promoted at larger scale to motivate farming communities, agriculture departments and other relevant organization take forward the agenda of soil reclamation in Sindh to end hunger and perpetuating poverty.



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