Promoting Sustainable Agriculture, Agroforestry and Livelihood Enhancement in Thar Desert, Rajasthan

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1. Background

In the western part of Rajasthan State lies the extensive Thar Desert - which is covered in rolling dunes of sand for almost its whole expanse. It is noted that the annual precipitation in the north-eastern part of Thar is 200 mm to 300 mm; where, it has dry fauna with temporary vegetation during rainy seasons. However, in other regions of the Thar Desert, the amount of precipitation and vegetation continues to decline further. Due to this situation, the local residents rear pasture animals and grow single crop during rainy season. Being an arid area, the rainfall varies each year and income is not stable. Further, the residents are socially isolated as they reside in nearly 500 villages scattered around the desert with limited communication and road connectivity. Moreover, the desertification is noted to increase exponentially (JICA, 2003 [1]); which, impacts existence of several villages and makes its infrastructure severely fragile.

Agriculture of the region has been adversely affected due to erratic rainfall, desertification and decreasing arability of existing soil. Sankalp Taru (ST) Foundation recognized the need to work with rural communities to slow down on-going desertification and provide sustainable means of livelihood. ST Foundation are pioneers in creating socio- environmental impact in the areas identified as critical based on their self- sustainable and livelihood supportive ecosystem models. In this case study, a collective action model that integrates rural farmers, village panchayat and government schools was proposed and implemented amongst the village communities of Barmer district of Thar Desert, Rajasthan. It is important to note that success of project was dependent on engaging these key stakeholders, as the land for planting trees would be provided by them. Therefore, there was critical need for equally involving them in key decision making processes – beginning from selection of trees species, identification of beneficiaries and project monitoring. Further, it was emphasised that planted trees should thrive and survive, making it critical to engage the community in nurturing and upkeep of planted trees. A strong engagement with these entities would ensure

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1. JICA, 2003.India Afforestation and Pasture Development Project Along Indira Gandhi Canal. Field study report. Accessible at: https://www.jica.go.jp/english/our_work/evaluation/oda_loan/post/2004/pdf/2-41_full.pdf

development of enthusiastic and self-sustainable model, resulting in higher survival rate of trees typically in the tune of more than 95%.

ST started this project with an aim of improving local ecological and socioeconomic conditions of rural population in Barmer region. The programme was designed to improve local livelihood option by increasing production of fruits, firewood and fodder along with conservation of biodiversity by planting native species. This would aid in converting barren land into viable livelihood options and thereby contribute in alleviation of poverty in the desert region of western Rajasthan State region.

Broadly, these can be segregated in two categories of goals:

a) Environmental goals:

- Increase green cover in rural areas of Barmer, Rajasthan, compared to baseline areas

- Increase the biodiversity index of the study region by planting native tree species

- Optimize available water resource and promote adoption of sustainable agricultural practices

b) Socio-economic goals:

- Improve livelihood of marginal farmers by identifying agro-forestry based livelihood options

- Identify ways and means of using barren land to earn livelihood

- Promote women empowerment in rural areas by promoting tree plantation and maintenance

- Engage youth and students in tree plantation activities and promote environmental education in local government schools

2. The Operational Model

ST, with support of local community and corporate donors, adopted following operational model to promote successful adoption of sustainable agriculture and agro-forestry in Barmer district, Thar Desert, Rajasthan for livelihood enhancement of marginal farmers:

Community plantation: ST Foundation plant trees in community (Panchayat) land and create an ecosystem involving community members who help in growing and nurturing trees in long term. Through this model, a community forest is developed to promote bio-diversity by planting native

species and to create a natural habitat and empower women by improving their livelihoods by training them on producing allied agro products

a) **Rural livelihood support programme:** Under this approach, ST Foundation plant trees in farmers' land in rural areas, where ST works with the farmers and provides them with fully grown fruit bearing saplings, micro-drip irrigation system and other planting material. ST Foundation trains beneficiaries on sustainable farming methods giving rise to sustainable and engaging programme in long term. Once grown, these medicinal and fruit bearing trees act as source of livelihood for the beneficiaries

b) **Clean and Green school programmes:** In this model, trees are planted inside the school campus. School students and teachers are involved in the plantation activity and use interventions such as workshops, educational movies, practical training to achieve a self-sustaining ecosystem. They develop a sense of responsibility among school community so that they nurture planted trees in long term.

3. Interventions

ST aimed to achieve its objectives by using agro-forestry techniques with large consensus and participation of the benefiting community, including rural farmers, panchayat and students. This was identified as key to achieve higher survival rates of planted tree sapling in the region under consideration. Following intervention areas have been adopted by ST.

3.1 Agro-forestry

According to Food and Agriculture Organization (FAO, 2015[2]), agro-forestry is defined as "a land use management system in which trees or shrubs are grown around or among crops or pasture land. It combines shrubs and trees in agricultural and forestry technologies to create more diverse, productive, profitable, healthy, ecologically sound, and sustainable land-use systems".

In case of arid climate, it can play a significant role in mitigating the effect of variable and harsh climatic conditions that continue to impact crop production. It was identified that through successful adoption of agro-forestry techniques, the soil fertility can be raised, followed by improvement in crop growth and achieving sustainable production of food, animal fodder, fuel, and several other products for day-to-day utilization on farms like compost, medicine etc. In addition, the productivity is assured even in periods of persistent drought and famines that are not infrequent in these dry regions. According to recent report by Tewari and Singh (2006[3]), agro-forestry can aid

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2. JICA, 2003.India Afforestation and Pasture Development Project Along Indira Gandhi Canal. Field study report. Accessible at: https://www.jica.go.jp/english/our_work/evaluation/oda_loan/post/2004/pdf/2-41_full.pdf

3. http://www.fao.org/forestry/agroforestry/80338/en/

in increasing production of food due to i) introduction of fruit and fodder producing trees and ii) increased soil fertility resulting from the organic matter produced by deciduous tree organs. It is important to note that more products and services provide opportunities of higher income and reduce dependence on high doses of fertilizers and other subsistence products.

During the project, following interventions were proposed by ST for agro-forestry:

1. Focused group discussions and awareness drive to encourage horticulture based farming. Through these, farmers and community members were encouraged to plant pomegranate and pear saplings.

2. Tissue culture saplings (TC) were introduced in rural farm and community land. The plant tissue culture technique involves development of mature plant cells under sterile conditions and its replantation in actual field later on. It is widely used method to produce clones of a plant and offers certain advantages over traditional methods of propagation. It is noted that these plants can generate high yield, have a low gestation period, are resistant to diseases and are easier to transport, making this a revolutionary idea as it encourages high participation and enthusiasm amongst the farmers.

3. Farmers in most parts of Rajasthan have to cope with severe water deficit and degraded land prone to rapid top layer depletion because of intensive cultivation. The soils could not retain moisture and were deficient in soil nutrients and organic matter. Therefore, through micro drip irrigation systems, ST ensured sustainable use of water and fertilizer. Drip irrigation is a form of irrigation that saves water and fertilizer by allowing water to drip slowly and directly to the roots of many different plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. At ST high quality micro drip irrigation systems by Jain Irrigation System is used that can sustain the arid conditions of the region, again encouraging higher participation and enthusiasm amongst the farmers.

4. ST interacted and consulted with prominent agronomists in India to develop an in-depth understanding of the geographic and socioeconomic condition of region to aid successful delivery in later stages. Under their guidance, ST is able to include research-based interventions, which develop and sustain the local ecology of the area. One such intervention is intercropping, where farmer's plant pulses in-between pomegranate and pear saplings. These fast growing pulses help farmers survive economically till their plants gestation period is over (2-3 years).

5. The approach adopted by the Foundation is that of *permaculture* (or *agroforestry*), in which ST provides well-grown fruit bearing saplings, fertilizers and pesticides to the farmers. Maintenance of trees is

undertaken by the farmer owning the land and they are regularly advised and monitored by ST's on-ground representatives. The beneficiaries enjoy sustainable returns and gain horticultural skills.

3.2 Community Involvement

Emphasis on community involvement is laid during programme development, as ST believes that higher community involvement would result in higher survival rate of trees. Following steps are taken to plant trees and involve community members in key decision-making processes of the programme.

A need-assessment survey is conducted before deciding if the area is suitable for plantation. This survey assesses the land area, distance from major cities and roadways, land fertility, project complexity and community participation expectations

Community meetings/farmer meetings are conducted where the idea of afforestation is conveyed to the locals. This process plays a key role in determining if the project will be successful on ground as equal participation from the community is expected.

After creating excitement amongst the locals, the following steps are taken:

Step 1- Identification of Land

After the initial discussion, interested farmers and panchayat heads join hands with ST to conduct afforestation programme for a duration of 2-3 years. The beneficiaries are carefully selected using a set criterion to maximize socio-environmental impact of the programme. Their suggestions along with ST's technical support pan out the next steps of the programme. Resources are leveraged mutually from both parties to make this model sustainable. ST works on a co-investment model where 10% of monetary investment comes from the farmers while the remaining is invested by ST. Through this approach ST has continued support throughout the programme as farmers engage in nurturing the plants till their gestation period is over and they can enjoy the fruits of their harvest.

Step 2- Selection of species

Fast growing, native species with high productivity are recommended for restoring the lands in order to increase productivity and enrich biodiversity. ST also proposes to engage local community members in the selection of species. Based on the analysis of existing vegetation in the area, ST proposes to plant certain species of trees that are suitable to grow in the terrain. However, to produce fodder for livestock they also propose to plant Khejri (botanical name - Prosopis cineraria) trees. Khejri is also considered a religious plant in the area whose growth would generates good will in the

community and helps execute the project smoothly. They intend to procure grown saplings (more than 1.5 years old) to maintain a healthy survival rate and quick growth. These saplings are procured from the local nurseries, creating good will in the local community and minimising transport cost.

Step 3- Plantation programme

ST carries out the project in Build Grow Transfer (BGT) model, where ST will develop the site, plant saplings, maintain the planted block with the farmers for agreed upon period (preferably for 2-3 years) and transfer the developed green block to local community/farmer. In order to create rural employment, ST also employs resources from the local community to carry out plantation and post plantation care. They also undertake fencing of the planted block and engage/mobilize locals to ensure further protection-making the entire plantation process community driven. Along with this, ST also conducts community programmes throughout the duration of the programme. Through these interactive workshops, farmers are taught about latest and organic farming techniques while training them on making their own fertilizers like vermin-compost. These workshops are another way of connecting with the community and creating a self-sustaining ecosystem where locals take responsibility of the trees and their protection.

Step 4- Clean and Green School programme

As mentioned above, community involvement is key factor in making this programme successful. Through the Clean and Green programme, ST connects with students and teachers and promote greenery while using interventions such as workshops, educational movies and practical training to create a healthy ecosystem. They try to develop a sense of responsibility among school community so that they nurture planted trees in long term. ST believesthey are shaping young minds of tomorrow while connecting with the entire local community including students.

4. Proposed Innovations
## 4.1. IT Framework

ST aspires to bring transparency and visibility to the whole plantation programme. An online portal and a mobile application (ST G-1 application that can be found on Google Play Store) were developed to enable individuals and corporate participation in community plantation projects. These portals aimed at channelizing the support from key stakeholders by providing a transparent and user-friendly platform where survival of trees can be tracked using a GPS tracker.

It can be noted that a live dashboard enables donor partners to effectively manage their CSR programmes. ST's unique mobile application module further enables rural ground operations team to capture photos and GPS coordinates of the planted trees and share instantly with the respective planters from the village itself using a 2G mobile phone network. While adopting ICT brings more transparency, visibility, excitement and automation to the whole process, our operational excellence ensures higher survival rates of planted trees.

The key features of ST's IT framework for individual and corporate donors have been underlined below:

*Figure 1: SankalpTaru Online Platform Connects Sponsors and Beneficiaries*
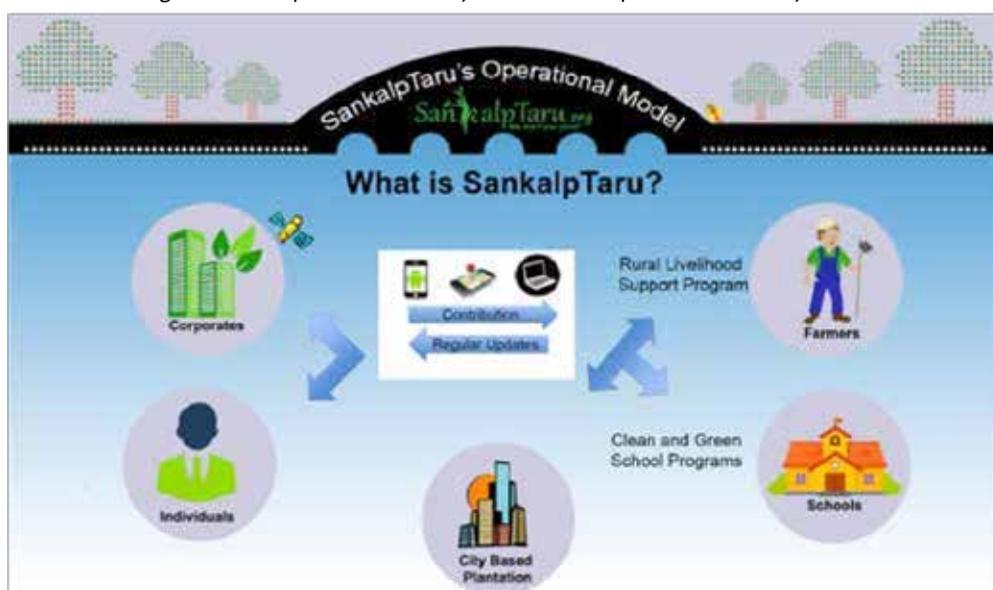
Individual planters (Application Users)

• Individuals across globe can conveniently make significant contributions planting trees at any of our project locations with just a few taps and clicks on their mobile phones or desktops. They can plant an E-tree in a virtual forest using phones and computers, through 'ST G1' application; while an actual tree would be planted on ground in a rural village supporting livelihood of marginal beneficiary or supporting community as a whole.

• Individuals can wish, gift, greet, celebrate or commemorate by planting trees.

• It provides opportunity for building connection with community linked with the on-ground live tree plantation

- Individuals will receive regular notifications regarding the trees planted via emails. One can locate, visit and even navigate to their trees on Google maps plug in.

Figure 2: Representation of the ST G-1 Application
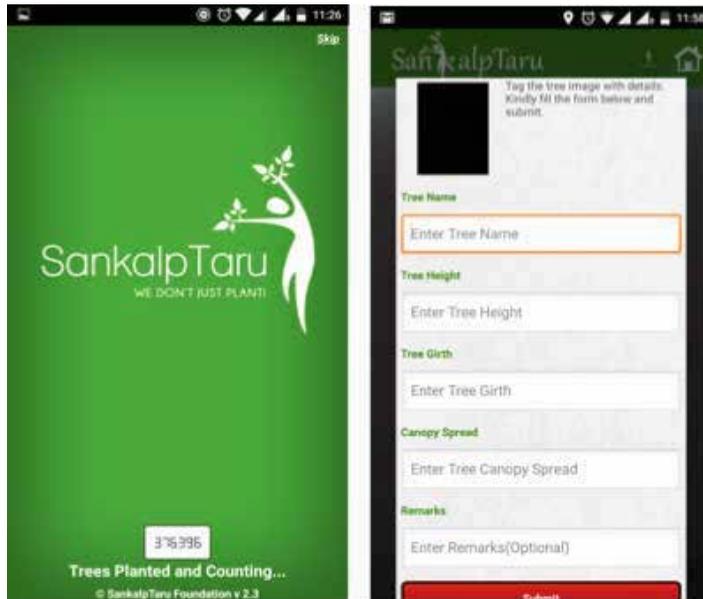
- Provide an estimate of Carbon footprint saving by the individual and help in fulfilling an individual's carbon footprint projects On ground application team (Application Users)

- Every time an E-tree is planted by a user, ST's on-ground crew team deployed at the project location receives a notification on his phone, which has ST G1 application installed. A tree is then planted on ground by the programme beneficiaries or students, depending upon the project location and socio-environmental theme of the location

- User friendly platform which enables on-ground team to easily upload photographs and videos of activity

- Automated updates to participant via emails provide transparency, clarity and closeness to the planter far away.

- Through the application, the on- ground team provides regular post plantation updates to the planter.

For corporate sponsors such as ATC TIPL (Viom Networks), Google, Honda etc., the trees are photographed and tagged on the same application and the information is uploaded to the corporate's mini forest (Figure 4). The link is later shared with the sponsor who can now view and track the status of their programme.

ST also offers dashboard system to track, report and manage these plantation programmes. These efforts not only bring in transparency but also provide convenience to corporate sponsors to monitor the plantation programmes.

Figure 3: Representation of virtual forest

Figure 4: Corporate Dashboard to Track Planted Trees and Beneficiaries
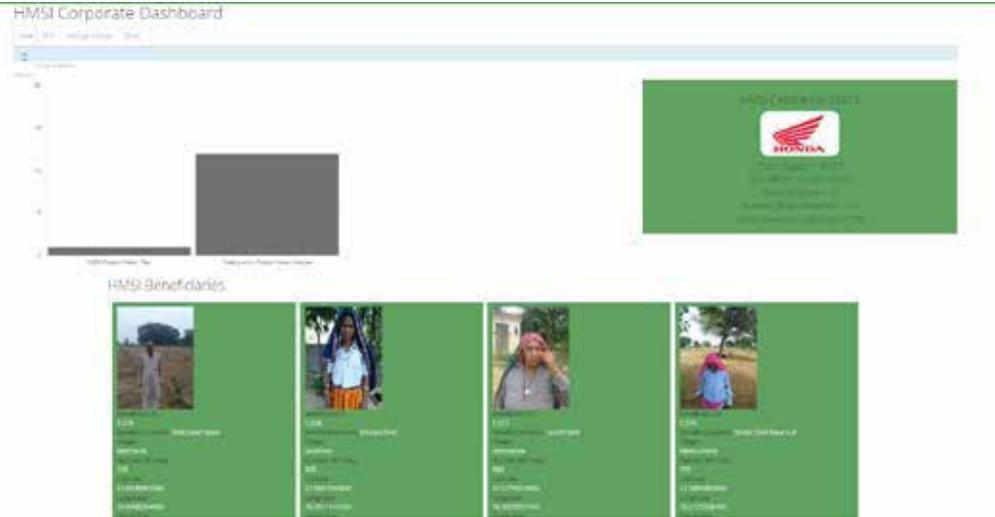
4.2 Innovative Water Management Techniques

Given the severe water deficit in the area, several cheap and innovative water management techniques are used to rejuvenate water table and promote efficient usage of water:

Introduction of micro-drip irrigation system

Drip irrigation saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly to the root zone, through a network of valves,pipes,tubing, and emitters. This method is chosen instead of surface irrigation for various reasons, often including concern about minimizing evaporation and optimizing water usage. As Barmer experiences shortage of water and high temperature, using drip irrigation systems promotes higher survival rates of plants

Gravity run drip irrigation System

A gravity fed irrigation system is a cheap effective way to provide water for smaller crop areas. The basic system is very simple consisting of an elevated reservoir with a pipe coming out the bottom that feeds water into a basic drip irrigation system that is all controlled by hand. This makes for a popular choice, as it is affordable for marginal farmers with no additional electricity cost attached to it.

Harvesting rainwater from school rooftops

Another effective and low cost innovation is rain water harvesting from school rooftops, which catch rainwater and store it in underground or above-ground tanks for later use. One way to collect water is rooftop rainwater harvesting, where any suitable roof surface can be used to intercept the flow of rainwater in combination with gutters and downpipes (made from PVC in this area) to provide schools with water. This model was implemented in schools where Clean and Green programme were conducted and it generated successful results. Through this they were able to collect water for irrigation and domestic purposes.

Solar powered bore wells

Given the extreme temperature and prolonged hours of direct sunlight, solar power bore wells were a success in Barmer. The solar water pumping system is capable of running all types of electrical water pumps with applications varying from irrigation to household demands, we use these pumps to draw water from the bore-well and irrigate the fields using drip irrigation.

5. Impact – Triple Bottom Line Approach

ST has been instrumental in going beyond a typical tree plantation programme and creates multiple benefits to the environment, village

community including farmers and school students. St has developed a customized impact assessment matrix in close-ended questionnaire format to estimate Environmental, Social and Economic impacts of the intervention (Annexure I) and summarized in subsequent sections.

5.1 Environmental Impact

Plantation programmes have been developed to meet the needs of farmers and with the main objective of protecting biodiversity.

- Environmental sustainability is achieved by planting various native species which increases the biodiversity index. Increase in green cover enhances the growth of natural eco-system creating a natural habitat attracting wildlife species. In addition to increasing the green cover, the project aims at stimulating a community participation driven ecosystem which works towards nurturing plant species, restoring and managing the forest block without disturbing the natural vegetation.

- Topographically, problems associated with water conservation and land deterioration are high. Barren land which remained un-utilized for years, served as a source to restore/rejuvenate the water table as trees helps in maintaining the soil moisture leading to lesser evaporation.

- To overcome the problem of managing water resources, technical and management strategies were developed. Water bodies were rejuvenated by improving the catchment area to harvest rain water which could be further used for livelihood activities including irrigation.

Table 1: Impact

Environmental Impact	Year 2016
No. of Trees planted	100,000
No. of plant species planted	50+
Water bodies revived	4
No. of green schools	110+
Barren land greened	120 hectares

Mechanism to track environmental impact
The IT platform helped ST to track real time environmental impact as trees are geo-tagged.

5.2 Social Impact

ST's multi-facet approach revolves around creating a wide social impact which goes beyond a typical plantation programme adding benefits to the

communities. The green belting project has brought numerous advantages to the biodiversity of the entire region, and the local populations has not only economically benefitted but also have secured livelihood by being engaged in long term employment and sustainability.

Rural employments have always been a social and economic problem. With increased focus on community participation ST has been able to successfully create a self-sustaining eco-system where every villager feels responsible to take care of the plantation blocks.

The increase in agricultural activity by implying the identified agroforestry techniques has created more employment opportunities and alleviation of poverty.

The beneficiary screening processes have always given marginal farmers first preference; bringing maximum socio-economic impact. Given the social obligations, women empowerment has been generated promoting gender equality as they are now allowed to work in their own farms and community and help generate additional income for their families.

The Clean and Green school programme running under ST's ward has been quite successful as well. There is an improved participation from students in nurturing trees planted in their campuses. Eco-clubs have been formed consisting of students and teachers, Maru Vatika (Desert Garden) have been developed where students take lot of interest to grow and nurture desert species

Table 2: Social Impact

Social Impact	Year 2016
No. of farmer beneficiaries	200
No. of family members supported	1000
Students engaged	10,000

5.3 Economic Impact

With ST's focus on agro forestry based plantations, they ensure a good income generation source for the rural beneficiaries. An average family in the Indian arid zone comprises of 7 to 8 members with large land holdings and livestock heads. Although traditional land use systems like mixed cropping, agro forestry are common, the land use system in the arid zone of Barmer, Rajasthan have evolved under different socio-economic and cultural set up.

- Farmers predominantly grow Bajra, a rain fed crop for just 4 months and earn from its yield. To provide extra source of income to the small and marginal farmers, through agro forestry and horticultural techniques, fruit bearing saplings (pomegranate) were provided to the farmers. The fruit production generated another source of livelihood.

- Through agro forestry techniques, ST was able to increase green cover in Barmer by planting 100,000 trees of native origin while increasing green cover by 120 hectares. By providing micro-drip irrigation systems and by optimizing water usage, more barren land was brought under irrigated cultivation than otherwise possible. The afforestation programme has increased productivity of pulses and vegetables as intercropping techniques are used; allowing multiple harvests of grain and fruits which were otherwise not possible.

- Training on intercropping, organic farming, composting and cultivation of non-timber based forest products (such as Fodder cake of babool and neem, Ayurveda products made of neem) were also given, so farmers were able to practice integrated farming while producing supplementary products to support their livelihoods. In community based plantation, these fodder cakes were also used to increase milk production in cattle and generate additional income.

The project provided a windbreak and a more acceptable and enjoyable ambience for living. The afforestation project has contributed positively towards increased income generation and employment. The success of the project has also been acknowledged by the Indian Institute of Corporate

Affairs under the SD-CSSRR programme 2014-2015 "Community plantation project at Thar Desert". Also, it made a notable increase in annual collective income of INR 33 million.

In addition, impacts in Thar Desert have been exhaustively covered by print media.

The national agency working on corporate responsibility and governance, Indian Institute of Corporate Affairs (IICA), has continued to support ST's work:

6. Challenges

Similar to any development projects, this project was also initially affected by several challenges during pre-and on-ground implementation. These were mainly related to reforestation goals, site characteristics, factors limiting survival and growth, appropriate species and genetic source, proper planting tools, and the best out planting season etc. During the planning and implementation phase, appropriate steps were taken to control following

challenges and promote afforestation in the study area. The key challenges have been summarized below:

- Barmer is an arid, drought prone area with acute water shortage, making scarcity of water the biggest challenge while promoting afforestation projects. The district receives just 270-300 mm of rain annually, which is spread roughly across 15 days. Hence, to retain this water and overcome water scarcity challenges, ST promoted adoption of robust rainwater harvesting techniques to store rainwater for domestic and irrigation purposes.

- Extreme temperatures in Barmer also attract insects and pests, such as termite that are present in large quantities owing to easy infestation in wooden material in arid environment. It is observed that these termites can cause substantial damage to grasses, shrubs, trees and crops, which will render a huge economic impact on marginal farmers. Therefore, there is a need for appropriate scientific/technical interventions that aims to educate locals for adopting appropriate preventive and curative actions.

- Increasing green cover by involving local community in planting trees using agro-forestry techniques was a challenge initially, owing to prevalent and traditional practices of people. Several initiatives in the past have been aimed to promote afforestation and greenery in western part of Rajasthan but have been mostly limited to plantation of Babool (*Acacia tortilis*) with minimum benefits to the associated communities. Given their past experiences, locals were hesitant towards change and adopting agroforestry techniques to plant native plants that could grow in the area but were not growing given the invasive nature of Babool plantation. Several community meetings were conducted to overcome this mental block and promote greenery by planting native plants.

- Similarly, given the communities past experiences, locals lacked confidence in the project and expected it to fail at an early stage, generating minimum participation to sustain and maintain afforestation programmes. Community and farmer confidence was slowly built over time as the trees weathered the harsh climate and still sustained themselves.

- Despite being given key roles in local-level planning and management, in reality, there may be low actual involvement of local communities in PRI decision-making processes. This made it a challenge for ST to understand the underlying local issue and device a sustainable plan to help the problem.

- Clear property rights regimes were of utmost importance while executing afforestation projects on ground, making it a challenge as community members were reluctant in signing a NOC (No Objection Certificate)

  with ST to execute the project on-ground. After many discussions and confidence building, this exercise was accepted by local panchayat heads.

  Local students are very enthusiastic about tree plantation and promoting greenery, however, they lacked the resources to do so. Lack of water is a major issue, additionally; unavailability of monetary funds is also a challenge. Through ST's clean and green school programme, the students are being given the resources they need to promote greenery in their vicinity.

- Women of Rajasthan are often viewed as an economic liability in their natal home and a burden in the marital home. No monetary remuneration for women's household work, lack of control over money generated or earned by them and lack of negotiating power have contributed a great deal in the perpetuation of a negative image in family and society. It is now widely acknowledged that women are being pushed into the informal sector and are engaged increasingly in low skill and low paid occupation. There are few opportunities for women to move into non-traditional occupations and even if such an opportunity is available, they cannot take advantage of these opportunities on account of family and societal restrictions. To address this challenge, ST encouraged women beneficiaries to participate in afforestation programmes that could be conducted in their barren fields, aiming to promote greenery while promoting women empowerment by giving them sustainable livelihood options.

7. Scale and Sustainability of Programme

Unlike any other typical forestry projects, ST provides planters transparency and visibility in tree plantation activities, making this programme unique and rewarding. They closely work with marginal farmers, village communities and government schools where trees are being nourished and grown. During this process, they aim to generate a sense of ownership amongst these farmers, village community and school children to make the whole project self sustainable in the long run. They believe that a higher survival rate of trees can be achieved if local resources are engaged and mobilized during programme management. It can be noted that social impact of afforestation programme can be increased through provision of larger employment opportunities, especially among women, through large-scale community participation.

On the other hand, the clean and green school programme can aide in developing environmental consciousness among children as they would be torch bearers of maintaining the existing bio-diversity in the future. In terms of the environmental benefits, when a sapling grows into a tree it not only

helps to create a natural eco-system but also act as carbon sink and supports in mitigating impacts of large scale global warming. Further, produce of afforestation is reaped by marginal beneficiaries as an incentive that helps in reducing poverty and providing additional source of livelihood to the families.

It is important to note that this afforestation and community engagement model is "plug_and_play" in nature, where, it can be applied in other geographies with high deforestation levels. ST is currently applying this model in the cold arid desert of Leh (Ladakh) that has shown positive community mobilization and ownership results. ST has been able to mobilize local communities and students to grow Apricot Orchards and Salex showcasing how they have increased green cover and provide additional sources of livelihood for participating communities. Another important point to note is the active involvement of corporate sponsor during project design and implementation stage, as they are one of the key stakeholders of the project whose support is essential during implementation. Using this model, they have been able to plant and sustain more than 450,000 trees in a short span of 3.5 years.

In the long run, ST aims to plant more than million fruit bearing and medicinal trees in the next 5 years, where the harvested fruits and other non timber forest products would add to the economic development of the local community by reducing poverty and malnutrition, while promoting gender equality and empowering women. Further, these planting trees would directly contribute in mitigating carbon emissions while reaping environmental benefits worth millions. In order to achieve these objectives and aligning with market linkage and tree-produce processing units, they intend to achieve the following objectives:

• Build a Research and Development division, where they can work on high yielding grafted saplings, organic farming, micro-irrigation techniques and other innovating techniques

• Collaborate with scientific research institutions in order to promote biodiversity and ecological balance in respect with the local environment

• Develop a demonstration center for sharing learning and increasing knowledge exchange

• Collaboration with international agencies who can replicate the model and continue to impact lives at large

8. Acknowledgment