
Impact Assessment Report

Jal Aadhar Integrated Watershed Management Program

Prepared For

TATA CAPITAL

TATA Capital

Prepared By



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CHAPTER 1: INTRODUCTION

Tata Capital Housing Finance Limited (TCHFL) implemented the CSR Intervention of the Integrated Watershed Management Program in the 11 villages of vandavasi and Madurantakam Taluks during the Financial years(2018-2022) and 5 villages of Thirukazhukundram Taluk the Financial years (2017-2021). The village in vandavasi and Madurantakam are that of Salavedu, Kavedu, Seeyalam, Badhur, Ammanambakkam, Mangalam, veliyambakkam, Seesamangalam, Rajampalayam, Porparankaranai and Gunankaranai. And these fall both under the Tiruvanamalai and Chengalpet Districts of North Tamil Nadu. The villages of Thirukazhukundram Taluk are Salur, Ponpadrikudam, Edaiyur, Narapakkam, Veerakuppam and Mambakkam. These come under the Kancheepuram District of North Tamil Nadu. The implementation partner for this CSR Intervention is **National Agro Foundation(NAF)**,

The objective of the project

The integrated watershed management program envisages a positive increase in the availability of water (surface and ground) in the catchment area and impacts livelihoods through soil and water conservation methods, water recharging methods, efficient water management practices in agricultural and other livelihood practices through a participatory approach with the community.

The criteria applied for the selection of the villages were on the basis of the criteria that the villages which were in over-exploited and water stressed area and which were not a beneficiary of any other CSR Programs, potentiality for community participation, priority to rural/Standard Error of Mean-urban areas, and locations predominated by agricultural and allied sector activities.

Project Profile

Project Name	Integrated Watershed Development Program- Edaiyur	Water Conservation for Sustainable Livelihood – Jal Aadhar Sustainable Village Project
District	Thiruvanamalai and Kancheepuram	Tamil Nadu
Taluk	Edaiyur and Veerakuppam	Vandavasi and Madurantakam
Villages covered	Salur, Ponpadrikudam, Edaiyur, Narapakkam, Veerakuppam and Mambakkam	Salavedu, Kavedu, Seeyalam, Badhur, Ammanambakkam, Mangalam, Veliambakkam, Seeshamangalam, Rajampalayam, Porpanankaranai & Gunankaranai
Project Components	Integrated watershed Development	Enhancing natural resource base (Soil and water) · Plantation and green cover Sustainable Agriculture Training and Capacity Building
Families benefited	1612	4556
Households benefited	5395	12778
Budget Allocation	INR 195.0 Lakh	INR 281 Lakh
Project Duration	4 years (2017-2021)	4 years (2018-2022)

CHAPTER 2: EXECUTIVE SUMMARY

Introduction

Tata Capital Housing Finance Limited implemented the CSR intervention of the Integrated Watershed Management Program in the 11 villages of Vandavasi and Madurantakam Taluks during the Financial years(2018-2022) and 5 villages of Thirukazhukundram Taluk the Financial years (2017-2021).

The village in Vandavasi and Madurantakam is of Salavedu, Kavedu, Seeyalam, Badhur, Ammanambakkam, Mangalam, Veliyambakkam, Seesamangalam, Rajampalayam, Porparankaranai, and Gunankaranai. And these fall both under the Tiruvanamalai and Chengalpet Districts of North Tamil Nadu.

The villages of Thirukazhukundram Taluk are Salur, Ponpadrikudam, Edaiyur, Narapakkam, Veerakuppam and Mambakkam. These come under the Kancheepuram District of North Tamil Nadu.

The Implementation partner for this CSR Intervention is National Agro Foundation (NAF). CSR Impact Assessment Study was undertaken by SoulAce to understand the Social and Environmental Impact created by the CSR Interventions of TCHFL implemented through its project partner NAF.

Framework of the Study

The study employed Sociological and Hydrological Approaches to understanding the social and environmental impact of the CSR interventions in the project communities between the FY 2017 to 2022.

Research Methodology

The Social Impact part of the study purported to study the Impact created by the CSR Interventions of TCHFL on the transformations that occurred in the Project communities, primarily through the creation of watershed structures at Edaiyur and Vandavasi Blocks and secondarily how these improved water availability combined with Interventions aimed at improving Agricultural productivity enhanced the socioeconomic conditions of the people in the project communities.

A Descriptive Research Design with a Mixed Approach of Quantitative and Qualitative studies and a sample size of 979 respondents for Vandavasi and 263 for Edaiyur was taken up for the study.

The Hydrological Approach of the study was undertaken through a review of the topographic map and analysis of existing hydrogeologic data and Collection of field data from on-site assessments. The Hydrological Approach mainly focussed on change/improvement of the groundwater table and change in surface water holding capacity and reduction in runoff.

ENVIRONMENTAL INITIATIVE 1: PERCOLATION POND

Tata Capital Housing Finance Limited -NAF constructed a percolation pond in Edaiyur, for the purpose of managing stormwater runoff, preventing flooding, and reducing downstream erosion. The Percolation pond has been found to be effective in replenishing the groundwater levels in the village.

Impact created



Reduce Flooding



Increase of water table



Availability of water during summer months



Improvement of pisciculture



Increase in number of cropping



Increase of Cultivable land

ENVIRONMENTAL INITIATIVE 2: CHECK DAM

TCHFL – NAF constructed 3 check dams one at Salavedu village and another at Veliyampakkam and the third one at Amanampakkam in Vandavasi Block.

In Thirukazhukundram, 2 check dams were constructed one at Salur and another at Edaiyur.

Impact created



Increased water for Drinking purposes through improved water levels in wells



Prevention of water runoff



Increased fodder availability



Increase in Income



Increase in yield



Prevention of flooding

ENVIRONMENTAL INITIATIVE 3: CATTLE PONDS

To address the issue of scarcity of drinking water for cattle during the Summer months cattle ponds were constructed by Tata Capital Housing Finance Limited and NAF in the villages of Edaiyur, salur, veerakuppam, and Ponpathirkudam.

Impact created



Improved water availability for cattle during summer months



Increase in milk yield of cow by ½ Litres per day



Reduced burden of farmers to provide drinking water to cattle

ENVIRONMENTAL INITIATIVE 4: TRENCH CUM FIELD BUNDS

Trench cum field bunds are a great way to store runoff water, enabling more water to infiltrate into the soil and provide moisture for more periods for the development of vegetation. These interventions were constructed by Tata Capital Housing Finance Limited and NAF in the villages in Vandavasi block.

Impact created



Improved soil moisture and reduction in runoff



Transformation of barren lands to cultivable ones



Reduction of soil-water erosion



Long-term groundwater recharge

KEY FINDINGS OF THE ENVIRONMENTAL INITIATIVES

- The rise of the water table by 10 to 12 feet has been reported because of Environmental Interventions.
- Growth of fish cultivation by 2,500 to 3,000 kg within a period of 6 months from Percolation pond.
- Increase the number of cropping
 - 80% of farmers are able to double cropping:
 - Samba Pattam &
 - Kuruvai Pattam
 - 20% of farmers are further able to third cropping
 - Navarai Pattam
- 90% of cattle farmers felt there is increased water availability during summer months due to the cattle ponds
- 80% of cattle farmers reported an increase in milk yield in cows by ½ Litres per day.
- 90% of farmers felt that the burden of providing drinking water to cattle has decreased.

Increase in yield of paddy and Income

Vandavasi:

- Field of Paddy before the Environmental interventions: 1,617.89 Kgs. per acre. After the Interventions: 1,813.16 Kgs. per acre. Increase in yield: 195.26 Kg. per acre.
- Increase in income: The mean Income of the farmers was Rs. 20,715/- before the Interventions and Rs. 22,842.11/- after the Interventions.
- Increase in Income: Rs. 2,126.32/-.

Edaiyur:

- Mean yield of Paddy: Before the Interventions: 1837.29 Kgs. per acre. After the Interventions: 2022.03 Kgs. per acre. Increase in yield: 184.75 Kg.
- The mean Income of the farmers was Rs. 21118.64/- before the Interventions and Rs. 23,355.93/- after the Interventions.
- Increase in Income: Rs. 2,237.39/-.

FINDINGS FROM THE HYDROLOGIST STUDY



The strength of the relationship between the rainfall and water level was positive and moderate.



The depth has increased by an average of about 3 meters in the Vandavasi block and by an average of 3.8 meters in the Thirukalukundram block over the intervention period.



About 26.45% of the rainfall has recharged directly to the ground in the Vandavasi block and about 16.7% in the Thirukalukundram block.



Creation of surface storage of 43,820.49 cubic meters in the Vandavasi cluster and 40,476 cubic meters in the Edaiyur cluster, with a storage potential of about 60% of the capacity. The volume of storage created is capable of holding about 1% of the annual rainfall received in the intervention area.



Change in land use pattern indicates a marked growth in the area under water (+2.75%; +5.32%), crops (+4.86%; +3.79%), and trees (+1.74%; +3.13%) for both Vandavasi and Edaiyur clusters indicating the success of efforts towards water management, agricultural productivity, and afforestation.



NDVI analysis further shows that there is an observed shift from dense vegetation to sparse vegetation (18%; 16%) which is the result of increased crop diversity and the shift away from water-intensive crops.



With regards to cropping intensity, double cropping is the most common practice, followed by single cropping and triple cropping in the period of assessment (2016-2018). Reports from the farmers indicate it is possible to cultivate a third crop owing to the interventions by NAF.

SOCIAL INITIATIVE 1: VILLAGE DEVELOPMENT COMMITTEE

The Village Development Committees comprise 15 members elected by the Gram Sabha members and having a fair representation of land owners, Landless farmers, SHG members, and members of Scheduled Castes was one of the first initiatives taken up by TCHFL to spearhead the Development Interventions. Each VDC formed for a village has a chairman, vice-chairman, Treasurer, and Secretary.

Impact created



Enabled overcoming community reluctance for accepting Projects



Served as a Liaison between the community and Tata Capital Housing Finance Limited



Enabled improved community participation in Development Interventions



Ensured Sustainability of the Project Interventions



Provided a Platform for community to voice out their concerns through the representatives of the VDCs

Key Findings:

- Greater Involvement of the community through Participatory approaches in the program planning stage.
- Mobilization of community members towards Development Initiatives became possible through the VDCs.
- To ensure community ownership of the projects, funds were mobilized from the community by VDC. This fund is mainly meant for the sustenance of the projects post-exit from the community. Tata Capital Housing Finance Limited contributed its share of 5% towards the fund as a part of the project activity. This fund is maintained in a separate bank account by the VDC.

SOCIAL INITIATIVE 2: SYNTAX TANK

Tata Capital Housing Finance Limited -NAF installed 9 units of Syntex Tanks in the villages of Veliyampakkam, Seeyalam, Cunankaranai, Amanampakkam, Salavedu, Seeyalam, Manimangalam, Anaikunnam, and Eiyppakkam to address the needs of the community for safe

drinking water. Impact created



Improved water security to the community



Reduced Travel distance for fetching water



Reduced Time spent to fetch water

Key Findings:

Reduced Travelling Distance

There was a reduction in the time traveled to fetch water from 425 mts to 38 mts due to the intervention.

Reduced Time spent to get water

Due to the distance reduction, the time spent fetching water was reduced from 60 minutes to 30 minutes.

Availability of drinking water during Summer months

90.6% of the respondents opined that they get sufficient water to a certain extent, while 9.4% of the respondents felt it is sufficient to a larger extent.

SOCIAL INITIATIVE 3: SHG FEDERATION

Under Tata Capital Housing Finance Limited , the Vandavasi project SHG federation was started with the goal of making women active participants in Income Generation and empowering them to support their families.

Impact created



Increased participation of women in Income Generation Activities



Enhanced Gender Equality



Increased ability among women to contribute to family Income



Increased Empowerment among women

Key Findings:

- 83.7% of the female respondents were not involved in any income generation activities before becoming a member of the SHG federation.
- 16.3% of the female respondents were already involved in some or other income-generation activities before joining the SHG federation.
- 100% of the female respondents were involved in Income generation activities after becoming a part of the SHG federation.
- 54.3% of the female respondents were involved in Backyard Poultry. Dairy Farming (39.4%) Tailoring (2.7%), Rest involved in grinding shops for making Idly/Dosa batter, Grocery Shops, xerox shops, small eateries, and Nursery raising. There was also one respondent who had a JCB machine.

Increased Income for members of SHG Federation

After joining the SHG each women member was earning an average of Rs. 6382.81 due to involvement in Income Generation Program (IGP).

SOCIAL INITIATIVE 4: SUMMER PLOUGHING

To better prepare the soil for cultivation, TCHFL introduced the method of summer plowing in the project villages of Vandavasi. This Intervention has been found to be immensely helpful to the farmers in drying their grains, cleaning, segregation, and enhancing the quality of grains.

Impact created



Increased yield of Paddy



Increase in Income of farmers



Substantial saving for each farmer



Enhanced Quality of Soil for better cultivation

Key Findings:

Increase in yield of Paddy

The mean yield of Paddy was 2079.41. before the Intervention and 2295.59 Kg. after the Intervention of Summer Ploughing. There is an increase of 216.18 Kgs. in the yield of Paddy due to the Intervention.

Increase in Income of farmers

The mean Income of the farmers was Rs.31,286.76 before the Intervention and Rs.34,595.59 after the Intervention. There is an increase of Rs.3,308.82 in the income of the farmers due to the Intervention.

Substantial Saving for each farmer

Since TCHFL -NAF carried out Summer ploughing without charging the farmers, each beneficiary was able to save around Rs. 3000/- the ploughing being done free of cost,

Benefits perceived by farmers

100% of the respondents could immediately tell that the hard crusted upper layer of the soil gets broken when deep plowing is carried out which makes water infiltration easier. 100% of the respondents stated that the soil moisture content also gets substantially improved.

92% of the respondents could state the benefit that herbicides and pesticide residues or harmful chemicals coming out from the roots of previous crops get eliminated because of exposure to atmospheric air and Sunlight.

SOCIAL INITIATIVE 5: THRESHING YARD

TCHFL constructed 3 nos. of Threshing yards were constructed in the Vandavasi block and 4 nos. of Threshing yards in the Edaiyur block.

Impact created



A reliable solution to the problem of drying grains



Enhanced quality of grains



Reduced wastage of grains



Increased economic gain

Key Findings:

- 84.2% of the respondents in Vandavasi and 67.3% of the respondents in Edaiyur stated that the quality of grains increased.
- 57% of the respondents at Vandavasi reported an increase in income between Rs.5000 to Rs.10,000/-.
- 33.9% of the respondents in Vandavasi reported an increase in income between Rs.1000 and Rs.5000/.
- 56.7% of the respondents in Edaiyur reported an increase in income above Rs. 10,000/-.
- 26% of respondents in Edaiyur stated that earned an additional income between Rs. 5000 to Rs.10000/-.
- This increase in income is because of, reduced wastage, improved drying, and improved quality of grains fit of storage and selling when market prices are high, made possible because of using the threshing yard.

SOCIAL INITIATIVE 6: SOLAR LIGHT

The stretches of community inhabited by socioeconomically downtrodden people and not having any amenity for nighttime lighting were taken up for installation of solar lights by Tata Capital-NAF.

Impact created



Increased amenity for night time lighting with clean energy



Enhanced safety for motorists during night time



Enhanced sense of security for women and children



Enabling children to study during night time



Perception of reduced harm from snakes and poisonous insects

Key Findings:

- 100% of respondents stated that the need for nighttime lighting was a long-felt need.
- 100 % of respondents stated that women and children feel a sense of security to move around because of the availability of lighting.
- 70% of the respondents felt better safety of movement for motorists and passersby during night time.
- 90% of the respondents stated that children make use of solar light to do their home assignments and read their school books at night now.

SOCIAL INITIATIVE 7: S.R.I CULTIVATION

Tata Capital Housing Finance Limited introduced the S.R.I cultivation method to the farmers in Vandavasi and trained them on increasing rice yield through the scientifically proven method of S.R.I Cultivation.

Impact created



Reduced seed requirement



Reduced water requirement



Increased yield



Increased Income

Key Findings:

- The seed requirement for S.R.I Cultivation has got reduced by 90% in comparison with the Traditional Agricultural method.
- The mean yield of paddy was 865 Kg. through Traditional cultivation methods and 1110 Kgs. by S.R.I. Method for every 50 cents with an increase of 245 Kg. of yield by the latter method.
- There is an increase of 245 Kgs. in the yield of Paddy due to the S.R.I method of Cultivation.
- The mean Income of the farmers was Rs.1800/ through the adoption of the Traditional cultivation method and Rs. 5570/- through S.R.I Cultivation.
- There is an increase of Rs. 3770/-in income of the farmers due to the adoption of the S.R.I. cultivation method.
- The mean expenses for Traditional Rice Cultivation are Rs.10,700/- and Rs.12,050/- for SRI cultivation. A mean increase of Rs.1,350/- per 50 cents of the area of cultivation was observed in S.R.I cultivation.

SOCIAL INITIATIVE 8: PULSE PRODUCTIVITY

Tata Capital Housing Finance Limited introduced Scientifically proven methods of improving Pulse productivity to the farmers of Vandavasi and trained them on various yield-improving techniques.

Impact created



Increased yield of pulses



Increased Income of farmers



Enhanced livelihood opportunity to farmers

Key Findings:

Increased yield of pulses

The mean yield of Pulses was 166 Kg. before the Intervention and 210 Kg. after the Intervention. There is an increase of 44 Kg. in the yield of Pulses Per 0.50 acres of land due to the Intervention.

Increase in expenses

The mean expenses before the Intervention were Rs. 9700/-, and after the Intervention, it is Rs. 11450/-. A mean change of an increase of Rs. 1750 has been observed.

Increase in Income

The mean Income of the farmers was Rs. 6200 before the Intervention and Rs. 9800 after the Intervention. There is an increase of Rs. 3600/- per 0.50 acres in the income of the farmers due to the Intervention.

SOCIAL INITIATIVE 9: VEGETABLE CULTIVATION

TCFHL trained the farmers of vandavasi to improve vegetable cultivation and the study has found more than 30% of the farmers who were not earlier undertaking vegetable cultivation are now involved in the same and improving their livelihood.

Impact created



Increased yield of vegetables



Increased Income to families



More land brought under vegetable cultivation



Improved nutrition to families

Key Findings:

Increase in cultivable area of vegetables

There is an increase of 35 cents in the acres of cultivation used for vegetable production.

Increase in yield of vegetables

The mean yield of Vegetables was 1375 Kgs. before the Intervention and 2565 Kgs. after the Intervention of improvement in agricultural productivity. There is an increase of 1190 Kgs. in the yield of vegetables due to the Intervention.

Increase in mean Income of Farmers

The mean Income of the farmers was Rs. 9670/- before the Intervention and Rs.19050/- after the Intervention. There is an increase of Rs.9380/ in income of the farmers due to the Intervention of productivity of vegetables.

SOCIAL INITIATIVE 10: PASTURE DEVELOPMENT

Developing Pasture for fodder was not a practice in the project communities before Tata Capital Housing Finance Limited introduced it. Cattle owners have reported more green fodder availability for cattle now when compared with the situation before.

Impact created



Increased fodder availability to cattle



Reduced expenses on provision of fodder for cattle



Increased milk yield



Increased income to farmers

Key Findings:

- After the Intervention, 40% of the community members began allocating a portion of their land toward pasture development.
- Increased milk yield of cattle - Increase by 1 to 2 liters of milk per cow per day.
- This has also reduced the economic burden of the farmers in feeding their cattle by 60% to 70%.

SOCIAL INITIATIVE 11: INTERCROPPING

The Practice of Intercropping which refers to two or more, usually dissimilar crops on the same piece of land, was introduced in the Project villages of Vandavasi by TCHFL.

Impact created



Improved soil health



Improved yield of crops



Greater coverage of risks in case of failure of main crop

Key Findings:

- 100% of all the farmers involved in Intercropping are aware that intercropping enriches the nutrient content of the soil with organic carbon Nitrogen, Phosphorus, and Potassium.
- 80% of all the farmers have reported increased yield of the major crop.
- 80% of all the farmers report using the minor crop for domestic use rather than commercial purposes.
- 30% of farmers have started adopting the practice of Intercropping after the Intervention.

CHAPTER 3: RESEARCH METHODOLOGY

Research can be stated as a logical and systematic search for new and useful information on a particular subject matter. Social Science Research refers to the systematic activity of gaining new understanding by following scientific principles and methods to minimize bias and subjectivity. The defining characteristics of scientific research are objectivity, ethical neutrality, reliability, validity, and testability are strictly followed in this research. Identification of the research problem provides the starting point of research, which is then defined and redefined through a proper review of the Literature on the problem or deliberations with research experts and knowledgeable others in the subject matter of interest. The research problem taken up for this study is to understand the Social Impact created by the CSR Interventions of Watershed Initiatives christened the Jal Aadhar Program of Tata Capital Housing Finance Ltd., (TCHFL) implemented through the project Partner National Agro Foundation (NAF).

The study investigates the subject matter of Assessing the Impact of the Jal Aadhar Project by adopting two Approaches/Perspectives:

Social Impact Assessment of TCHFL's Jal Aadhar Project		
Perspective/Approach of the Study	Methodology Adopted	Intended Outcomes of the Approach
Sociological Approach	<p>Mixed Methodology of Quantitative Tools and Qualitative Tools.</p> <p>For Quantitative Part of the study involves Interview Schedule.</p> <p>The Qualitative part of the Study involves Focus Group Discussion, In-depth Interviews, and Key Stakeholder Interviews.</p>	<ul style="list-style-type: none"> • Change in Agricultural Productivity. • Changes in Expenses incurred for adopting new methods of cultivation. • Change in Income Levels. • Perception of change in ground water levels. • Perceived benefits of each Project task.
Hydrological Approach	<ul style="list-style-type: none"> • Review of the topographic map and analysis of existing hydrogeologic data. • Collection of field data from on-site assessments. 	<ul style="list-style-type: none"> • Change/improvement of the groundwater table. • Change in surface water holding capacity and reduction in runoff.

Social Impact Assessment of TCHFL's Jal Aadhar Project

Perspective/Approach of the Study	Methodology Adopted	Intended Outcomes of the Approach
	<ul style="list-style-type: none"> • Determine the change/improvement of the groundwater table (observatory wells and surface water bodies as per intervention). • Determine the change in surface water holding capacity and reduction of runoff. • Evaluate the change in land use pattern, cropping pattern, and agricultural productivity. • Mapping of recharge conditions i.e., rainfall, groundwater levels, availability of water in the intervention villages through recharge, directions of groundwater, and the interaction of surface and groundwater in the project areas. 	<ul style="list-style-type: none"> • Change in land use pattern, cropping pattern, and agricultural productivity.

The findings of the study under both approaches are categorised under the broad heads of:



Social Initiatives



Environmental Initiatives

Field of Study

Project Locations

The interventions under the project were implemented in a total of 16 villages in the districts of Tiruvannamalai and Chengalpattu

District	Thiruvannamalai	Chengalpattu
Taluka	Vandavasi and Madurangam	Edaiyur and Veerakuppam
Name of villages	Salavedu, Kavedu, Seeyalam, Badhur, Ammanambakkam, Mangalam, Veliyampakkam, Seeshamangalam, Rajampalayam, Porpanankaranai and Gunankaranai hamlets	Salur, Ponpadrikudam, Edaiyur, Narapakkam, Veerakuppam, and Mambakka

Methodology adopted the Sociological Approach of Jal Aadhar Project

Use of Mixed Methodology. The study adopted a mixed methodology of employing Quantitative tools like an Interview Schedule for brevity and precision of the findings and Qualitative tools of Focus Group Discussions, In-depth Interviews, and Case Studies for portraying enriched information that cannot be obtained through Quantitative methods.

Research Design

A Descriptive Research Design intends to portray the status quo or narrate what exists as it is, without trying to manipulate the variables. Since this research study purports to assess the extent of the impact of the Jal Aadhar Project without neither trying to diagnose the variables nor manipulate the variables involved to study the effect of one on the other, a Descriptive Research Design was thought to serve the purpose better.

Sampling Design

A Purposive Sampling is one in which the respondents are chosen on the basis of the respondent's ability to serve the purpose of the study, that is only those respondents who have certain experienced particular benefits or undergone particular situations will be competent to answer the questions posed and not all the people in a project location. For instance, while studying the effect of S.R.I. cultivation, not all the people in a community will be able to answer the questions. Only those who were a part of the

program on S.R.I. cultivation will be able to answer questions as opposed to the general population. Hence this study has adopted purposive sampling to cover only those respondents who have experienced a certain benefit or a project task. The Interview Schedule for each of the Project Interventions caters only to the particular segment of the community which was affected by a particular project task,

Name of the CSR Project Activity	Quantitative (Interview Schedule)		Qualitative (Interviews, Focus Group Discussions, Stakeholder Discussions)	
	Vandavasi Block	Thirukazhukundram Block	Vandavasi Block	Thirukazhukundram Block
Threshing yard	221	104	12	8
Check Dam	95	59	20	10
Percolation Pond	0	100	0	15
SHG Federation	221	NA	40	NA
Syntax Tank	276	NA	15	NA
SRI Cultivation	10	NA	5	NA
Pulse Productivity	10	NA	5	NA
Vegetable Productivity	10	NA	5	NA
Summer Ploughing	136	NA	10	NA
Cattle pond	NA	NA	22	20
Village Pond	NA	NA	20	20
Intercropping	NA	NA	7	0
Farm Pond	NA	NA	30	30
Pasture Development	NA	NA	10	10
Farm Machinery	NA	NA	10	10
Agro Forestry	NA	NA	10	10
Total	979	263	211	133

Tools of Data Collection

For the Quantitative Part of the study, an Interview Schedule was prepared, with separate Tools for each of Project Intervention. Interview Schedules were prepared for Project tasks like beneficiaries of Syntax Tank, Threshing yard, Improvement of Pulse Productivity, S.R.I Cultivation, vegetable productivity, Check Dam, Percolation pond, Summer Ploughing, and SHG Federation. Interview Guides and Facilitation Guides for notes taking for Interventions like cattle ponds, village ponds, farm ponds, pasture development, and Agroforestry. Some of the project tasks were covered both quantitatively and qualitatively.

Key Stakeholders



The Hydrological Approach of the Study

Assessment of the impact of the interventions on the groundwater table was done in 3 key steps.

Step 1: Water Level Assessment

This step was to estimate the level of change in the water level in the observation wells. This involved comparison of the pre-intervention levels with the post-intervention levels and also accounted for the difference due to monsoons.

This difference in depth (Δ Depth) was plotted on a map and interpolated to understand the scenario throughout the area of intervention.

This step was useful to determine the following: Long-term water level
The absolute difference in water level
Rise/fall of water level in relation to the change in rainfall
Rise/fall of water level in relation to the increase in groundwater development

This step involved the assessment of the rainfall received in the intervention area throughout the duration of the project. This also involved the assessment of the rainfall trend over the intervention period. A regression analysis between both informed the levels of correlation and the strength of the relationship between them. This in turn helped to establish if the change in groundwater level was direct because of the rainfall patterns or if the interventions had a role to play. The Water-Table Fluctuation (WTF) method was used to establish the contribution of rainfall to the change in water levels. Further assessments were done to attribute the role of the intervention in the increase of the water depth.

Step 3: Attribution Assessment

In case of a positive or negative trend in the amount of rainfall received, further assessments were done to attribute the change in groundwater levels to the interventions done. This involved assessment of land use changes with regard to factors like changes in agricultural areas, changes in green cover, changes in water availability, cropping intensity, and so on. Spatial assessment methods such as NDVI (Normalized Difference Vegetation Index) and NDWI (Normalized Difference Water Index) techniques were used, both spatially and temporally, to estimate the changes in the intervention area. The following datasets were collected from the implementing partner, National Agro Foundation, to facilitate the objectives of the study:

- Depth to the water level in observation wells.
- Rainfall data for the block.
- The interventions that were done, and their details.
- Photos from the field survey.

The above datasets are provided in Annexure 1.

Mohan, a farmer belonging to Edaiyur, says: ' If the rainfall is sporadic in nature, then the water will be retained in the field for only 2 days after the rain. Only if there is continuous rainfall as there is during monsoons, shall the soil have moisture content. Due to the decreased absorption capacity of the land, there will be more water retained in the fields.

During the monsoons, they will go dry after 20-25 days. But I can see water retained in my fields for at least 50 days and sometimes for even 60 days. This is mainly after the construction of the percolation pond and increased water table in the village'

In addition to the above datasets, additional data was collected from various sources to validate the data from the implementing partner, which was used for the assessment of the impacts of their project. These are as follows:

- Depth to water level from Tamil Nadu Water Supply and Drainage Board (TWAD), and Central Ground Water Board (CGWB) (provided in Annexure 2).
- Rainfall data from Indian Meteorological Department (IMD) (provided in Annexure 2). Other datasets that were used in the assessment are as follows:
- Soil types from Tamil Nadu Agricultural University (TNAU) (provided in Annexure 3).
- Aquifer system from Central Ground Water Board (CGWB) (provided in Annexure 3).
- Specific Yield from Groundwater Estimation Committee (GEC) (provided in Annexure 3).
- Land Use Land Cover change between 2018 – 2021 from ESRI Living Atlas[1].
- Normalized Difference Vegetation Index (NDVI) is obtained from the analysis of multispectral images obtained from Sentinel-2 (January 2018 - 2022).
- Cropping Intensity data obtained from GCI30: a global dataset of 30 m cropping intensity[2].

[1] Karra, Kontgis, et al. "Global land use/land cover with Sentinel-2 and deep learning." *IGARSS 2021-2021 IEEE International Geoscience and Remote Sensing Symposium*. IEEE, 2021.

[2] <https://doi.org/10.5194/esStandard Division-13-4799-2021>

CHAPTER 4: MAJOR FINDINGS OF THE STUDY

Major findings of the study

The major findings of the study are presented under two broad headings using both Sociological and Hydrological Approaches.

- Major Findings of the study- Environmental Initiatives

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- Major Findings of the study- Social Initiatives.

Major Findings of the Study- Sociological Approach.

This chapter presents the major findings of the following Project Activities.

	Initiative	Project Activity
Environmental Initiatives	1	Percolation Pond
	2	Check Dam
	3	Cattle pond
	4	Field Trench cum Bund
Social Initiatives	1	Village Development Committee
	2	Syntax Tank
	3	SHG Federation
	4	Summer Ploughing
	5	Threshing Yard
	6	Solar Light
	7	S.R.I Cultivation
	8	Pulse Productivity
	9	Vegetable Cultivation
	10	Pasture Development
	11	Intercropping

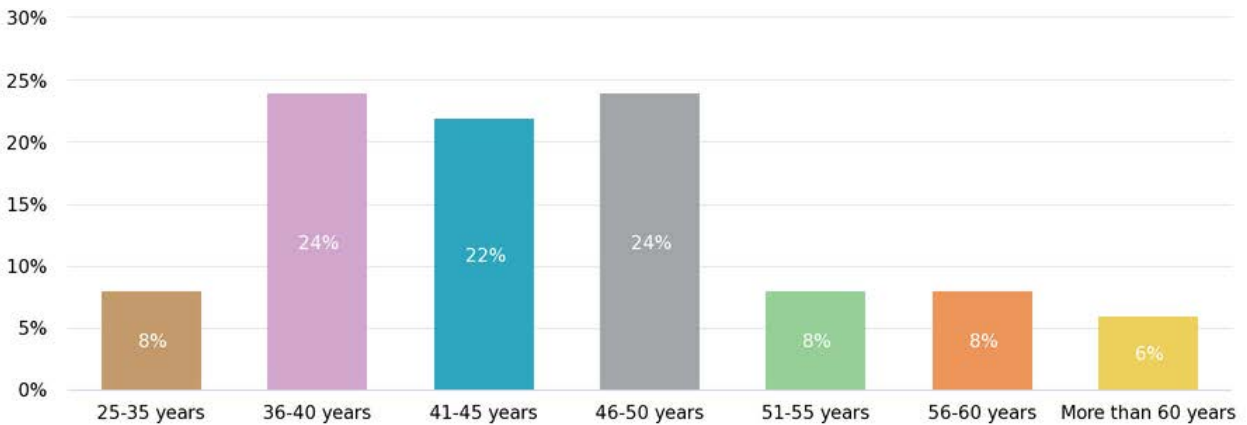
Environmental Initiative 1: Percolation Ponds

Percolation ponds are small ponds constructed in low-lying areas of barren lands in order to store the run-off of rainwater enabling better percolation downwards and sideways. The deeper these ponds lesser the loss of water through evaporation. Interactions of the research team with the beneficiaries in Edaiyur revealed that the Percolation pond constructed by Tata capital-NAF is effective in replenishing the groundwater during the rainy season. Since most of the flow-off rainwater enters the percolation pond the velocity of runoff water is reduced thereby leading to less soil erosion at the same time, these structures have been found to be effective in reducing the siltation in the check dams as reported by the community members.

Impact of Percolation Pond construction.

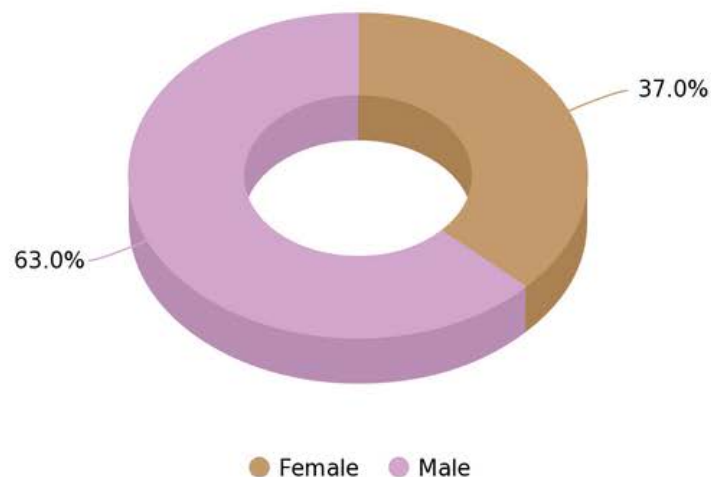


Percentage distribution of respondents by age-group



It can be observed that people belonging to the age group 46-50 years and 36-40 years contribute 24% each to the sample size, while those in the age group 36-40 years form 22% of the sample. 8% of beneficiaries in each of the categories of 25 to 35, 56-60 and 51 to 55 years can be seen in the sample. The sample also has 6% of beneficiaries aged above 60 years. It can be seen that the sample has diverse age groups who can offer varied sets of opinions and insights, based on their experience in the field.

Percentage distribution of respondents by gender



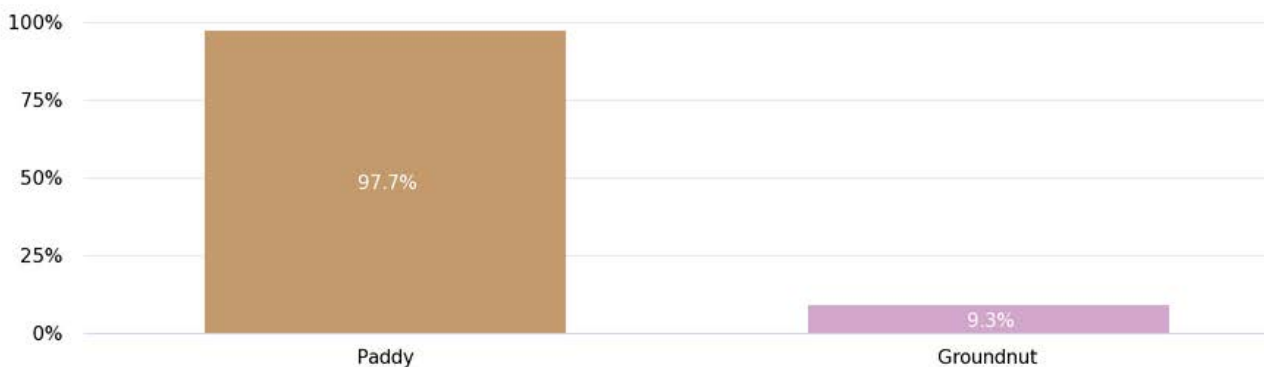
The sample comprises 63 % male and 37 % female respondents.

Percentage distribution of respondents by annual Family income



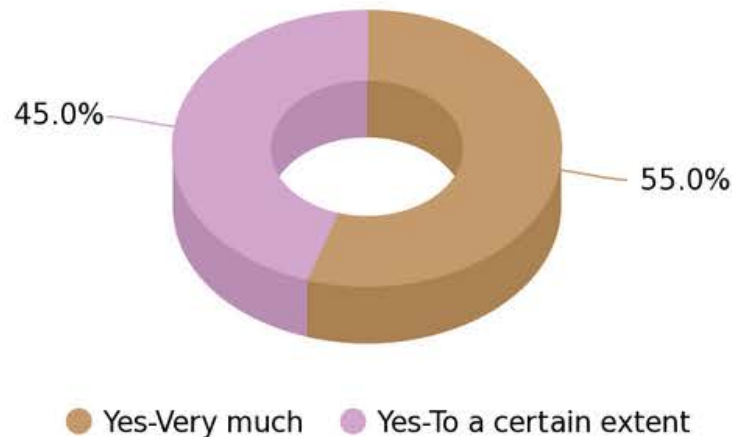
When the respondents were asked about their Annual Family Income, a majority of the respondents, that is 75% of the respondents, reported less than Rs. 1 Lakh per year, while 22% of the respondents stated that they earn between Rs. 1 Lakh and Rs. 2 Lakhs. 3% of the respondents earned between Rs. 2 Lakhs and Rs. 3 Lakhs.

Percentage of respondents reported about the major crops cultivated by them



When the respondents were asked about the major crops cultivated by them, almost all the respondents, ie. 97.7%, stated that they cultivated Paddy. This was followed by 9.3% of respondents who stated Groundnut as the major crop cultivated by them.

Field Capacity for better water retention, as reported by the farmers



All the respondents were selected from within 700 mts radius of the Percolation pond, 55% of the respondents stated that the water retention capacity of their farmlands has increased by a large extent, whereas 45% of respondents stated that it has increased by a certain extent. Prior to the construction of the percolation pond, there was little water retention in the fields after the last rain of the monsoon season.

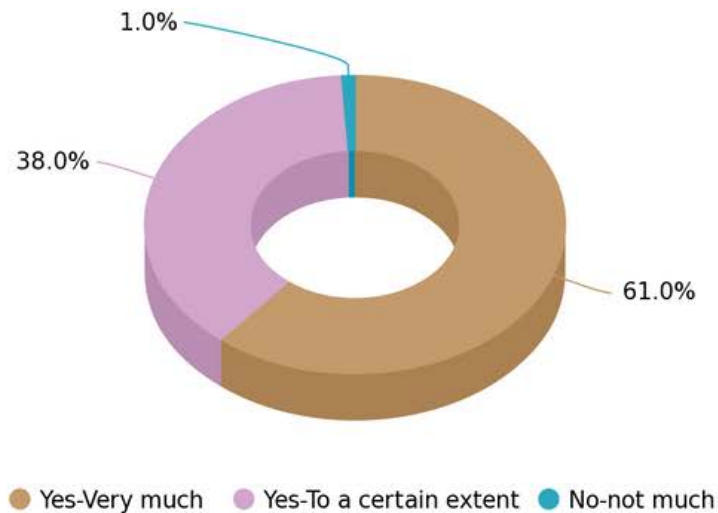
It was shared by most of the farmers that earlier, after the last rains during the monsoon season, there used to be water retention in the soil for a maximum of 20 days. But after the construction of the percolation pond, they were able to observe water retention for at least 45 to 50 days after the final rains.

The difference in responses can be attributed to the different experiences of the farmland owners on water retention. Those farmlands which are closer to the percolation pond show higher levels of water retention capacity, which gradually decreases as one moves farther away from the percolation pond. It should also be noted that none of the respondents have said they did not see any water retention in their fields compared to the situation before the construction of percolation ponds.

Anjalai of Edaiyur says: ' We used to face a scarcity of drinking water 5 years ago. There is a water tank at Madha Koil street, from which the entire village gets its drinking water supply. Before the construction of the percolation pond, we use to get drinking water only for 1 hour or even as less as half an hour during the summer months. Now for the past 3-4 years, we are not facing much shortage of water in the summer months. We get drinking water almost though out the day. The watershed structures constructed in our village by the TATA CAPITAL have proved very much beneficial to all of us.'

Impact: Increase in the Water Table of wells

Percentage of respondents reported whether there is any increase in the water table table of the wells



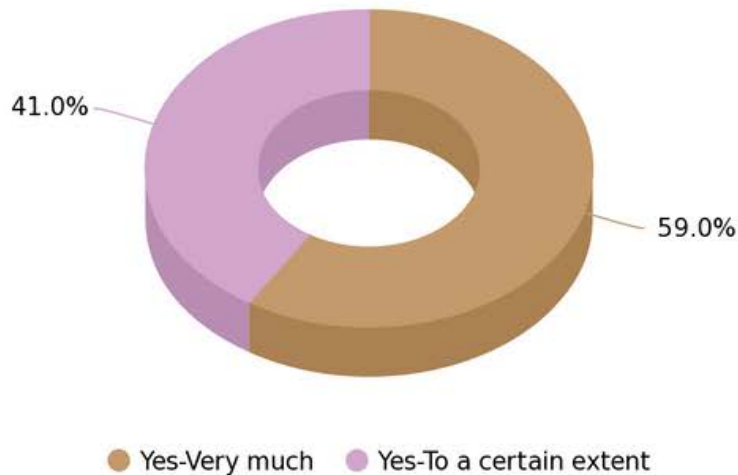
When the respondents were asked whether there was any increase in the water table in the wells of the community, 61% of the respondents stated that the water table increased to a large extent, while 38% reported an increase in water table levels to some extent. There was one respondent who stated there was not much increase in water table levels.

When the farmers were further asked to quantify the increase in water levels in their wells in terms of cms, inches, or meters, many of the farmers were not able to quantify in terms of these units, but they were able to answer in 'Adi' or the Tamil word for feet. The responses of the farmers varied from a minimum increase of 6 feet to 8 feet. There were a few cases of farmers reporting an increase of 10 to 12 feet too.

Ravi, a farmer belonging to Edaiyur, says: ' Before 2016, finding water for cultivation used to be very difficult in this rural region. As NAF and TATA CAPITAL started constructing the watershed structures like the percolation pond, supply channel, Gabion Check dams, farm ponds, etc., the situation began to gradually change and we started getting more water for cultivation purposes. There was increased water retention in the soil. Water levels in the wells increased due to the water structures constructed. Earlier, I was doing only one cropping, whereas now I am able to carry on two cycles of cropping too. There are also a few farmers who are able to do the third cycle of cropping in this village.'

Impact: Construction of the percolation pond led to a reduction of flooding in the community

Percentage of respondents reported whether the percolation pond led to reduction of flooding in the community



When the respondents were asked whether flooding has reduced after the construction of the percolation pond in the community, 59% of the respondents stated that flooding has greatly reduced, while 41% of respondents agreed that flooding has reduced to a certain extent.

Many farmers with whom our team interacted during the study stated that before the construction of the percolation pond, there used to be huge water stagnation in some parts of the village and normal life became very difficult during such times. Even the fields with crops submerged in water led to heavy crop losses. After the percolation pond was constructed, most of the water flows down to the percolation pond avoiding stagnation of water and flooding resulting from it.

Elumalai, a farmer belonging to Edaiyur, says: ‘ Earlier, when it used to rain, the bunds of fields used to get eroded by the floods. Our crops used to get submerged in water, and we used to suffer crop losses for 4-5 years. Now since supply channels are constructed to enable a faster flow of flood water, the water gets drained easily into the channels and from the channels to the percolation pond. The check dams hold a lot of run-off flood water, which earlier used to get stagnated at many places in the village, causing flooding. Now despite heavy rains during the last monsoon, we did not face issues of flooding in our village.’

Added revenue to the Panchayat due to percolation pond

All the farmers with whom we interacted during the course of the Impact Study stated that fish rearing is also undertaken in the percolation ponds. Fish varieties like Rogu and Katla are reared in the percolation ponds. Within a period of 6 months, around 2500 to 3000 kg of fish can be cultivated, and these fish fetch anywhere between Rs. 150 per to Rs. 200/- per g.

Desilting of Percolation Pond

Community members who interacted during the study revealed that as the percolation pond was well maintained with adequate water levels, the need for desilting of the pond has so far not risen, and if there is a need they will all put their efforts together, discuss in the Village Panchayat and take a decision on the matter. It was added that the pond requires desilting only.

Key Impact of the Project

Increased water levels in wells reported

Farmers in Edaiyur reported that water in their wells rose by 15 feet to 25 feet after the construction of the Percolation pond.

Water availability during summer months

Community members in Edaiyur felt that there is much availability of water (57%). 43% of the respondents stated that water availability has increased during the summer months to a certain extent.

Increased water availability during summer months

There is increased water availability during summer months to a larger extent (58%), and to a certain extent(42%) as reported by community members. Though this water is not used for drinking purposes, this structure indirectly impacted the availability of water in the wells of the community.

Conclusion

Interactions with the community members revealed that the percolation pond largely impacted the increase of the water table in the community, with increased water availability during the summer months. It has also led to increase in the cultivable area of individual farmers and the number of cropping too. It was known from the research study that the community positively perceives these structures.

Environmental Initiative 2: Check Dam

Tata capital – NAF constructed 3 check dams one at Salavedu village and another at Veliyampakkam in the year 2019-20, and third one at Amanampakkam in the year 2020-21 in the Vandavasi Block. In Thirukazhukundram the first check dam was constructed in the year 2019 -20 and in the following year 2 check dams were constructed one at Salur and another at Edaiyur. The places where the check dams are now constructed earlier had thick coverage of bushes and even small hillocks at places. It was reported that the community was involved in clearing the bushes, making way for the supply channel. The stones removed from these areas were utilised for strengthening the embankments. Community members interacted at all the four sites stated that flooding of agricultural fields has now been curtailed to a larger extent and smooth flow of water is now ensured through the supply channels. It was shared that the supply channels flow with copious water during monsoon and water retention in the supply channel can be seen in summer months too. This study was conducted among 95 respondents of vandavasi and 59 respondents of Edaiyur.

Availability of water for Domestic Purposes has increased due to check dam construction.

Whether the water availability for domestic uses increased after the construction of the check dam	No. of respondents		% of respondents	
	Vandavasi	Thirukkazhukundram	Vandavasi	Thirukazhukundram
Yes, To a large extent	56	37	58.9	62.7
Yes, To some extent	39	22	41.1	37.3
Grand Total	95	59	100.0	100.0

Vandavasi

When the respondents were asked whether water for domestic use has increased after the construction of the check dams, a majority of the respondents 58.9% stated that water availability has increased to a larger extent, while 41.1% of the respondents observed an increase to a certain extent. There was no respondent who denied that there was an increase in water levels though an option of No was provided.

The beneficiaries interacted with the research team and noted that after the construction of the check dams, the water table in the wells has risen by at least 6 to 8 feet, and now they have more water available for domestic purposes.

Thirukazhukundram

The majority of the respondents at Thirukazhukundram Block (62.7%), observed that after the construction of the check dams water availability has increased to a larger extent, while 37.3% of the respondents stated that they perceived increased water availability for domestic purposes to a certain extent. Beneficiaries who interacted during the study shared that they were able to see an increased water table in the wells from a minimum of 5 feet to 10 feet.

Reduced expenses in provision

Whether the expenses on provision of fodder to their cattle decreased after the construction of the check dam	No. of respondents		% of respondents	
	Vandavasi	Thirukkazhukundram	Vandavasi	Thirukazhukundram
Yes, To a large extent	55	38	57.9	64.4
Yes, To some extent	40	21	42.1	35.6
Grand Total	95	59	100.0	100.0

Vandavasi

A Majority of the respondents that is 57.9%, noted that because of the increased availability of Green Fodder, their expenses on buying fodder for their cattle have decreased to a larger extent, while 42.1% of the respondents observed a decreased expense to a certain extent. None of the respondents denied it.

Thirukazhukundram

A Majority of respondents that is 64.4% of the respondents noted that because of the increased availability of Green Fodder, their expenses on buying fodder for their cattle have decreased to a larger extent, while 35.6% of the respondents observed a decreased expense to a certain extent. None of the respondents denied it.

Prevention of water runoff after the rains.

Whether water has runoff after rains effectively prevented after the construction of the check dam	No. of respondents		% of respondents	
	Vandavasi	Thirukkazhukundram	Vandavasi	Thirukazhukundram
Yes, To a large extent	52	37	54.7	62.7
Yes, To some extent	43	22	45.3	37.3
Grand Total	95	59	100.0	100.0

Vandavasi

When the respondents in vandavasi block were asked whether water runoff after the rains has been prevented now after the construction of the check dam, 54.7% of the respondents agreed to the statement to a larger extent, while 45.3% of respondents agreed to some extent.

Thirukazhukundram

A Majority of respondents that is 62.7 % stated that water runoff after the rains has been prevented now after the construction of the check dam to a larger extent, while 37.3% of respondents agreed to it to some extent.

Key Impact of the Project

Increased water availability observed

When the community members were asked about the change in water table, it was observed that the water table increased between 6 to 8 feet in the villages of Salavedu, veliyampakkam and Ammanampakkam in vandavasi block and an increase of 5 feet to 10 feet was observed in Salur and Edaiyur villages of Thirukazhukundram Block.

Conclusion

The research study reveals that the villages of Salavedu, Ammanampakkam and Veliyampakkam of Vandavasi Block and the villages of Salur and Edaiyur are highly benefitted by the construction of check Dam. Good moisture retention in the Agricultural Fields and also increased productivity of crops was also reported. The supply channels of the check dam can also be seen with good water flow for most months of the year and flooding has got largely reduced after the construction of the check dam.

Environmental Initiative 3: Cattle Pond

Good amount of water seen:

SoulAce Research Team visited the cattle ponds in the villages of Edaiyur, Salur, Veerakuppam, and Ponpathirkudam and observed that all these water bodies were holding a good amount of water.

Identifying the need for cattle pond construction:

Members of the Village Development Committee and Focus Group Discussions with the community revealed that the project Interventions of the Jal Aadhar Project were initiated after duly identifying the needs of the community using a participatory approach. Instead of adopting a Top driven approach, the project Team elicited people's involvement in the project communities through Participatory Rural Appraisal (PRA) Techniques. Technical experts in the Fields of Agriculture, hydrology, and social experts of the Team undertook Transect walks with people in the project communities. Resource mapping and Social mapping were done with the Community's involvement which brought to light the issue of scarcity of drinking water for cattle during the Summer months between April to August. Appropriate sites in each of the villages were identified by understanding the geological and hydrological features by the team of experts in consultation with the people of the villages of Edaiyur, salur, veerakuppam, and Ponpathirkudam. Needs were identified, prioritized, and ranked which led to choosing to undertake Cattle pond as a necessary intervention in these communities.

Involvement of Village Development Committee:

Village Development Committees were formed with people's participation and the formal and informal leaders of the community were involved in planning and constructing the cattle ponds as with other Interventions implemented by the Jal Aadhar Program. The maintenance of the cattle pond is undertaken through the funds collected by the VDCs, which are pooled in a Bank Account and when the need arises for repair work, the amount is withdrawn and spent for the purpose.

The burden of providing water for cattle drinking felt to be greatly reduced:

The Research Team's Interaction with the community members revealed that it used to be very difficult for finding means for water provision for cattle during summer months, as people themselves suffer huge water scarcity. After the construction of the cattle pond, cattle have a water source for drinking in the community, which has given a feeling of relief to the cattle farmers.

Moderate increase of milk yield:

Interactions with community members revealed that most of them have observed that there is an increase between ½ liter to a liter of milk yield per cow per day. . This increase in milk yield also brings along an increase in revenue generated through it, though by a smaller amount.

Positive Perception of the community on the Intervention:

The majority of the community members who interacted with the Research Team seemed to express an overwhelmingly positive opinion on the cattle pond. The communities look upon the cattle pond as a valuable asset.



Foundation stone of the cattle pond at Veerakuppam, Edaiyur.

Environmental Initiative 4: Trench Cum Field Bunds

Field trenches cum bunds

TCHFL constructed Field trenches cum bunds in the farmlands in the project villages of Rajampalayam, Gunankaranai, Salavedu, Anaikunnam, and Edaiyur. The Field trenches and bunds were meant for increasing precipitation by breaking the slope of the ground and reducing the velocity of water runoff. By decreasing the velocity of water flow, they improve water infiltration. These structures also help in preventing soil erosion. Interviews were undertaken with 10 farmers for whom Field Trenches and bunds were constructed.

Impact observed from Field Trenches and bunds

beneficial to farming practices. It was shared that there is better water retention following rains in the trenches, as water runoff from rain is effectively prevented.

All the respondents (100%) stated that the degradation of soil has largely been reduced because of the protection of soil loss by the structure of the bund. Earlier there used to be a loss of fertilizers applied on soil, which gets carried out of the field following rains. This has been prevented effectively by the structure of Field trenches cum bunds.

All the respondents (100%) stated that water infiltration has improved and soil moisture levels are good now. Stagnation of some amount of water in the fields is required for paddy cultivation and now the presence of Field bunds helps in maintaining a water level in the Field, conducive for paddy cultivation.

Crop loss due to floods has also been reduced after the structures of Field bunds and trenches were conceded by all the farmers.

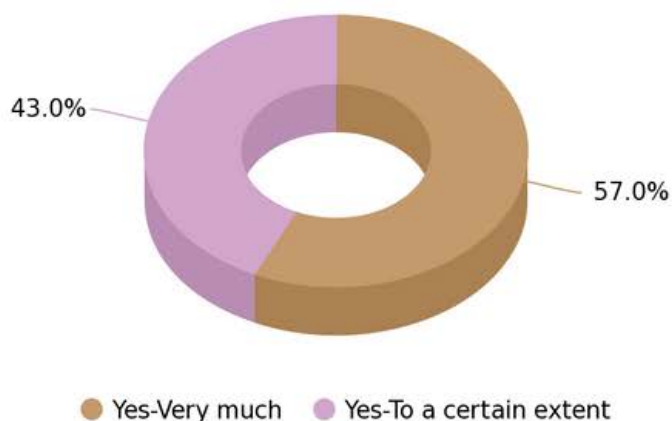
All the farmers who interacted during the course of the study stated that the yield levels have improved by 20% after having the structures of Field Trenches cum bunds.

Impact observed from various Environmental Initiatives

This section describes the Impact of the environmental initiatives of Percolation ponds, Check dams, Cattle ponds, and Field trenches cum bunds.

Impact: Increased water availability for cropping during summer months due to various Environmental Initiatives

Percentage of respondents who reported whether there is increased water availability for cropping during summer months due to various environmental initiatives



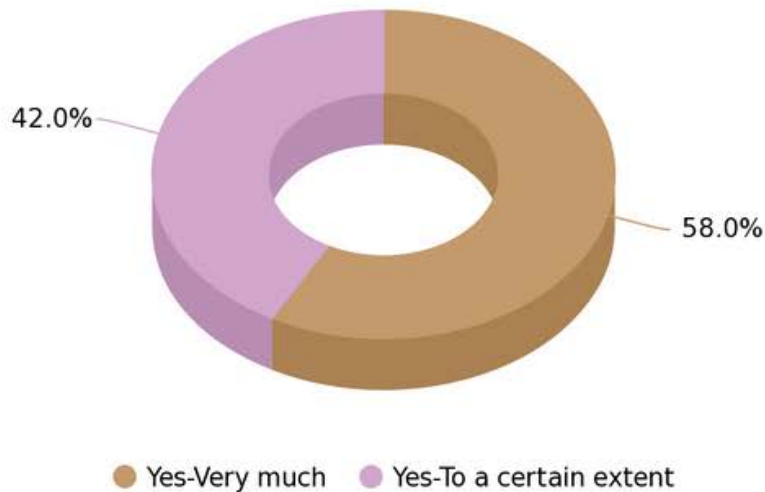
When the farmers were asked whether there was increased water availability for cropping during summer months due to the various environmental initiatives, the majority of respondents, that is 57%, stated that there is good availability of water, while 43% of respondents stated that water availability has increased during summer months only to a certain extent.

Most of the farmers noted that earlier they had only a single cycle of cropping done. The cropping called 'Samba pattam' in the local language is usually undertaken during the months of November to January or February. Before the construction of the watershed structures in the community, only Samba pattam was in vogue in the project communities of Edaiyur. However, after the CSR Intervention of watershed structures constructed by the TATA CAPITAL through NAF, farmers are able to carry out 'Kuruvai Pattam' or the second cycle of cropping in the months of April and May. This has become possible only because of increased water availability for cultivation in the summer seasons too.

The Third Cycle of cropping known as 'Navarai Pattam' is also carried out in the months of June and July. Though it is not a common practice by most villagers, a few of the farmers are also able to carry out the third cycle of cropping.

Impact: Increased water availability for drinking water purposes due to various watershed structures.

Percentage of respondents reported whether there is increased water availability for drinking purposes after the construction of the percolation pond

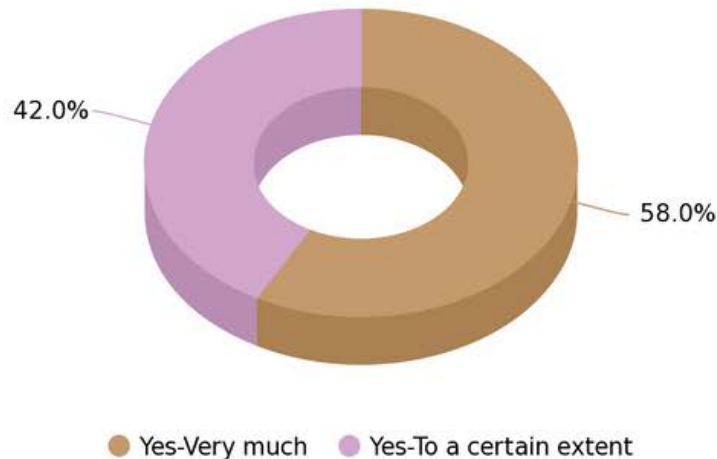


When the respondents were asked whether there was increased water available for drinking water purposes after the construction of various watershed structures 58% of the respondents stated that there is much availability of water as compared to before, while 42% of the respondents stated that there is increased water availability to a certain extent. It should be noted here that though the purpose of the construction of various watershed structures is not supplying drinking water, the presence of a percolation pond helps in augmenting the water table in the community land thus it indirectly leads to better availability of drinking water through the wells and waterbodies in the community.

Most farmers with whom our team interacted during the course of study at Edaiyur attributed the increase in water availability for drinking water purposes to the increased water table in the wells after the construction of the various watershed structures.

Impact: Increase in the cultivable area after the construction of various watershed structures.

Percentage of respondents reported whether they are able to increase the cultivable area after the construction of the percolation pond



When the respondents were asked whether they were able to increase the cultivable area after the construction of various watershed structures the majority of the farmers, that is 58%, stated that they were able to increase it by a large extent, while 42% of the respondents reported an increase in cultivable area to a certain extent.

Most of the farmers with whom our team interacted during the course of the study stated that they were able to increase their cultivable area to 75% of the total land area, where as earlier they were able to cultivate in only about 50% of the area due to less water availability. This increase in cultivable area was attributed to the availability of more water made possible by different watershed structures built in the community like the Gabian check dams, farm ponds, percolation ponds, etc.

Impact: Sufficient availability of Green fodder observed after the construction of the various watershed structures.

Whether their cattle getting sufficient fodder after the construction of the check dam	No. of respondents		% of respondents	
	Vandavasi	Thirukkazhukundram	Vandavasi	Thirukazhukundram
Yes, To a large extent	56	37	58.9	62.7
Yes, To some extent	39	22	41.1	37.3
Grand Total	95	59	100.0	100.0

Vandavasi

When the respondents were asked whether they observed any improvement in the availability of Green Fodder after the construction of various watershed structures a majority of the respondents that is 58.9% of the respondents stated Green fodder is available to a larger extent now, while 41.1 % the respondents replied that Green Fodder is now available to a certain extent. None of the respondents denied the statement. When asked how the various watershed structures dam resulted in increased availability of green fodder, the respondents noted that because of increased water retention in the community lands especially those adjoining the watershed structures, there is more growth of greenery, and the cattle go for grazing there, which has substantially reduced the need for them to provide dry fodder.

Thirukazhukundram

A majority of the respondents in Thirukazhukundram that is 62.7% of the respondents observed increased availability of Green Fodder for cattle after the construction of various watershed structures while 37.3% of the respondents noted an increased availability but to a certain extent only. Beneficiaries interacted with the Research Team and shared that they can see more green vegetation in the village compared to 4-5 years ago and they stated that cattle now have green fodder for many months than what used to be available earlier.

Vandavasi

Impact: Statistically significant increase in the yield of Paddy observed after the Construction of various watershed structures.

The Question of increase in yield of paddy was asked to 76 respondents among 95 respondents who grew paddy.

H0: Null Hypothesis: There is no significant difference in the yield of Paddy before and after the construction of the watershed structures.

HA1: There is a significant increase in a significant difference in the yield of Paddy after the construction of the watershed structures

HA2: There is a significant decrease in the yield of Paddy after the construction of the watershed structures.

Mean yield before the Intervention in Kgs./Acre	Mean yield after the Intervention in Kgs./Acre	Standard Deviation before the Intervention	Standard Deviation after the Intervention	Stand ar d Error of Mean Before	Stand ar d Error of Mean After	P value
1617.89	1813.16	531.45	515.65	54.50	52.19	0.0109

The mean yield of Paddy was 1617.89 Kg. per acre before the construction of watershed structures and 1813.16 per acre after the construction of watershed structures.

There is an increase of 195.26 Kg. per acre in the yield of Paddy after the Construction of various watershed structures was observed.

At a 95% confidence interval, this increase in Paddy yield could be from 45.43 Kgs. to 345.09 Kgs.

The mean value p-value is 0.0109 and by conventional criteria, this difference is statistically significant.

Hence the Null Hypothesis that there is no significant difference in the yield of Paddy before and after the construction of the various watershed structures is rejected and the alternative hypothesis that there is a significant increase in the yield of Paddy after the construction of watershed structures is accepted.

Thirukazhukunram

Impact: Statistically significant increase in the yield of Paddy was observed after the Construction of watershed structures.

The question of increase in yield of paddy was asked to 45 out of 59 respondents who grew paddy.

H0: Null Hypothesis: There is no significant difference in the yield of Paddy before and after the construction of the watershed structures.

HA1: There is a significant increase in a significant difference in the yield of Paddy after the construction of the watershed structures

HA2: There is a significant decrease in the yield of Paddy after the construction of the watershed structures.

Mean yield before the Intervention in Kgs./Acre	Mean yield after the Intervention in Kgs./Acre	Standard Deviation before the Intervention	Standard Deviation after the Intervention	Stand ar d Error of Mean Before	Stand ar d Error of Mean After	P value
1837.29	2022.03	386.81	364.87	50.36	47.50	0.0087

The mean yield of Paddy was 1837.29 Kg. per acre before the construction of watershed structures and 2022.03 Kg. per acre after the construction of the watershed structures.

There is an increase of 184.75 Kgs. in the yield of Paddy after the construction of the watershed structures was observed. At a 95% confidence interval, this increase in Paddy yield could be from 47.63 Kgs. to 321.86 Kgs. The mean value p-value is 0.0087 and by conventional criteria, this difference is very statistically significant.

Hence the Null Hypothesis that there is no significant difference in the yield of Paddy before and after the construction of the watershed structures is rejected and the alternative hypothesis that there is a significant increase in the yield of Paddy after watershed structures is accepted.

Vandavasi

Impact: Statistically Significant change in Income due to the construction of the various watershed structures was observed.

HO: Null Hypothesis: There is no significant difference in the Income of the farmers before and after the construction of the watershed structures.

HA1: There is an increase in the Income of the farmers after the construction of the watershed structures.

HA2: There is a decrease in the Income of the farmers after the construction of the watershed structures.

Mean Income before the Intervention	Mean Income after the Intervention	Standard Deviation before the Intervention	Standard Deviation after the Intervention	Stand ard Error of Mean Before	Stand ard Error of Mean After	P value
20715.79	22842.11	4251.82	4517.85	436.23	463.32	0.0001

The mean Income of the farmers was Rs. 20715/- before the construction of the watershed structures and Rs. 22842.11/- after the construction of the watershed structures.

There is an increase of Rs. 2126.32/- in the income of the farmers after the construction of the watershed structures.

At a 95% confidence interval, this increase in the area could be from Rs.1937.82 /- to Rs.2314.81/- was observed. The mean value p-value is 0.0001 by conventional criteria this difference is statistically significant.

Hence the Null Hypothesis that there is no significant difference in the Income of the farmers before and after the construction of the watershed structures is rejected and the alternative hypothesis that there is a significant increase in the yield of paddy after the construction of the watershed structures is accepted.

Thirukazhukunram

Impact: Statistically Significant change in Income due to the construction of the watershed structures was observed.

H0: Null Hypothesis: There is no significant difference in the Income of the farmers before and after the construction of the watershed structures.

HA1: There is an increase in the Income of the farmers after the construction of the watershed structures

HA2: There is a decrease in the Income of the farmers after the construction of the watershed structures.

Mean Income before the Intervention	Mean Income after the Intervention	Standard Division before the Intervention	Standard Division after the Intervention	Stand ard Error of Mean Before	Stand ard Error of Mean After	P value
21118.64	23355.93	4323.49	4700.56	562.87	611.96	0.0001

The mean Income of the farmers was Rs. 21118.64/- before the construction of the various watershed structures and Rs. 23355.93/- after the construction of the watershed structures.

There is an increase of Rs. 2237.39/- in the income of the farmers after the construction of the watershed structures. At a 95% confidence interval, this increase in the area could be from Rs. 1915.05/-to Rs. 2559.52/- was observed. The mean value p-value is 0.0001 by conventional criteria this difference is statistically significant.

Hence the Null Hypothesis that there is no significant difference in the Income of the farmers before and after the construction of the watershed structures is rejected and the alternative hypothesis that there is a significant increase in the yield of paddy after the construction of the watershed structures is accepted.

Major Findings from the hydrologist study



The strength of the relationship between the rainfall and water level was positive and moderate.



The depth has increased by an average of about 3 meters in the Vandavasi block and by an average of 3.8 meters in the Thirukalukundram block over the intervention period.



About 26.45% of the rainfall has recharged directly to the ground in the Vandavasi block and about 16.7% in the Thirukalukundram block.



Creation of surface storage of 43,820.49 cubic meters in the Vandavasi cluster and 40,476 cubic meters in the Edaiyur cluster, with a storage potential of about 60% of the capacity. The volume of storage created is capable of holding about 1% of the annual rainfall received in the intervention area.



Change in land use pattern indicates a marked growth in the area under water (+2.75%; +5.32%), crops (+4.86%; +3.79%), and trees (+1.74%; +3.13%) for both Vandavasi and Edaiyur clusters indicating the success of efforts towards water management, agricultural productivity, and afforestation.



NDVI analysis further shows that there is an observed shift from dense vegetation to sparse vegetation (18%; 16%) which is the result of increased crop diversity and the shift away from water-intensive crops.



With regards to cropping intensity, double cropping is the most common practice, followed by single cropping and triple cropping in the period of assessment (2016-2018). Reports from the farmers indicate it is possible to cultivate a third crop owing to the interventions by NAF.

Reports from the farmers indicate it is possible to cultivate a third crop owing to the interventions by NAF.

Social Initiative 1: Village Development Committee



The following facts came were highlighted in the course of the Interview.

The VDC members shared that the community has witnessed a gradual increase in the groundwater levels due to various watershed initiatives in the community like village ponds, cattle ponds, percolation ponds and check dams. Agricultural activities have also seen a good amount of improvement resulting in a substantial increase in the income of the farmers in the community.

Village Development Committees (VDCs) as the fulcrum of all Development Initiatives

Composition of VDCs

The Village Development Committees composed of 15 members elected by the Gram Sabha members and having a fair representation of land owners, Landless farmers, SHG members, and members of Scheduled Castes was one of the first initiatives taken up by Tata capital to spearhead the Development Interventions. Each VDC formed for a village has a chairman, vice-chairman, Treasurer, and Secretary.

Ensuring Sustainability of the Projects through VDCs

The VDCS mobilizes funds from the community and maintains the funds in a separate Bank Account to ensure the continuation of the project activities even after the exit of Tata capital from the Project Communities.

Tata Capital also provides 5% of its unutilized funds under the Project for the sustainability of the Project to the VDC account.

Ensuring continuous community engagement

The study found that the VDCs have members who have high levels of voluntariness to involve themselves in Community progress and growth, motivate and mobilize the community members towards common Initiatives carried out in their village.

Overcoming community reluctance and building support

The study found that the VDCs have played a crucial role in engaging with community members, clarifying their concerns about the relevance and probable usefulness of the project Interventions. This helped Tata Capital in the smooth implementation of its projects through its project partner NAF.

Acquired awareness of Modern and Scientific Agricultural Practices

The Village Development Committee members acknowledged that the various Training sessions organized by TATA capital - NAF on various best Practices in agriculture improved their Knowledge of these areas and instilled them in the hope that these practices can result in better yield and better income for the farmers. Though the community members were not enthusiastic about accepting and trying out these ideas in the earlier stages, the repeated visits of experts Technical and social experts to the villages added more credibility to these messages. Their continuous interactions and deliberations with community members made the community members think of experimenting with these ideas in their agricultural field.

Fodder availability has increased

Tata capital- NAF encouraged the farmers to grow fodder varieties and 8 varieties of fodder seeds were supplied. Some of the major varieties grown are CO 4, Agathi, Cumbu, and Napier Grass. It was shared that more than 300 farmers would have benefitted in the entire watershed area.

The farmers have been sensitized adequately on the importance of growing fodder varieties as a measure to feed cattle with protein-enriched fodder, which in turn can lead to increased milk yield. Since growing fodder within the agricultural fields entails earmarking some portion of the land for this purpose, initially farmers showed little reluctance to do the same. Over course of meetings, many began realizing the importance of growing fodder varieties and apportioned between 5 cents to 10 cents of land for the growth of green fodder. As a result of this activity, the cattle owners now have an ensured supply of fodder for their cattle and this has almost reduced 60 to 70% of their need for buying fodder for their cattle and also physical labor in procuring grass for their cattle. The cows are said to be showing an increased milk yield by 1 liter to 2 liters, which means an added income from extra milk yield.

Substantial increase in Ground water level observed

The various watershed initiatives like Check dam, Cattle pond, village pond, and percolation pond have helped in slowing down the runoff water after rains and have acted as reservoirs for storing rainwater. The surface runoff water has got reduced by 20% to 30% when compared to the situation before the CSR Intervention of watershed activities. The groundwater used to be at a depth of 400 feet and even more before these CSR Project activities. But after these interventions, the groundwater level increased by 30 to 40 feet, which was observed as a good increase by the community members. Some of the community members who interacted with the Research Team mentioned an increase in the groundwater level as high as 50 ft.

Increase in Farm yield

The farmlands have started showing a higher yield of grains and in particular, the Fields in the vicinity of the Check Dams have a considerably higher yield of crops compared to those located at a distance from the Check Dams. But it was noted that there was a substantial increase in grain yield across all fields in the village. There is a 20 to 30% increase in the yield of various crops as shared by the community members.

Increase in number of cropping

Before the watershed Interventions, only Single cropping was practiced by most farmers, and double cropping was carried out only with the exception of a few farmers. After the watershed interventions, due to increased water retention in the soil, and also due to supportive weather conditions of good rainfall in the past 3-4 years, most farmers were able to carry out double cropping. Few farmers are also able to go for the 3rd cropping too, which is an appreciable change as noted by the VDC members.

When the VDC members were further probed about whether they attributed the increase in yield to good rains or the watershed initiatives, they stated that there were years of very good rainfall even before the watershed initiatives before 2017, like in the year 2015, but the community were not having enough water holding structures to capitalize the copious water flow. The members stated that good rainfall at the right time of the crop cycle is an essential condition for increased crop yield but the availability of a supportive infrastructure amplifies the effect or at least optimizes the effect of increased water availability due to rains, which normally goes waste in the absence of such structures.

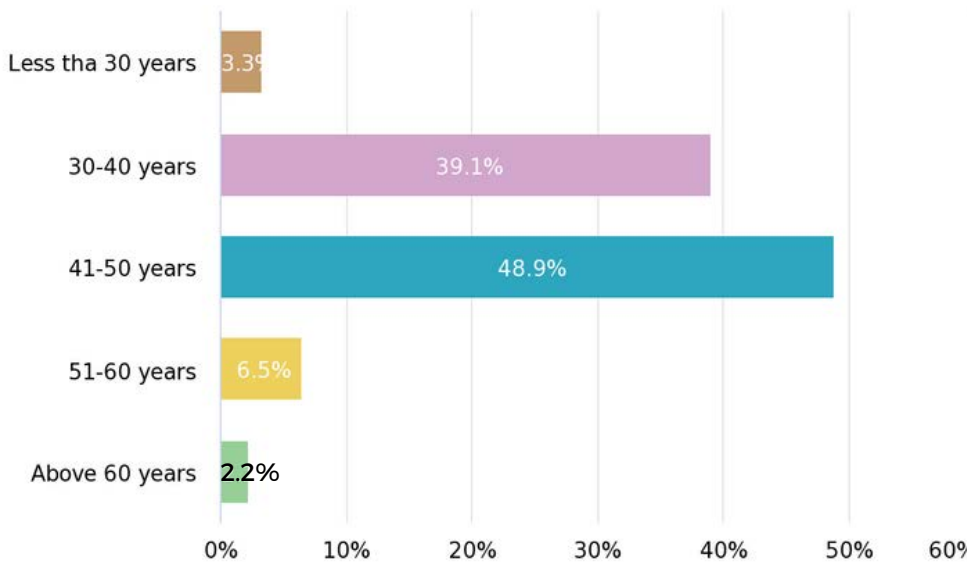
Financial burden on paying for water has substantially reduced

Wells of the community which used to be absolutely dry in summer months are now showing the presence of water during dry months too. The community members feel this is a welcome change attributed mainly due to the availability of the new water structures in the community, which have considerably improved the water table. The improved water level in the wells resulted in having sufficient water for cattle to drink, apart from serving the drinking water needs of the family. Earlier the community members were also spending money for buying drinking water. It was shared that now almost all community members have an assured source of drinking water.

Social Initiative 2: Syntax Tank

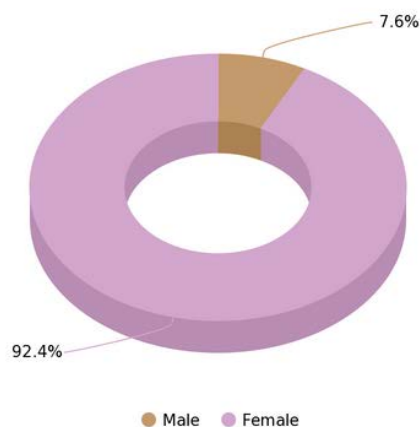
When TCHFL-NAF initiated its project activities in the year 2018-19, it sensed the dire need among the project communities for safe drinking water. The need for safe drinking water with easy access to the community was voiced in the participatory Rural Appraisal exercises in the villages and it was one of the top priority needs of the project communities. Hence TCHFL- NAF installed around 9 units of Syntex Tanks in the villages of Veliyampakkam, Seeyalam, Gunankaranai, Amanampakkam, Salavedu, Seeyalam, Manimangalam, Anaikunnam, and Eiypakkam.

Age group of the respondents

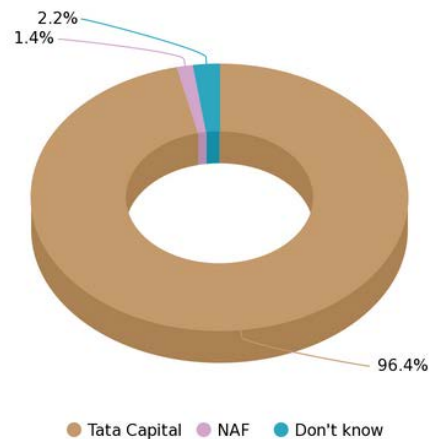


It can be observed that respondents in the age group of 41-50 years composed 48.9% of the sample, followed by 39.1% in the age group 30 to 40 years. Those in the age group 51 to 60 formed 6.5 % of the respondents while there 3.3% of respondents less than 30 years and 2.2% of respondents above the age of 60 years.

Percentage distribution of respondents by gender

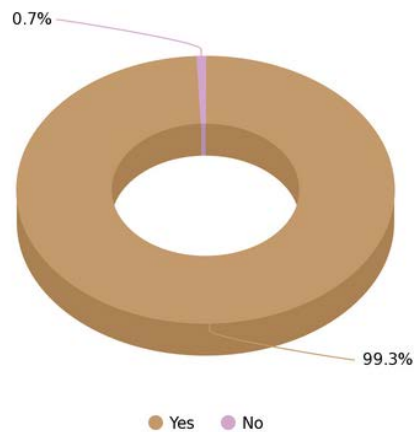


Visibility of the Donor



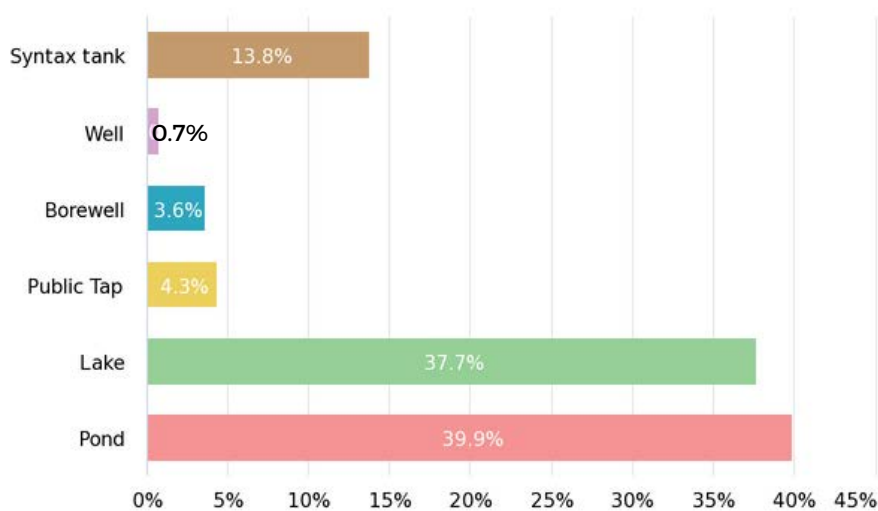
When the respondents were asked which organisation had installed Syntax tank in the locality 96.4% of the respondents answered it is TATA Capital which did it, and only 1.4% of the respondents stated the name of NAF. 2.2% of the respondents were not aware of the donor organisation. This observation of the beneficiaries in all project villages goes along with similar identification of TATA capital for all other CSR Project Interventions too.

Tap connection at home



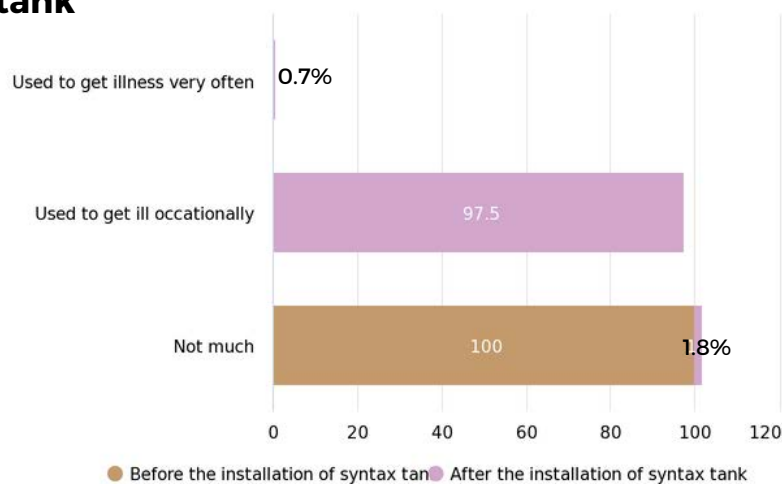
Almost all the respondents in the project villages were not having a Tap connection barring 2 respondents (0.7%). This shows that all the beneficiaries were solely dependent on the syntax only for drinking water purposes.

Source of water for cleaning and washing purposes now



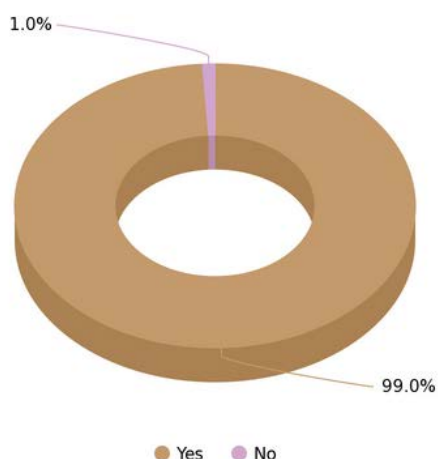
When the respondents were asked what is the source of water for cleaning and washing purposes, 39.9% of the respondents stated that they were using Pond water, while 37.7% of the respondents stated that they go to the lake for this purpose. 13.8% of the respondents use water from the syntax tank for this purpose, while 4.3% of the respondents use Public Tap provided by the Panchayat for this purpose. 3.6% of the respondents were using Borewell for the same.

Prevalence of water borne diseases before and after the installation of the syntax tank



When the study wanted to identify if there was any water borne diseases that existed in project communities before the installation of syntax tank and whether those diseases have got reduced now after beginning to use water from the syntax tank, it came to be known that water borne diseases were occurring only occasionally and they were not a major health problem in the area as stated by 97.5 % of the respondents. After the installation of the syntax tank all the 100% of the respondents stated that there was not much water borne diseases, except for occasional illness. None of the community members shared the prevalence of water borne diseases as a major concern either before or after the installation of the syntax tank.

Sufficiency of water received from the Syntax Tank



When the respondents were asked about whether the quantity of water received from the syntax tank was sufficient for their drinking water needs almost all the respondents (99.3%) barring 2 respondents (0.7%) stated that water is sufficient for their daily drinking water needs.

Impact: Statistically significant reduction in travelling distance to get water observed

HO: Null Hypothesis: There is no significant difference in the distance traveled to get water before and after the installation of the syntax tank.

HA1: There is a decrease in the distance traveled to get water after the installation of the syntax tank.

HA2: There is an increase in the distance traveled to get water after the installation of the syntax tank.

Mean Distance travelled before, in mts.	Mean Distance travelled after, in mts.	Standard Division before the Intervention	Standard Division after the Intervention	Standard Error of Mean Before	Standard Error of Mean After	P value
425.54	38.24	185.30	14.38	11.15	0.87	0.0001

The mean distance traveled to get water before the installation of the syntax tank was 425.54 mts. and The mean distance traveled to get water after the installation of the syntax tank was 38.24 and the difference between these two means is 387.30 mts., which implies that the beneficiaries' travel distance to get water has got reduced this much.

At 95 % confidence levels this distance can be anywhere between a minimum of 365.45 mts and 409.15 mts. The p-value is less than 0.0001, which means this is extremely statistically significant. Thus the null hypothesis that there is no significant difference between the distance traveled to get water before and after the installation of the syntax tank is rejected and the alternative hypothesis that there is a decrease in traveling distance to get water is accepted.

Impact: Statistically significant reduction in Time spent to get water observed

H0: Null Hypothesis: There is no significant difference in the Time travelled to get water before and after the installation of the syntax tank.

HA1: There is a decrease in the Time spent to get water after the installation of the syntax tank.

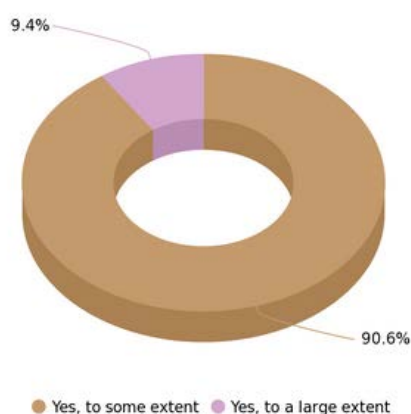
HA2 : There is increase in the Time spent to get water after the installation of the syntax tank.

Mean Time spent to get water in minutes before	Mean Time spent to get water in minutes after	Standard Division before the Intervention	Standard Division after the Intervention	Stand ar Error of Mean Before	Stand ar Error of Mean After	P value
59.84	31.09	13.98	3.91	0.84	0.24	0.0001

The mean time spent to get water before the installation of the syntax tank was 59.84 minutes and the mean time spent to get water after the installation of the syntax tank was 31.09 minutes and the difference between these two means is 28.74 minutes which implies that the beneficiaries' traveling time to get water has got reduced this much.

At 95 % confidence levels this distance can be any where between a minimum of 27.11 minutes and 30.37 minutes. The p value is less than 0.0001, which means this is extremely statistically significant. Thus the null hypothesis that there is no significant difference between the time spent to get water before and after the installation of the syntax tank is rejected and the alternative hypothesis that there is a decrease in traveling time to get water is accepted.

Availability of water during summer months

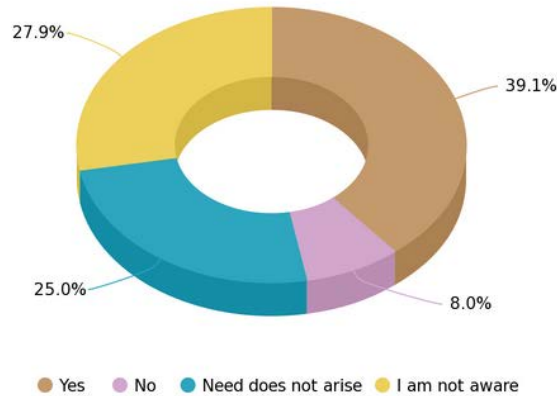


When the respondents were asked whether they got sufficient water during summer months, a majority of the respondents that is 90.6% of the respondents stated that they get sufficient water to a certain extent, while 9.4% of the respondents stated that the water they get during summer months is sufficient to a larger extent.

Problems faced in getting drinking water now

When the respondents were asked whether they faced any difficulties or problems in getting drinking water now, all the respondents stated that they are happy with the availability of drinking water from the syntax tank and that they are not facing any problems with the water availability.

Repairing of Syntax Tank



When respondents were asked whether the syntax tank was repaired or not after the installation, 39.1% of the respondents stated that there were repairs to the syntax tank. When they were asked about the nature of the repairs they replied that it was minor repairs like changing leaking Taps only and other than that there were not any other repairs that happened. 25% of the respondents stated that the syntax tank was functioning in a proper condition since installation and there was no need for carrying out any sort of repair work in that. Similar to this response, 8% of the respondents stated that the syntax tank was not repaired, while 27.9% of the respondents were not aware of whether the syntax tank was repaired or not. From these response patterns, we can infer that the syntax tanks installed were in a good condition, and there was not much need for repairing them.

Maintenance of Syntax Tank

When the respondents were asked who maintains the syntax tank all the respondents stated that it is the Panchayat that maintains the syntax tank.

Key Impact of the Project

Decrease in Distance traveled to get water observed

The mean distance travelled to get water before the installation of the syntax tank was 425.54 mts. and 38.24 mts. after the installation of the syntax tank. The difference between these two means is 387.30 mts., which implies that the beneficiaries' travel distance to get water has got reduced this much.

Reduction in time spent to get water

The mean time spent getting water before the installation of the syntax tank was 59.84 minutes and 31.09 minutes after the installation of the syntax tank. The difference between these two means is 28.74 minutes which implies that the beneficiaries' got a saving this much time now.

Considerable water availability during summer months

90.6% of the respondents opined that they get sufficient water to a certain extent, while 9.4% of the respondents felt it is sufficient to a larger extent.

Conclusion

Beneficiaries who interacted with the study opined that their hard labor on getting water by traveling long distances to reach lakes got reduced now. They along with the reduction in the distance traveled there was also a time saving on getting water. Beneficiaries also reported of a good quality of water with no bad odor or color. There was not much impact on waterborne diseases, as even before the installation of the syntax tank, it was not a major health issue in the project villages.



Social Initiative 3: SHG Federation

Under TCHFL, the Vandavasi project SHG federation was started in the year 2019 with 512 members with the goal of making women active participants in Income Generation and empowering them to support their families. All the Income Generation Program activities are routed through the SHG federation. Interactions with the members of the SHG federations provided insights into how the lives of the women have changed and the knowledge they have gained in financial operations. The SHG federation acted as a platform for women of different project communities to come together, and procure loans for investing in Income Generating activities like the breeding of cattle, and poultry, owing Tailoring shops, shops for making idly batter, xerox shops, etc., This research study has been carried out among 221 women belonging to different SHGs part of the Federation. The research team found that the SHG federations were facilitated for Bank linkage, and many have procured loans from Banks for further expansion of their businesses.

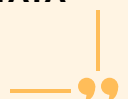
Sridevi:- A Stellar Example of Women's Empowerment



Sridevi, 34 years old, Female, Veliambakkam, Vandavasi Block can be said to be a role model to women in the region. Her story is one of struggles and challenges and how with grit and sheer determination she overcame all the odds. Today, she stands as a stellar example for other women in the rural community to follow suit.

Sridevi's husband died when her newborn infant was just 40 days old. She became shell-shocked not knowing what she would do alone with the child for livelihood. She was broken and could not come to terms with her adversity for quite some time. At the time of marriage, she had completed her diploma in nursing, but she was hesitant to take up the job of a nurse as it would involve leaving her little kid at home and going out from the village to a nearby town. At the time, she had observed that people in her village took out their cows to a veterinarian's place for artificial insemination and that cattle owners spent a considerable amount of money on AI. She learned that there was a big demand in the village among cattle owners for artificial insemination and wanted to somehow learn it.

She approached the Arogya Milk production unit, where they taught AI technology. However, they refused to teach her the technology. Then she traveled to distant Chennai and approached the Government Veterinary Development Centre and pleaded with the authorities there to enroll her in the program for receiving AI Training. With great struggle, she got permission from the authorities to get training for the same from the center at Pudukottai. After learning the technology, she started doing AI in the village itself. Having seen her skill, and the rate of success of AI, she became popular in her village and the surrounding villages. In the year 2018, she came in contact with the TATA Capital - NAF personnel, who identified her potential and gave her the impetus to try out different income-generating activities. Coming into contact with the NGO, she was enrolled in the SHG federation, and she used to motivate and mobilize women in Veliambakkam to participate in all the meetings. Motivated by the TATA Capital - NAF personnel, she also started a petty shop attached to her home and started another stream of revenue generation. Whenever the NAF wanted to organize a meeting in the village for women, she used to go to every house and motivate and mobilize the women for the meetings. Having seen her energy, enthusiasm, and leadership abilities, all the SHGs elected her as the leader of the SHG Federation. In the year 2019, she got Rs. 30,000/- as a loan from the TATA Capital - NAF for buying 2 batter machines and started grinding idly/dosa batter for people in her village and nearby villages. Tasting success in her entrepreneurial activities, she wanted to expand her activities further wherein she applied for a loan of Rs. 10 Lakh under the PMEGP Scheme. She got it from the Union Bank of India, Tiruvannamalai. She got a Ground nut pounding machine with the money. Further, she also bought a grinding machine for making ginger garlic paste; people in her village and neighboring villages approach her for grinding ginger garlic paste for feasts during family celebrations. Apart from these activities, she also does vermicomposting, and Azolla cultivation and has a small horticultural nursery. She had recently bought a Xerox machine too. Through all her activities, she manages to earn close to Rs.35,000/- - 40,000/- a month, which is quite a good amount of money in the rural setting. She says **' I attribute my success to the moral support and encouragement given to me in my entrepreneurial activities by the TATA Capital - NAF. If they had not stood by me and given me ideas on how to improve my business, I would not have become this successful. TATA capital - NAF should continue to support people like me in this village.'**



Name of the SHG	No. of members	Year of Commencement
AMMAN	15	2019
ANANDHAM	13	2019
ANNAI THERESA	17	2019
DHARMAMMAL	12	2019
GANGAI	17	2019
KAVERI	16	2019
MALAR	15	2019
MALLI	13	2019
MARIKKOZHUNTHU	13	2019
ROJA	14	2015
SAMANTHI	15	2017
SENBAGAPOO-1	19	2019
SENTHAMIL	16	2019
SENTHOORAM	17	2019
SINTHUNATHIPOO	15	2019
THAMARAI	19	2019
THAZHAMPOO	16	2019
THENDRAL	12	2019
VAIGAI NATHI	17	2019
VENNILAVU	18	2020
VENPURA	17	2017
Total	326	

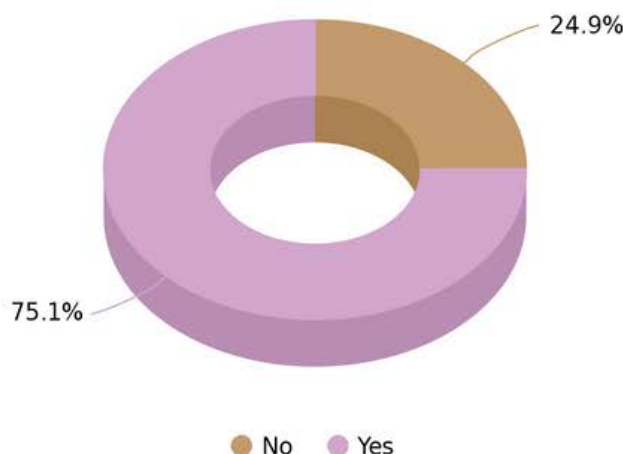
The above Table indicates the responses regarding the number of members in their SHG and the year of commencement of their SHG.

Possession of Bank Account

It is encouraging to note that all the respondents have a Bank Account in their name and they attributed this mainly to the increased awareness on the importance of having a Bank Account for their personal transactions, after becoming a member of the SHGs. Many of the respondents stated that they felt an improved sense of financial independence after coming to own a passbook in their name, whereas it was only the male member of the family who used to have a Bank Account until then.

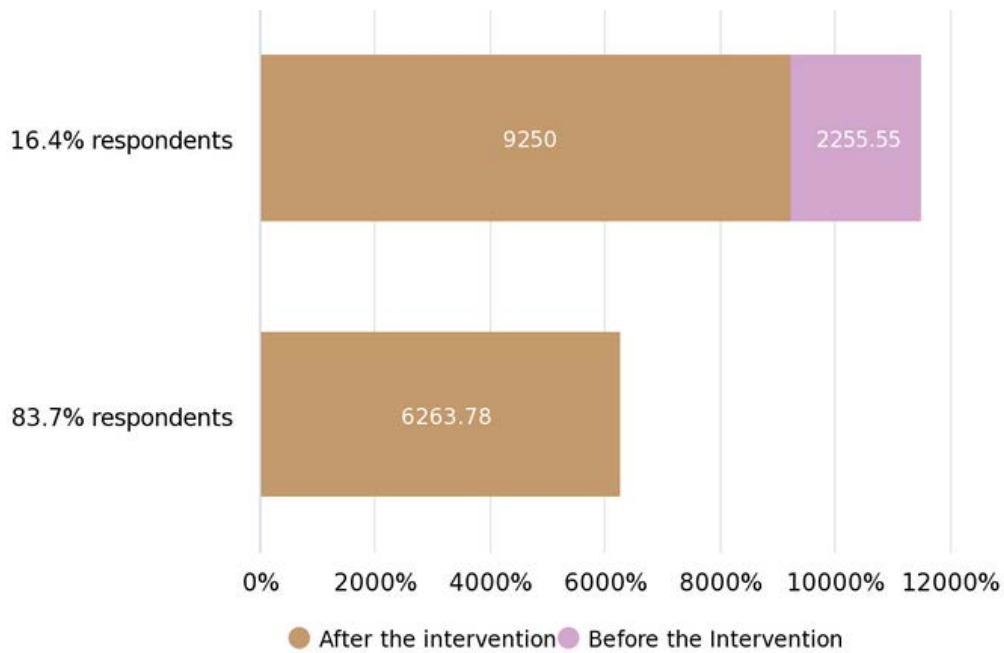
Impact: Considerable proportion of new membership in SHG attributed to facilitation by NAF

Whether the respondents was a member of any SHG before the one facilitated by NAF- TATA capital



When the respondents were asked whether they were members of any SHG before the CSR Intervention of NAF – TATA capital, a majority of the respondents, that is 75.1%, stated they were already members of an SHG, while 24.9% of the respondents stated that they came to know of the importance of an SHG only after the NAF-TATA capital projects started in their villages. The awareness sessions conducted by NAF – TATA capital instilled in their minds the need for becoming a member of an SHG. The women who were not a member of any SHG earlier got motivated to join SHG because of the opportunities for getting training in income generation activities so that they can contribute to their families in a productive manner. It also observed that the majority of those who were members of an SHG before joining the Federation were not involved in any income-generating program. They had joined an SHG mainly to get a loan at a lesser rate for domestic purposes.

Earnings before and after the intervention



Though 75.1% of the respondents were a member of SHG, the majority of them (79% of these women respondents) were not involved in any income-generating activities. The study found that most of them took up Income Generation activities only after joining the SHG federation facilitated by TCHFL. This can be mainly attributed to the capacity-building programs for the SHG women which focussed on Income Generation Programs. It was observed that 83.7% of all the women respondents were not involved in any IGP before joining the SHG federation. It was observed that due to their involvement in Income Generation Program, they were able to earn an average of Rs.6238.78/- per month.

16.4% of the respondents were already involved in some or other IGPs before joining the SHG federation. These respondents were earning an average income of Rs.2255.55 before joining the SHG federation, which increased to Rs.9250/- after joining the SHG. A change of income of Rs.6694.45/- was observed among respondents who were already involved in an IGP.

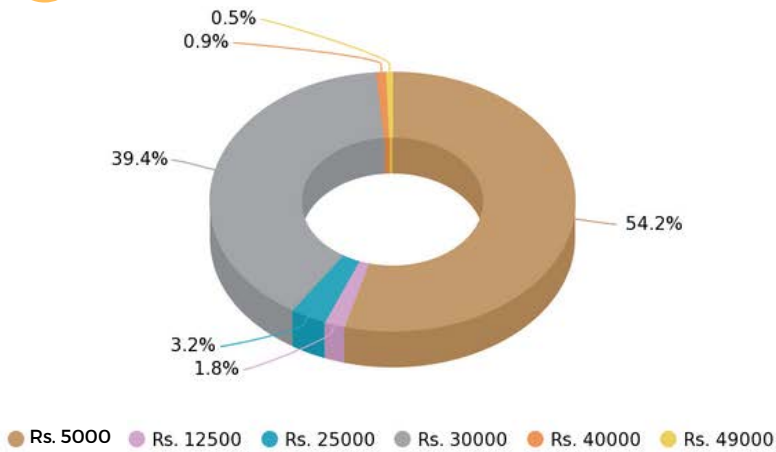
The mean of Earnings per month of all the respondents is Rs. 6382.81 due to involvement in Income Generation Program and at a 95% confidence interval this difference ranges from a minimum of Rs. 5603.08 to a maximum of Rs. 7162.53.

Income Generation Activities undertaken by the respondents

Income Generation activity they are involved in	No. of respondents	% of respondents
BACKYARD POULTRY	120	54.3
BATTER MACHINE	1	0.5
DAIRY FARMING	87	39.4
GRINDING MACHINE	2	0.9
GROCERY SHOP	1	0.5
JCB MACHINE	1	0.5
NURSERY RAISING	1	0.5
SMALL EATERY	1	0.5
TAILORING MACHINE	6	2.7
XEROX MACHINE	1	0.5
TOTAL	221	100.0

When the respondents were asked about their Income Generation activities, the largest proportion of respondents, that is 120 Individuals or 54.3% of the respondents, said they were involved in Backyard Poultry, while 87 Individuals or 39.4% of the respondents were involved in Dairy Farming. Six respondents or 2.7 % of the respondents were involved in Tailoring activities. Two of the respondents owned Grinding machines for making and selling batter for Idly/Dosa. There was one respondent in each of the IGPs of Grocery Shop, xerox shop, small eatery, and Nursery raising. There was also one respondent who had a JCB machine.

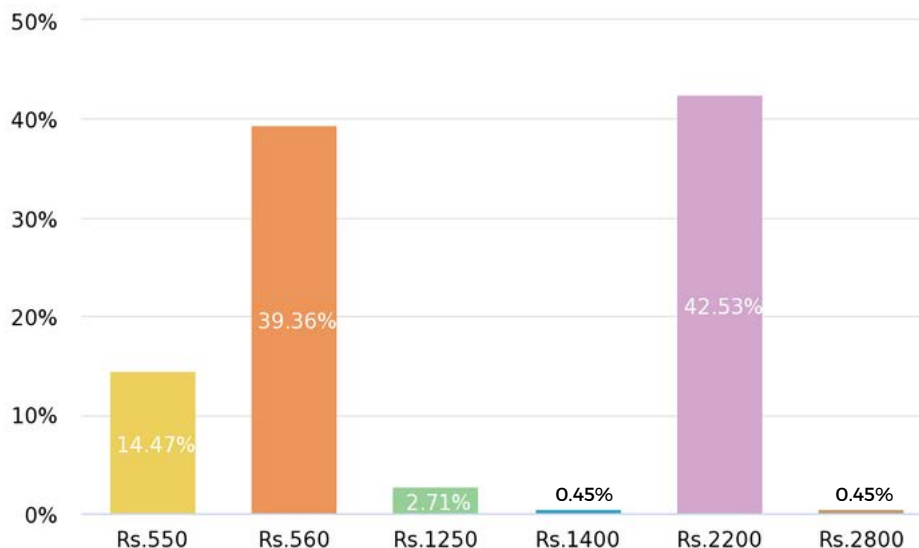
Amount of Loan obtained towards IGP



When the respondents were asked about the Income Generation Activities they were involved in, 54.3% of the respondents stated that they obtained a loan of Rs. 5000/-, and these respondents invested the amount for raising Backward Poultry.

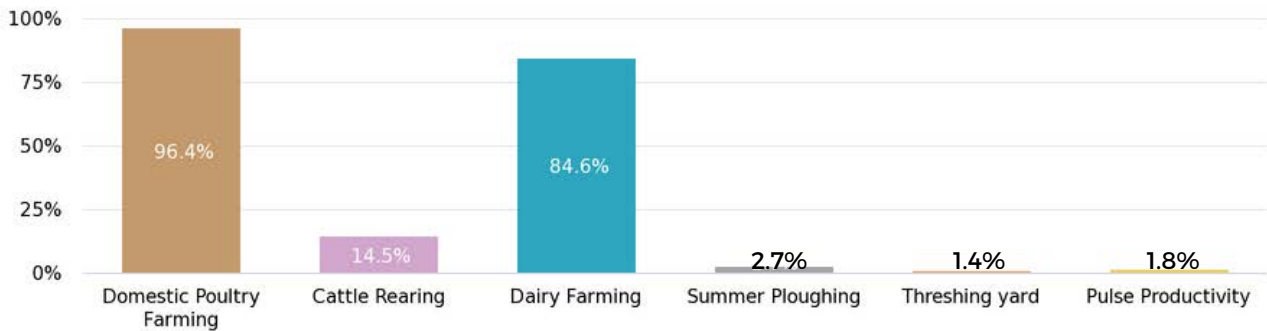
39.4% of the respondents got a loan amount of Rs.30,000/- which was meant for Dairy farming. 3.2% of the respondents obtained a loan of Rs.25,000/- for the purpose of Nursery raising, Xerox shop, Small eatery, Grinding machine, etc. 0.9 % of respondents got Rs.40,000/- as a loan for their investment in Income generation action, and 0.5 % of respondents (one respondent) got Rs.49,000/- as the loan amount. This respondent gave this amount as a partial investment for getting a JCB machine. For the purchase of a Tailoring machine, 1.8% of the respondents got Rs.12500/-

Amount repaid per month towards the loan taken



When the respondents were asked about the amount of money they repaid towards the loan taken by them, a majority of the respondents, that is 42.53% of the respondents, said they repaid Rs.2200/ per month, while 39.36 % of the respondents repaid Rs.560/. 14.47% of the respondents repaid Rs. 550/ - per month towards the loan amount. 2.71 % of respondents repaid an amount of Rs. 1250/- per month. 0.45 % of respondents paid Rs.1250 and an equal percentage of respondents repaid Rs.2800/- per month, as their loan installment.

Percentage of respondents who reported about the training Programs attended through the Federation



When the respondents were asked about the training programs they attended, 96.4% of the respondents stated that they attended training programs on Poultry Farming, followed by 84.6% of the respondents who attended training programs on Dairy farming. 14.5% of the respondents attended training programs on cattle rearing, and 2.7% of the respondents attended training programs on Summer plowing. Pulse Productivity (1.8%), and Threshing yard (1.4%) were the other Training Programs attended by the respondents. The timing and Poultry Farming must be the proportion of respondents attending training programs on Dairy Farby keeping in view a large number of beneficiaries of SHG obtaining loans for these activities, or conversely, their getting of loans for these activities could be out of motivation they obtained from attending these training programs.

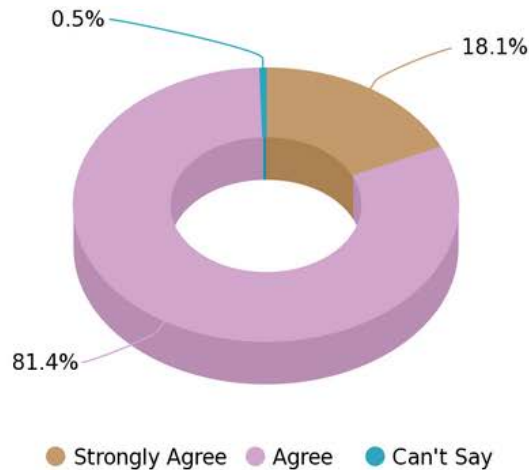
Case study of Mohana.



D. Mohana, 58 years, Female, Amanampakkam, is a member of Thalampoo Magalir Suya Udhavi Kuzhu, (Thalampoo women SHG). The group has 17 members. She says: ‘ Through the TATA Capital, many women got loans in the group for buying Tailoring Machines, getting milch animals, backyard poultry, etc. I got a loan of Rs. 25,000/- for buying a milk analyzer. I charge Rs.1 for testing 1 ltr. of milk. Every day at least 18 people approach me for test milk. On average, I test 80 liters of milk, 40 liters in the morning, and 40 ltrs. in the evening. I manage to earn around Rs.3000/ in a month. One of the advantages of getting the milk tested here is that the cooperatives accept the milk the farmers bring if it is tested and is of the right fat content. The rejection of the milk sent for procurement in the cooperatives will be less, hence, it is economically gainful to each farmer. Apart from this, with the motivation given by the TATA capital personnel, I got trained in AI too, which also fetches considerable income. I thank TATA capital for encouraging the women in the villages of this region through the SHG federation.’

Impact of Association of Women with SHG Federation and their empowerment

Percentage of respondents who reported whether they are confident of themselves after their association with the SHG

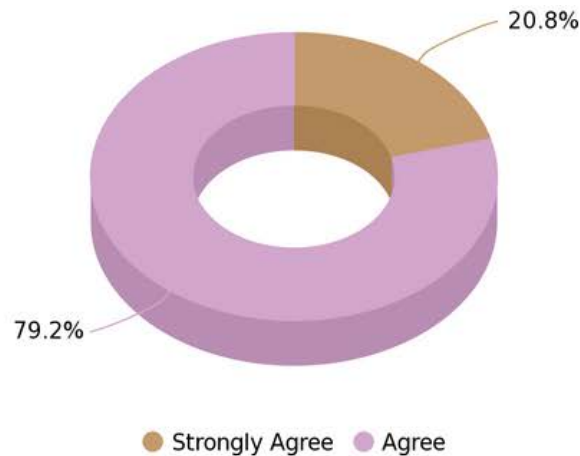


When the women beneficiaries of the SHG were asked whether they felt confident in themselves due to their association with the SHG federation, 18.4% of the respondents strongly agreed with the statement, while 81.4% of the respondents agreed with the statement. 0.5% of the respondents were not able to articulate the same. Beneficiaries who interacted with the research team said that they were earlier confined to their homesteads, capable of carrying out only domestic activities, and had never thought of their potential to contribute to the family income.

Association with the SHG federation increased their awareness of various things happening around them in society and also imparted knowledge on various livelihood options, motivating them to make economically productive contributions to the family. All these factors have contributed to their feeling more confident about themselves.

Ability to take important decisions in the family.

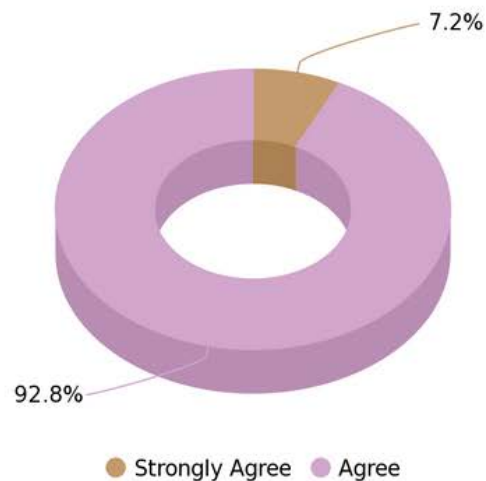
Percentage of respondents who reported whether they are able to take important decisions in their family after association with the SHG



When the women beneficiaries of the SHG were asked whether they were able to take important decisions in their family, 20.8% of the respondents strongly agreed with the statement, while 79.2% of the respondents agreed with the statement. Having gained confidence in themselves due to their ability to contribute to the family income, women beneficiaries now feel that they are able to take important decisions in the family.

Getting better recognition in family

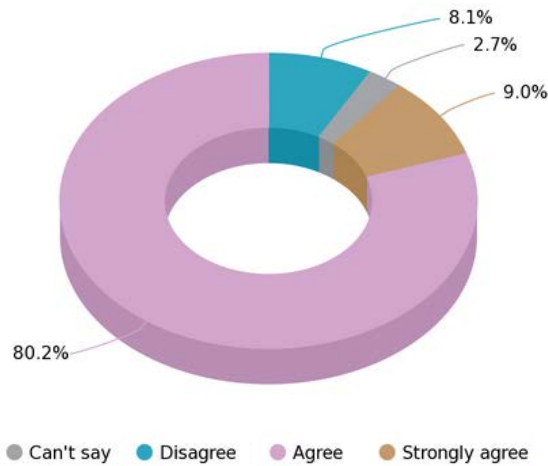
Percentage of respondents who reported whether they are getting better recognition in their family after association with the SHG



When the women beneficiaries of the SHG were asked whether they were getting better recognition in their families, 7.2% of the respondents strongly agreed with the statement, while 92.8% of the respondents agreed with the statement. On the same lines discussed above, women beneficiaries feel that they are beginning to get better recognition within their families.

Women's ability to spend for the needs of their children independently has improved.

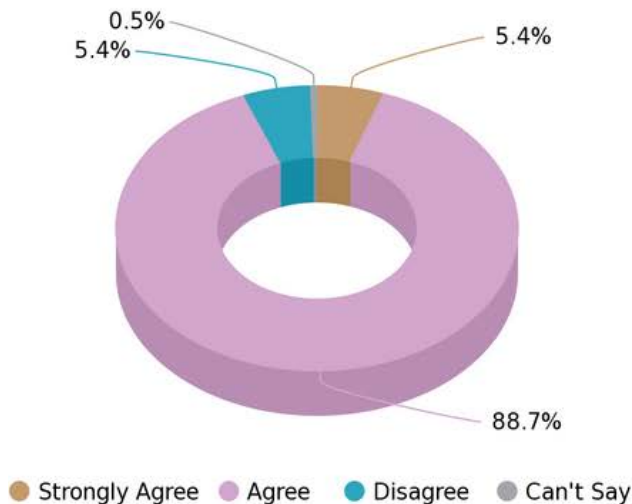
Percentage of respondents who reported whether they can spend for the needs of their children without depending on their husbands



When the women respondents were asked whether they are now able to spend on the needs of their children without depending on their husbands, 9% of the respondents strongly agreed with the statement, while 80.1% of the respondents agreed to the same. 8.1% of the respondents disagreed with the statement, while 2.7% of the respondents were not able to say anything about it. It is a known fact that men are the major wage earners in rural communities, and women find themselves dependent on men for spending either for themselves or their children. Beneficiaries shared that with their ability to earn now, they also make small amounts of savings at home itself, which they use for meeting the small needs of their children. Yet, we can see not all women beneficiaries are capable of spending something on their own or for their children.

Ability to travel to nearby villages on their own without depending on their husbands.

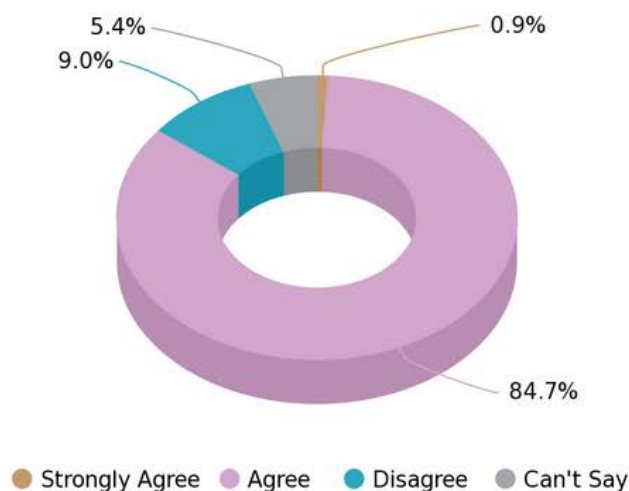
Percentage of respondents who reported whether they can travel to nearby villages/cities on their own without depending on their husbands



When the respondents were asked whether they can travel on their own to nearby villages without depending on their husbands, only 5.4% of the respondents strongly agreed with the statement, while 88.7% of the respondents agreed with the statement. 5.4% of the respondents disagreed with the statement while 0.5% were not able to articulate about the same.

Awareness of Government Welfare Schemes.

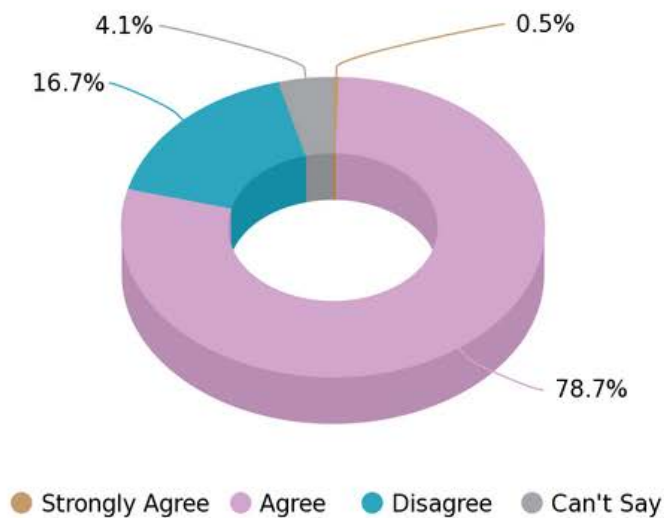
Percentage of respondents reported whether they are more aware of Government Welfare schemes because of their association with the SHG



When the respondents were asked whether they were aware of Government Welfare Schemes, only 0.9% of the respondents strongly agreed with the statement. 84.6% agreed with the same, 5.4% of the respondents were not able to tell anything about it, and 9% of the respondents disagreed with the same. Though a section of the beneficiaries who interacted with the research team expressed their knowledge of various Government Welfare Schemes, there were also beneficiaries who stated that they do not know much about the schemes. So, this could be one area in which future training sessions of the SHG federation can focus upon.

Awareness of Legal rights of women

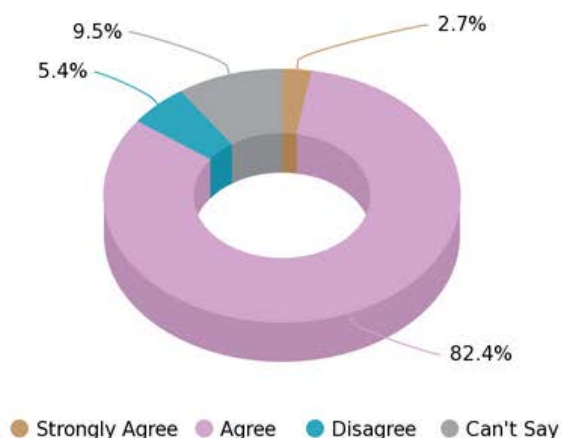
Percentage of respondents who reported whether they are aware of legal rights of women after association with the SHG



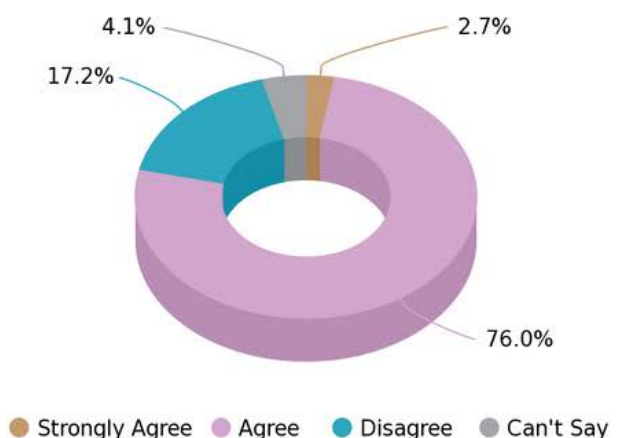
When the beneficiaries were asked about whether they have a basic level of awareness of the legal rights of women, 0.5% of the respondents strongly agreed with the statement, while 78.7% of the respondents agreed with the statement. 4.1% of the respondents were not able to divulge anything about it, and 16.7% of the respondents disagreed with the statement.

Volunteering for resolving community problems

Percentage of respondents reported whether they can volunteer for resolving community problems



Percentage of respondents reported whether they have participated in writing petitions / meeting Local authorities for resolving civic issues like street lights, drinking water etc.



Key Impact of the Project

Higher levels of women's participation in Income Generating Activities observed.

16.4% of the women respondents only were involved in income generation programs before joining the SHG federation, while 86.7% of the women respondents got involved in one or other IGP after joining the Federation.

Women of the SHG Federation received exposure to various Income Generating Activities, Agriculture and allied activities

Interactions with members of SHG revealed that they got exposure to various Income Generating Activities, Agriculture, and allied activities, which also led to their investment in these activities, empowering them, and making them productive members of their families

Empowerment of women on various areas

Interactions with the women Beneficiaries revealed that they are beginning to feel confident in themselves due to association with the federation, able to take Important decisions in the family, getting better recognition in their families, and their ability to spend for the needs of their children independently has improved. It was also noted that their ability to travel to nearby villages on their own without depending on their husbands has also increased.

This association with the SHG federation has empowered women in various ways.

Community mobilization and sensitization on various Project tasks

Tata capital - NAF also utilized the SHG federations as an instrument for mobilizing the community and sensitizing the community on various project tasks.

Conclusion

The research study came across one or two inspiring women in almost every village, who show extraordinary leadership, are Industrious, and have entrepreneurial aptitude. Though all the women of the SHGs benefitted, the lives of a few diligent women have drastically changed and Tata Capital- NAF acted as a catalyst for change. The women in the SHGs interacted with the team were outspoken and exhibited fair knowledge of the IGP they were involved with. They also shared the knowledge acquired through the Federation with their Spouses and children and made them experiment with new methods of Agricultural production and allied activities. Mobilization of the community and sensitizing the community also became possible due to the involvement of the SHG Federation.

Social Initiative 4: Summer Ploughing

Summer Ploughing, referring to the activity of deep ploughing of the Agricultural Field during hot summer months was not practiced in the Project villages of Vandavasi, before the Jal Aadhar Project of TATA Capital – NAF. The main purpose of Deep ploughing done in the month of May- June is to ensure overturning of the soil and also to disinfect the soil, due to direct exposure to the hot sun. Beneficiaries who interacted in the project villages acknowledged that the soil profile has largely improved, and the soil nature becomes more conducive to sowing crops once the southwest monsoon sets in. Most beneficiaries who got their land summer ploughed noted that the water retention capacity of the soil has improved significantly and the volume of water runoff after rains also got curtailed to a larger extent.

The study was conducted among 136 respondents belonging to the villages shown in the table.

Name of the village	No. of respondents	% of respondents
Veliampakkam	28	20.58
Ammanampakkam	26	19.11
Seeyalam	20	14.70
Aanaikunam	22	16.17
Manimangalam	22	16.17
Goonankaranai	18	13.23
Total	136	100



Sukumar, 52 years, Ammanampakkam says ' I have around 3 ½ acres of Land. TATA Capital- NAF undertook Summer Ploughing in the land belonging to my father-in-law. Earlier summer ploughing was not practiced here in these villages. When the soil is deeply ploughed using a JCB machine, there is a good mixture of fertile bottom soil with the topsoil. Summer Ploughing is done in the months of Chittirai, Vaiskasi, and Aani (Months of Mid May to Mid July). Because of summer ploughing I can say there is at least an increase of 1 to 2 bags of the yield. TATA capital – NAF carried out summer ploughing in the lands of farmers without charging any money.

Impact: Significant increase in the yield of Paddy due to Summer Ploughing observed

H0: Null Hypothesis: There is no significant difference in the yield of Paddy before and after summer Ploughing.

HA1: There is an increase in the yield of Paddy after the CSR Intervention.

HA2: There is a decrease in the yield of Paddy after the Intervention.

Mean yield before the Intervention in Kgs.	Mean yield After the Intervention in Kgs.	Standard Division before the Intervention	Standard Division after the Intervention	Stand ard Error of Mean Before	Stand ard Error of Mean After	P value
2079.41	2295.59	196.68	172.51	16.87	14.79	Less than 0.0001

The mean yield of Paddy was 2079.41. before the Intervention and 2295.59 Kg. after the Intervention of Summer Ploughing.

There is an increase of 216.18 Kgs. in the yield of Paddy due to the Intervention. At a 95% confidence interval, this increase in the area could be from Kgs. 200.16 to 232.19 Kgs. The mean value p-value is less than 0.0001 and by conventional criteria, this difference is extremely statistically significant.

Hence the Null Hypothesis that there is no significant difference in yield of Paddy due to summer ploughing is rejected and the alternative hypothesis HA 1, that the CSR Intervention has led to the increase in the yield of paddy due to summer ploughing is accepted.

Impact: Statistically Significant change in Income observed

H0: Null Hypothesis: There is no significant difference in the Income of the farmer's yield of Paddy before and after summer Ploughing.

HA1: There is an increase in the Income of the farmers due to Summer Ploughing.

HA2: There is a decrease in the Income of the farmers due to Summer Ploughing.

MeanIncome before the Intervention in Rs.	Mean Income After the Intervention in Rs.	Standard Deviation before the Intervention	Standard Deviation after the Intervention	Stand ar d Error of Mean Before	Standa rd Error of Mean After	P value
31286.76	34595.59	3054.83	2808.40	261.95	240.82	Less than 0.0001

The mean Income of the farmers was Rs. 31286.76 before the Intervention and Rs. 34595.59 after the Intervention.

There is an increase of Rs. 3308.82 - in the income of the farmers due to the Intervention. At a 95% confidence interval, this increase in the area could be from Rs. 3048.94 to Rs. 3568.70. The mean value p-value is less than 0.0001 by conventional criteria this difference is statistically significant.

Hence the Null Hypothesis that there is no significant difference in income of the farmers due to summer ploughing is rejected and the alternative hypothesis HA1 that there is a significant increase in the income of the farmers due to Summer ploughing after the CSR Intervention is accepted.

Observations on Summer Ploughing

Interactions of the research team with the beneficiaries of summer ploughing in the different villages revealed the following. The interactions with beneficiaries revealed that they were sensitized enough about the importance of undertaking summer ploughing. And having experienced the benefits firsthand, there is a felt need among the farmers in the villages for carrying out Summer Ploughing.

The hard crusted upper layer of the soil gets broken when deep ploughing is carried out which makes water infiltration easier. The soil moisture content also gets substantially improved.

The herbicides and pesticide residues or harmful chemicals coming out from the roots of previous crops are eliminated because of exposure to atmospheric air and Sunlight. This reduces the possible adverse effects of these sources from affecting the next crop, and hence productivity improves.

Even the larva of the pests which lie hidden deep in the soil is exposed and dies in sunlight. Hence possible harm to the next crop is prevented.

Soil continuity is broken because of ploughing, which prevents water runoff.

If the farmers have to hire a JCB for Ploughing it would cost around Rs. 3000/- for 1 acre of land. This is definitely a substantial saving for the farmers.

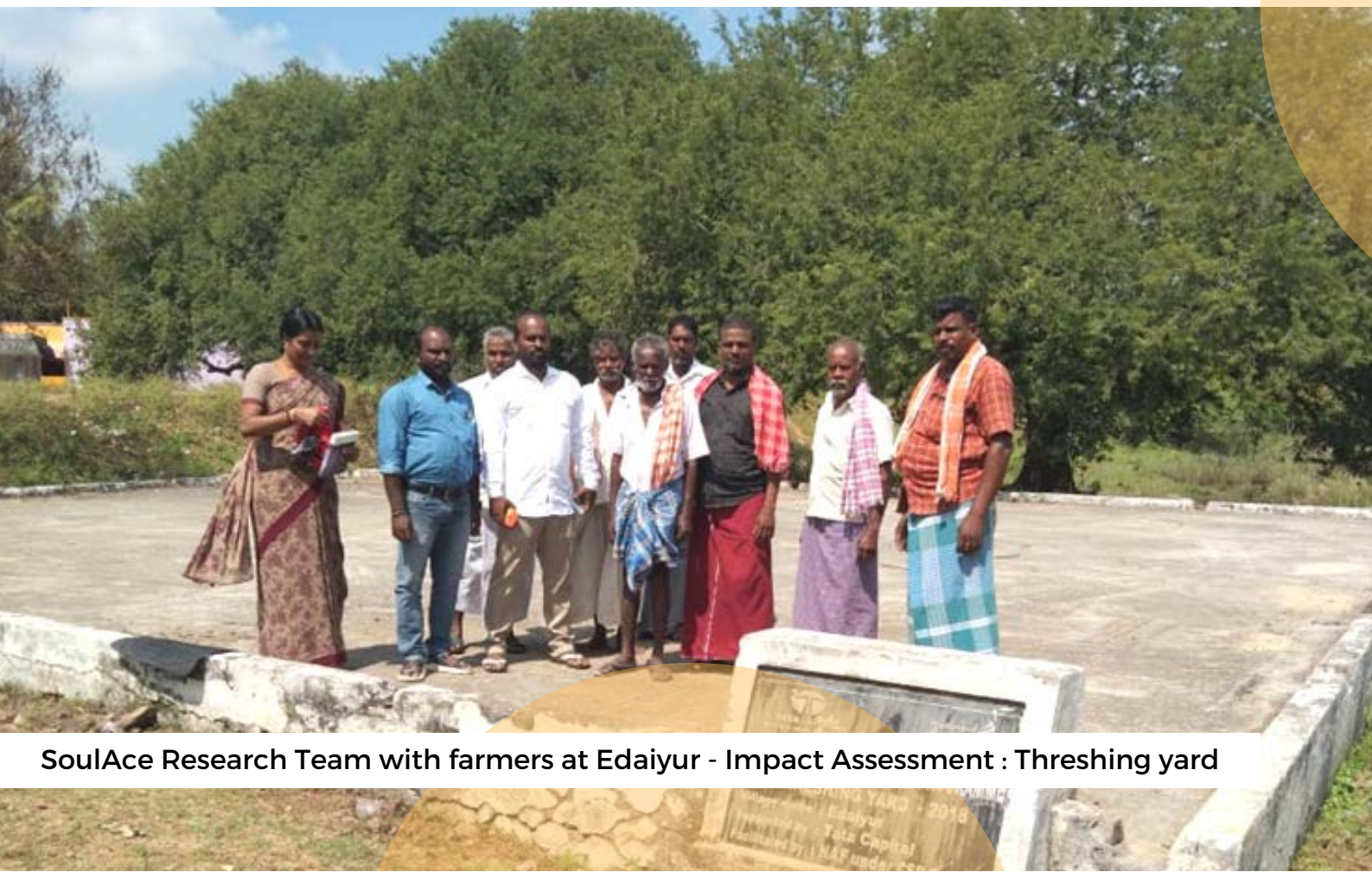
All the beneficiaries conferred that there is a definite increase in the yield of crops, after carrying out summer ploughing.



CSR Project Activity of Cattle Pond - Edaiyur

Social Initiative 5: Threshing yard

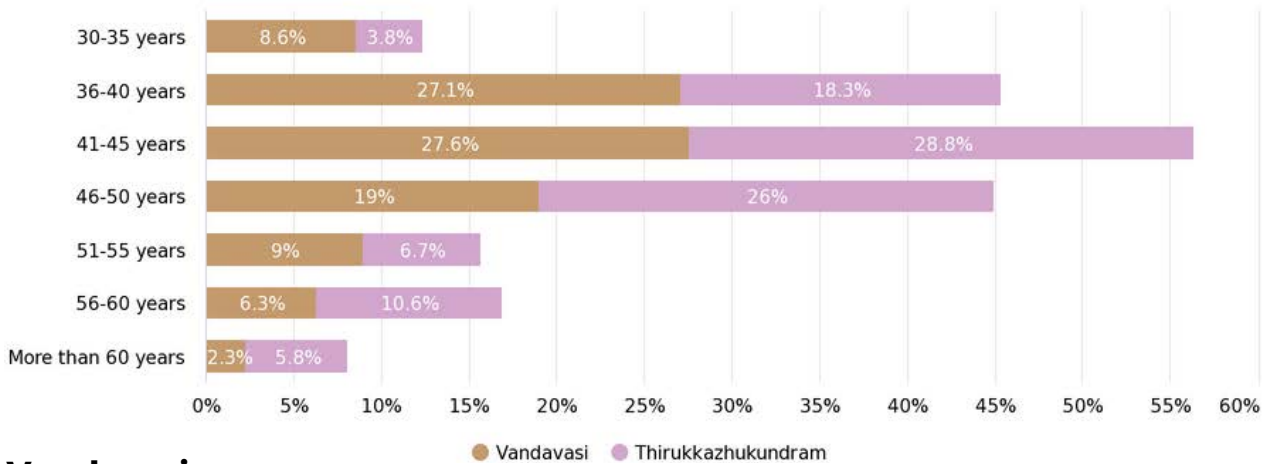
THRESHING YARD Threshing yards are essential to farmers for drying and cleansing of the product and can reduce crop wastage to a larger extent. Prior to the construction of threshing yards in the Project villages of Vandavasi and Thirukazhukundram block, there were very few threshing yards constructed many years ago by the Panchayat, and those structures got dilapidated and farmers abandoned using them. The usual practices before construction of the threshing yard were to spread the grains on the roadside or ground to dry, both of which led to substantial loss of grains, making considerable economic loss imperative. When people in the project communities approached TATA capital- through the Village Development Committee, 3 nos. of Threshing yards were constructed in Vandavasi block in 2018-19, 3 nos. in 2021-22, and 2 nos. of Threshing yards in Edaiyur block in the year 2017-18 and 2 more in the year 2018-19. Farmers were found using the threshing yard during the study and expressed that the threshing yards are much useful to them and have saved a good amount of grains from going to waste post-harvest. It was also shared that the quality of grains has also improved, due to which they are now able to store the grains and sell them later when the market price increases.



SoulAce Research Team with farmers at Edaiyur - Impact Assessment : Threshing yard

Age of the Respondents

Location wise percentage distribution of respondents by Age-group



Vandavasi

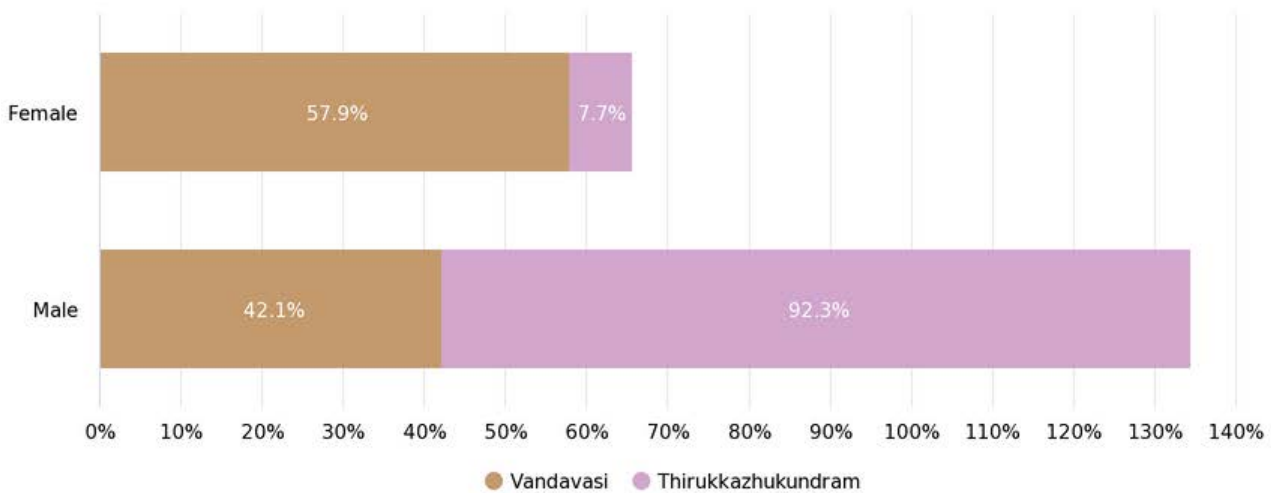
On observation of the data regarding the age distribution of the respondents in Vandavasi Block, it can be seen that the highest proportion of the respondents, i.e. 28%, belonged to the age group of 41-45 years. This is followed by 27.1% of respondents falling in the age group of 36-40 years and 19% of respondents falling in the age group of 46-50 years. 9% of respondents could be seen in the age group of 51-55 years, and 8.6% of respondents were in the age group of 30-35 years. The least proportion of 2.3% belonged to the age group of more than 60 years.

Thirukazhukundram

The largest proportion of respondents (28.8%) composing the sample in Thirukazhukundram Block belonged to the age group of 41-45. This is followed by 26% of the respondents falling in the age group of 46-50 years. 18.3% belonged to the age group of 36 to 40, 10.6% of the respondents were in the age group of 56 – 60 years. 6.7% of the respondents were in the age group of 51 to 55 years. 3.8% of respondents belonged to the age group of 30 to 35 years.

Gender Distribution of the respondents

Location wise percentage distribution of respondents by gender



Vandavasi

The data on the gender of the respondents in Vandavasi Block revealed that male respondents composed 57.9% and female respondents 42.1% of the sample.

Thirukazhukundram

The data on the gender of the respondents in Thirukazhukundram Block revealed that male respondents composed 92.3% and female respondents 7.7% of the sample.



SoulAce Research Team at Veliambakkam

Annual Family Income of the respondents

Location wise distribution of respondents by Annual Family Income

Annual Family income	Vandavasi	Thirukazhukundram
Less than Rs. 1 lakh	85.1	82.7
Rs. 1.1 Lakh to 2 Lakhs	14.5	12.5
Rs. 2.1 Lakhs to 3 Lakhs	0.5	3.8
Rs. 3.1 lakhs to 4 Lakhs	0.0	1.0

Vandavasi

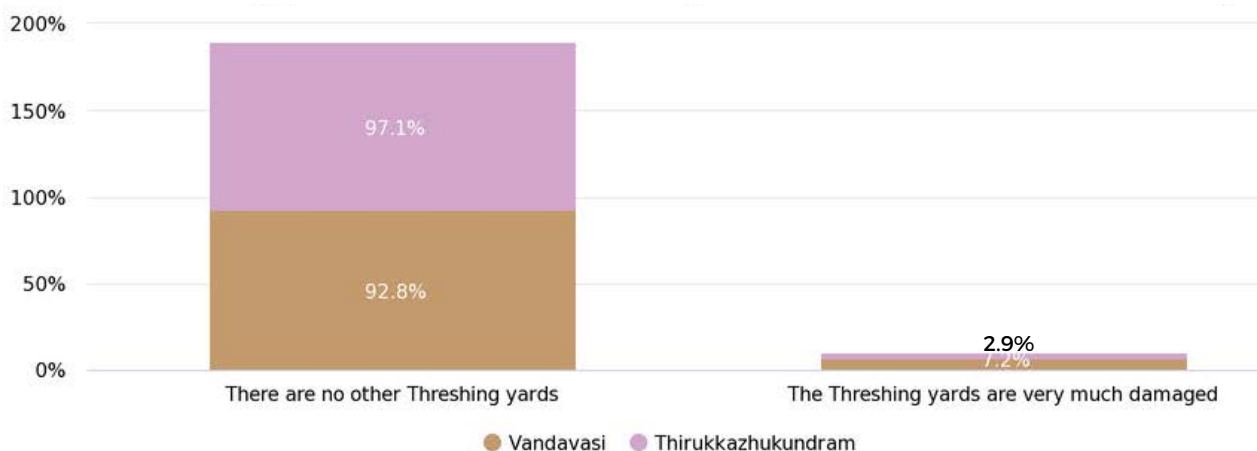
Distribution of the annual income of the respondents composing the sample in Vandavasi Block reveals that the majority of the respondents, that is 85.1%, stated that they earned less than Rs. 1 Lakh, while 14.5% respondents stated that they earned between Rs. 1 Lakh to Rs. 2 Lakh per year. 0.5% of respondents earned between 2 to 3 Lakh per year. No respondents stated that they earned more than Rs. 3 Lakh a year.

Thirukazhukundram

Distribution of the annual income of the respondents composing the sample in Thirukazhukundram Block reveals that the majority of the respondents, that is 82.7%, stated that they earn less than Rs. 1 Lakh, while 12.5% of respondents stated that they earned between Rs. 1 Lakh to Rs. 2 Lakh per year. 3.8% of respondents earned between 2 to 3 Lakh per year, and 1% of respondents earned between Rs. 3 Lakh and Rs. 4 Lakh a year.

Munusamy, 52 years, Veliampakkam, says ‘ I use the threshing yard to dry ‘Gundu Nellu’ (literally meaning Big rice- a variety of rice used for making batter for Idly-dosa locally also called as Idly rice) and Ulundu (urad dal). He said there was a threshing yard constructed by the Panchayat before, but it was completely damaged now and no one used it anymore. Here people come for dry Paddy, Black Gram, Green Gram, Millets, etc., Earlier, when we used to dry Ground nuts on the plain ground, there used to be wild boars that come, eat, and damage the crops. But they never come near the threshing yard. Hence, we feel safer about using the threshing yard. I grow Black gram only for domestic use as the yield is only 30 kg, and I grow only this quantity. The threshing yard is very much beneficial to all farmers in the village.’

Location wise Percentage of respondents reported about the condition of the other threshing yards in the community which are not constructed by NAF



Vandavasi

When the respondents were asked what the condition of the threshing yards that were not constructed by the TATA Capital was, 92.8 % of the respondents stated that they did not have any other threshing yards in their village, while 7.2% of the respondents stated that they had threshing yards that were damaged and not in a condition to be used. It should be mentioned here that some of the villages in this Block had threshing yards which were constructed by the Panchayat, but these were not maintained properly and the cement flooring was seen to be broken, or uneven and partially destroyed. When the villagers were asked whether anyone used these threshing yards, they said no. When the respondents were asked whether efforts were taken to restore the threshing yards, they replied that no one in the village showed interest in repairing the damaged threshing yards.

Thirukazhukundram

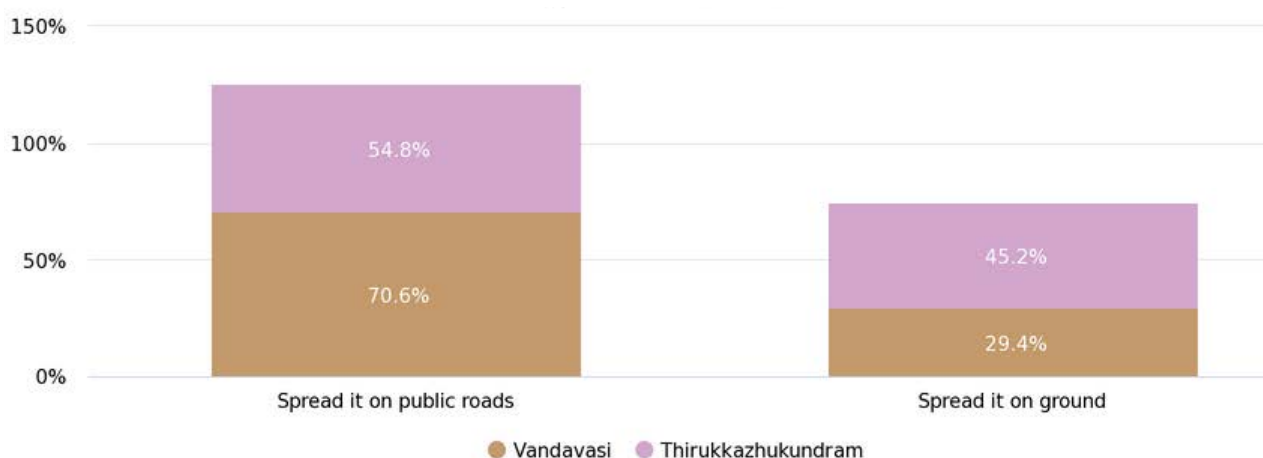
When the respondents were asked what the condition of the threshing yards that were not constructed by the TATA Capital was, 97.1% of the respondents stated that they did not have any other threshing yards in their village, while 2.9% of the respondents stated that they had threshing yards that were damaged and not in a condition to be used.



Sivagnanam, 40 years, Manimanagalam village, says: ‘ I used to dry Paddy here mostly and chilli at times. Earlier we used to dry our grains on the road or over the ground. When we used to dry it on roads, it used to be much troublesome for people on two wheelers. Grains also got scattered here and there, causing wastage. Drying on the ground is not suitable for small grains like millets as the grains get mixed with the soil and there will be a substantial loss because of it. The ground can be used for drying Groundnuts, as it is larger in size compared to other grains. After the Threshing yard was constructed, farmers are using the threshing yard for drying grains, and you can not see anyone using the roads to dry grains. I thank TATA Capital and NAF for constructing the Threshing yard which is much beneficial to the farmers of this village.’

Methods of drying grains before the use of Threshing yards

Location wise Percentage of respondents reported about the ways to thresh grains before



Vandavasi

When the respondents were asked how they used to dry their grains before the construction of the threshing yards, 70.6% of the respondents stated that the grains used to be spread on public roads, where there are not many roads and t, while 29.4% respondents stated that they just spread the grains on clean ground and dried them.

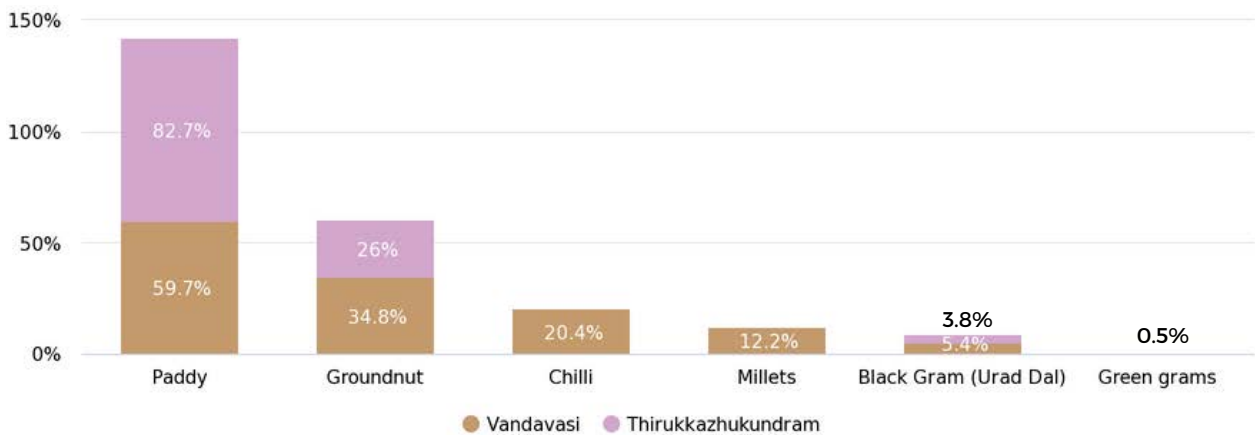
When the farmers were further asked about drying on village roads, they responded that there used to be cases of motor vehicle accidents happening every now and then due to motorists skidding because of the grains. Yet they did not have any other way to dry their grains earlier. When the farmers dried their grains on plain grounds in the village, a considerable amount of grains used to go to waste, due to mixing with the ground.

Thirukazhukundram

When the respondents of Thirukazhukundram Block were asked how they used to dry their grains before the construction of the threshing yards, 54.8 % of the respondents stated that the grains used to be spread on public roads, and they got dried in the sun, while 45.2% respondents stated that they just spread it on a clean ground to dry. It was acknowledged by the farmers that the method of drying grains on public roads or ground was not effective, as it led to the significant loss of the grain yield.

Grains dried at the Threshing yard

Location wise Percentage of respondents reported about the crops for which threshing yard is used by them



Vandavasi

When the respondents were asked about which grains they used to dry in the threshing yard, they stated the names of more than one grain that they dried. 59.7% of the respondents in Vandavasi Block stated that they used to dry Paddy in it, while 34.8 % of respondents dried Ground nut in the threshing yard. Drying of Chilli was done by 20.4% of respondents and millets by 12.2% of respondents. 5.4% of respondents dried Black Gram in the threshing yard.

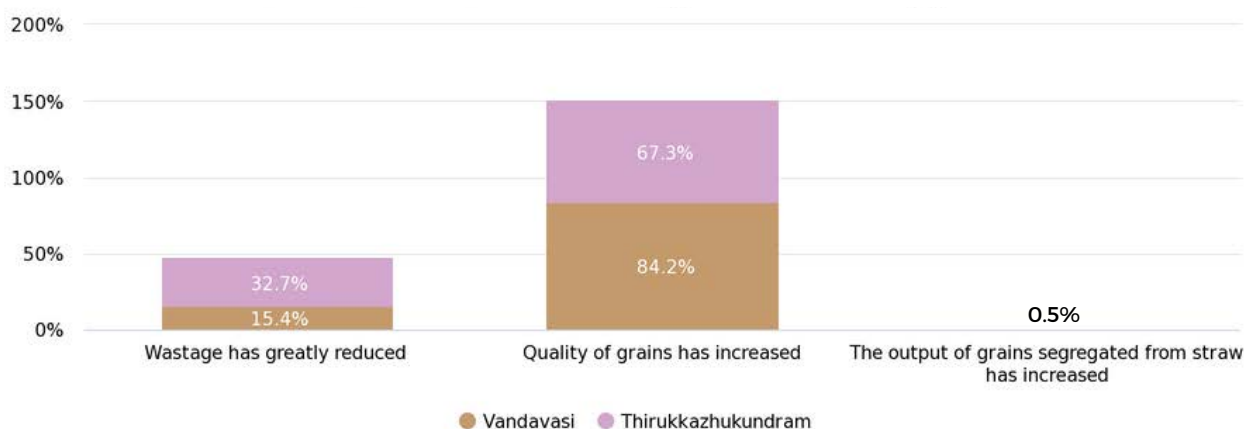
Thirukazhukundram

At Thirukazhukundram Block, 82.7 % of the respondents used the threshing yard for drying paddy, followed by 26% of respondents who used the threshing yard to dry Groundnut. 3.8 % of respondents dried Black gram in the threshing yard.



Benefits received by the use of the Threshing yard

Location wise Percentage of respondents reported the benefits received because of using the threshing yard



Vandavasi

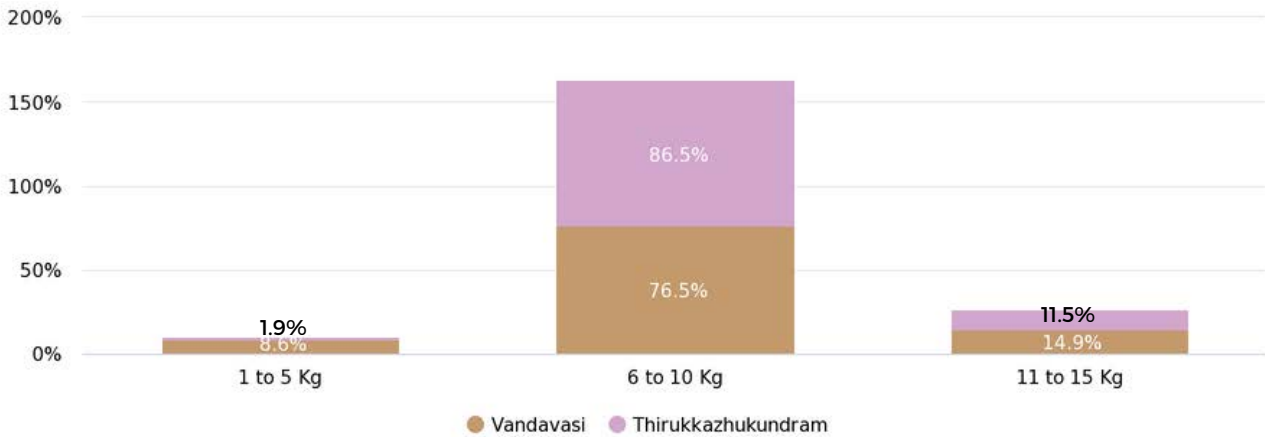
When the respondents were asked about what benefits they received because of the threshing yard, 84.2 % of the respondents stated that the quality of grains has increased, while 15.4% of respondents stated that the wastage of grains has greatly reduced. 0.5 % of respondents stated that the output of grains segregated from straw has also increased.

Thirukazhukundram

When the respondents belonging to the Thirukazhukunram Block were asked about what benefits they received because of the threshing yard, 67.3% of the respondents stated that the quality of grains increased, while 32.7% of respondents stated that the wastage of grains has greatly reduced.

Quantity of Grain additionally produced or saved because of using the Threshing yard.

Location-wise Percentage of respondents reported the quantity of grain additionally produced or saved because of using the threshing yard



Vandavasi

When the farmers were asked about the number of grains additionally produced or saved because of using the threshing yard, the majority of the farmers, that is 76.5% of the respondents, stated that they were able to save at least 6 to 10 kg of grains, while 14.9% of the respondents stated that they saved between 11 to 15 kg of grains. 8.6% of respondents stated that they were able to gain between 1 to 5 kg of grains.

Thirukazhukundram

When the respondents in Thirukazhukundram were asked about the number of grains additionally produced or saved because of using the threshing yard, the majority of the farmers, that is 86.5% of the respondents, stated that they were able to save at least 6 to 10 kg of grains, while 11.5% of the respondents stated that they saved between 11 to 15 kg of grains. 1.9% of the respondents stated that they were able to save between 1 to 5 kg of grains.

Impact: Additional Income from the use of the Threshing yard.

Location wise Percentage of respondents reported the additional income because of using the threshing yard



Vandavasi

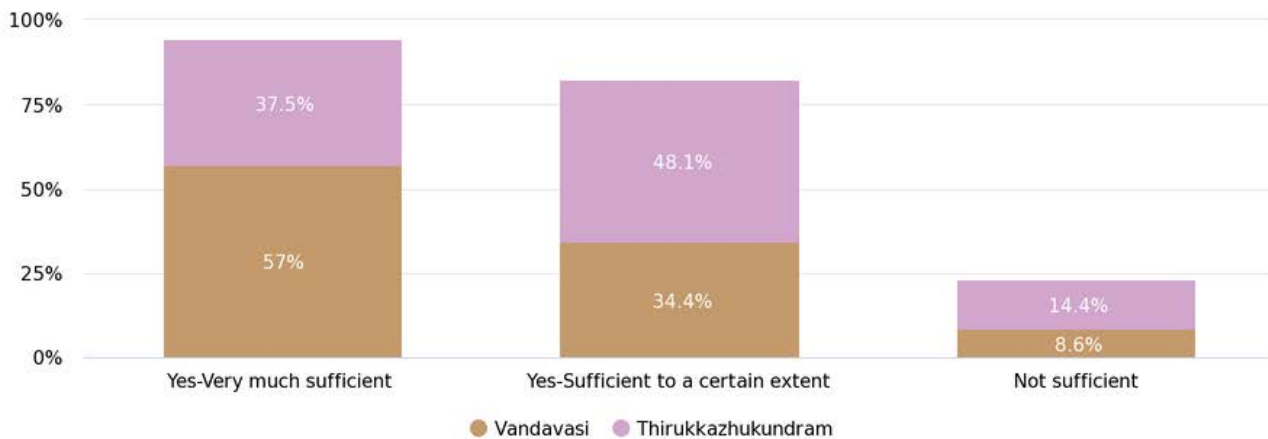
When the respondents were asked about the additional income they had received from the use of the threshing yard in a year, the majority of the respondents, that is 57%, reported that they got an increased income between Rs.5000 to Rs.10,000/-. 33.9% of respondents w stated that they earned an additional income between Rs.1000 to Rs.5000/- because of using the Threshing yard. 7.7% of respondents stated that they earned above Rs. 10,000/-, while a negligible proportion of 1.4% respondents stated that they received an added income below Rs.1000/-. Increased income was made possible because of improved drying, reduced wastage of grains, improved quality of grains, which can be stored and sold when the market price is good.

Thirukazhukundram

When the respondents were asked about the additional income they had received from the use of the threshing yard in a year in the Thirukazhukunram Block, the majority of the respondents, that is 56.7%, reported that they got an increased income of above Rs.10,000/-. 26% of respondents stated that they earned an additional income between Rs. 5000 to Rs.10000/-, while 17.3%of respondents stated that they earned an additional income between Rs. 1000 to Rs.5000/- because of using the threshing yard.

Sufficiency of the Threshing yards

Location wise Percentage of respondents reported whether the no. of threshing yards is sufficient or not for the community



Vandavasi

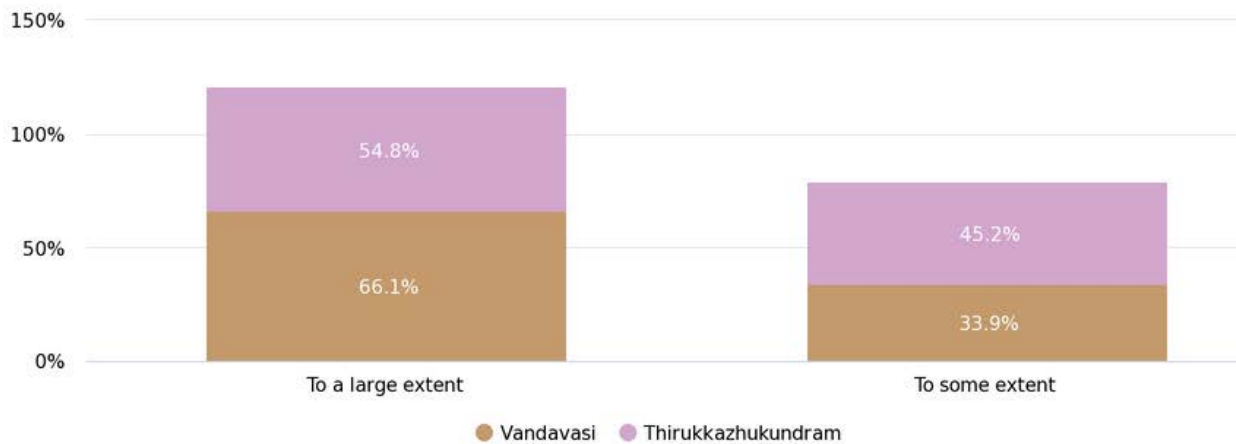
When the respondents were asked whether the Threshing yards in the community are sufficient for everyone, 57% of the respondents stated that it is very much sufficient, whereas 34.4% of the respondents stated that the threshing yards are sufficient only to a certain extent. 8.6% of the respondents also stated that the community needs more threshing yards and that they are not sufficient for everyone.

Thirukazhukundram

When respondents were asked whether the Threshing yards in the community are sufficient for everyone, 48.1% of the respondents stated that it is sufficient to a certain extent, whereas 37.5% of the respondents stated that the threshing yards are sufficient for the community. 14.4% of the respondents also stated that the community needs more threshing yards and that they are not sufficient for everyone.

Whether the usage of Threshing yards economically benefitted the farmers or not.

Location wise Percentage of respondents reported whether the usage of Threshing yard benefitted them economically



Vandavasi

When the respondents were asked whether the usage of Threshing yards has economically benefitted them or not, a majority of the respondents, that is 66.1%, stated that it has economically benefitted them to a large extent, while 33.9 % of the respondents stated that it has benefitted them economically only to a certain extent.

Thirukazhukundram

When the respondents were asked whether the usage of Threshing yards has economically benefitted them or not, a majority of the respondents, that is 54.8%, stated that it has economically benefitted them to a large extent, while 45.2 % of the respondents stated that it has benefitted them economically only to a certain extent.

Key Impact of the Project

Farmers feel benefitted out of the Threshing yard

It was observed that the quality of grains has increased (84.2% of respondents), wastage of grains got reduced (15.4% of the respondents) and the output of grains segregated from straw has increased (0.5% of the respondents) in Vandavasi. At Thirukazhukundram, 67.3% of the respondents stated that the quality of grains has increased, while 32.7% of respondents stated that the wastage of grains has greatly reduced.

Increase in income

57% of the respondents at vandavasi reported an increased income between Rs.5000 to Rs.10,000/-, while 33.9% of respondents stated that they would have earned an additional income between Rs.1000 to Rs.5000/-. 56.7% of the respondents reported an increased income above Rs.10,000/, followed by 26% of respondents who stated that they would have earned an additional income between Rs. 5000 to Rs.10000/- while 17.3% of respondents stated that they would have earned an additional income between Rs. 1000 to Rs.5000/- because of using the threshing yard.

Conclusion

The Threshing yards have reduced wastage of grains and have resulted in increased earnings as documented in the research findings. The research team was able to observe the extent to which the beneficiaries find the Threshing yard to be a valuable asset enhancing their common livelihoods.

Social Initiative 6: Solar Lights

TATA Capital - NAF had installed the first set of solar lights in the villages of veliyampakkam, Seeyalam, Goonankaranai, Amanampakkam, Salavedu, Manimangalam, Annaikunam, and Eiypakkam in the year 2018-19 and the second set of solar lights in the villages of Veliyampakkam, Manimangalam, Annaikunam and Eiypakkam and seeyalam in the year 2021-22. In the Thirukazhukundram Block, Solar lights were installed in Edayur village.

These solar lights were installed in the localities where there was neither an Electricity supply nor Lamp Post before. These places were inhabited by people belonging to the lower socio-economic categories within these villages.

Arumugam, belonging to the Irula Tribe, Velliampakkam in the backdrop of his hut and family members.



Arumugam, 57 years, Velliampakkam says ‘ Here in the place, where we stay there are 4 families only and we stay away from the main village. We do not have any interaction with the other villagers.

I go for quarry work in the neighboring Andhrapradesh state for 10-15 days a month and I get Rs.300 to Rs.400/- per day of work. We do not have a patta for this land, and we have been staying in this place for many years. There are no facilities, no electricity in this place. This place used to cover fully in darkness at the night and it will not be safe for children to stray out in the night, because of insects and snakes. Children won't be able to study at the night because of no light facility.

When Arumugam's children were interviewed by the Research Team they quickly retorted ' The solar lights are on from 6 in the evening to 6 in the morning. The light helps us to do the homework and also sit and study for more time.'

Arumugam continued that there were 7 children in the locality and all benefitted from the presence of solar light. When asked about who repairs the solar light, he answered that TATA Capital staff get the repair work done and that he does not have to pay any money for the repair work. He expressed his gratitude towards the good work done by TATA Capital- NAF.

Observations on the Impact of solar light Installation by the Research Team at Vandavasi and Edaiyur

Before the Installation of Solar lights	After the Installation of Solar lights
<p>Only the stretches of the communities occupied by the relatively better off sections used to have Infrastructure for night time lighting.</p> <p>These sections of the community used to reside in the central and main locations of the Project villages.</p>	<p>The need for night time lighting being a long felt need of people belonging to the lower socio economic strata - especially sections within the SCs and STs who occupied the peripheral areas or the isolated stretches of the community had no facility for lighting.</p> <p>TATA Capital - NAF has chosen the right locations and right beneficiary groups and addressed their needs.</p>
<p>Women folk and children felt insecure to move around the vicinity of their home steads in the darkness.</p>	<p>Women and children feel a certain sense of security to move around because of the availability of lighting. (As reported by 90% of respondents</p>
<p>There used to a fear of harm from poisonous snakes and insects because of the utter darkness around the homesteads.</p>	<p>The beneficiaries feel the perception of harm has got reduced to a larger extent. (As reported by 80% of respondents)</p>
<p>With the lack of functional toilets for most of the beneficiaries earlier, it used to be difficult for the women folk and children to come out in the night.</p>	<p>Women and children enjoy a better sense of relief now. (As reported by 100% of respondents)</p>
<p>It used to be difficult even for movement of Two wheelers and passers- by in these dark stretches earlier.</p>	<p>Beneficiaries feel that there is better safety of movement of Two wheelers and passer by in these places in the darkness. (As said by 70% of respondents)</p>
<p>Children of most of these beneficiaries were not able to study during the night times, because many of these homes were not having electricity connections.</p>	<p>Children make use of the solar light to do their home assignments and read their school books in the night now. (As said by 90% of the respondents)</p>

Social Initiative 7: S.R.I Cultivation

TATA Capital - NAF introduced the system of Rice Intensification, in the project villages of Ammanapakkam, Anaikunam, Velliampakkam, and Seeyalam through Frontline Demonstrations in the Fields of 16 paddy farmers spread across these villages. This section covers the study done among 10 farmers who had undertaken S.R.I Cultivation and has dwelt into the yield, income, expenses, and other benefits perceived by the farmers as a part of S.R.I. Cultivation Technique.

To implement this CSR Intervention TATA Capital- NAF had imparted training to a group of 15 women laborers on various techniques involved in S.R.I cultivation.



Labour Army - A case of inclusion, empowerment and change

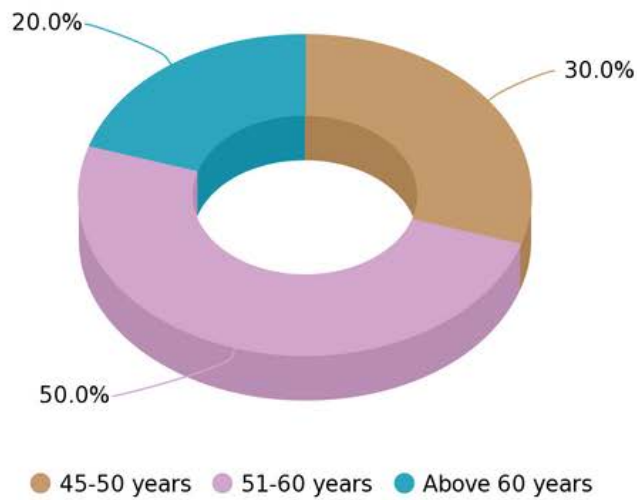
When TATA Capital – NAF project Intervention planned to introduce the system of Rice Intensification Technique in Vandavasi Block, the need for training a workforce which can carry out S.R.I Cultivation as the essential first step was felt, as farmers in the region are used only to the conventional method of rice cultivation. The Project staff motivated women laborers to join in their experiment of introducing S.R.I cultivation in the project villages of Velliampakkam, Ammanampakkam, and Seeyalam. It gave intense training in the S.R.I Cultivation method as it involves a lot of intricacies which are not a part of the conventional cultivation method. The women were taught how to raise the nursery bed with farm yard manure and how to carefully transplant the seedlings as young as 15 days from the nursery. They were also taught seed treatment and how to mulch the bed with paddy straw.

Meera, the leader of the SRI Army while interacting with the Research Team stated that ‘ We, a group of 15 women were chosen by NAF and given training in S.R.I cultivation method. S.R.I. cultivation involves a lot of differences when compared to conventional methods. For the S.R.I. method, we need a well-leveled and puddled land. This is required for water conservation as the seed bed would require only one inch of water. Once we take out the seedlings from the nursery bed we have to transplant them as fast as possible, say within half an hour. The land is also allowed to wet and dry alternatively, for instance after watering we have to wait for the land to dry out to the extent of developing a crack and then we need to again wet it. The spacing of the seedlings is more in S.R.I. for example a space of 22 cm. Is required. TATA Capital NAF paid us Rs. 3000/ for transplanting per acre and Rs. 2000/- per acre for raising the nursery. We are called as S.R.I Army and we are happy that we got trained in the S.R.I cultivation method and we are confident of carrying it out for the farmers who approach us. Women can get agricultural labor of Rs.250 to Rs.300/- for a day of work and we thank TATA Capital – NAF for enabling us to contribute to Agricultural productivity.

This study was undertaken among 10 respondents of the Frontline Demonstration project activity of Tata Capital- NAF.

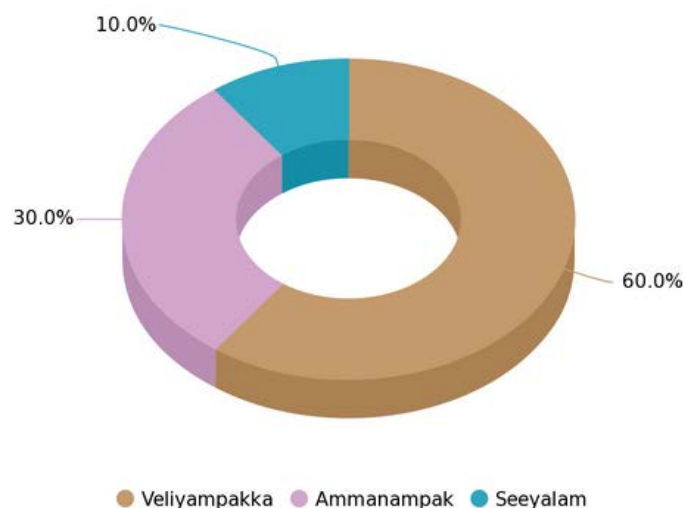
Gopi, a beneficiary from Ammanampakkam says ‘ Earlier I was practicing the traditional method of paddy cultivation, which required more water as well as more seeds. I had to use about 30 Kg. of seeds for one acre of land, and now the need for seeds has come down by 90%. With just 3 Kg. of seeds I can raise the nursery. I am thankful to TATA capital-NAF for the Training me in S.R.I Cultivation.’

Distribution of the respondents by Age group



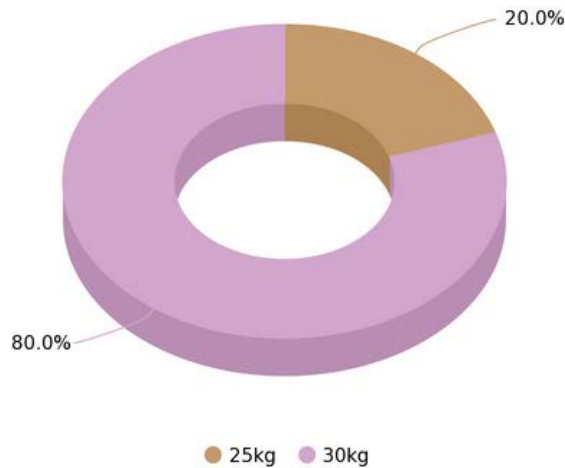
Observation of the data on the age group of the respondents revealed that the majority of respondents that is 50% of the respondents were in the age group of 51-60 years, followed by 30% of the respondents in the age group of above 60 years, and 20% of the respondents in the age group between 45 years to 50 years.

Village of the Respondents



It can be observed that the sample consists of 60% of farmers who adopted S.R.I cultivation from Veliyampakkam village, 30% from Ammanampakkam village, and 10% from Seeyalam village.

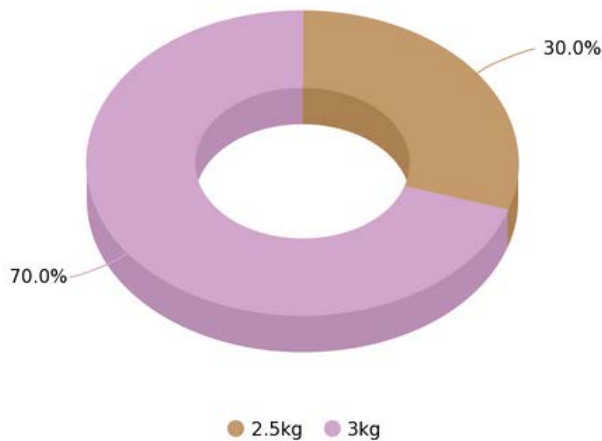
Seed Requirement for SRI Vs. Traditional Cultivation Method



Traditional Method

When the respondents were asked about the seed requirement for the Traditional method 80% of the beneficiaries stated that they would require 30 Kg. of seeds, whereas 20% of the farmers stated that they would require 25 kg. of seeds per acre for the Traditional method of rice cultivation.

Percentage of respondents about the Seed requirement per acre by SRI method (in kgs)



S.R.I. Method

Compared to the Traditional method, it is observed that there is a drastic reduction in the need for seeds to be used for SRI cultivation. It was stated by the beneficiaries (30% of the respondents)that it required only 2.5 Kgs. of seeds, whereas 70% of the beneficiaries stated that it would require only 3 kgs. of seeds for S.R.I cultivation.

Impact: Statistically significant increase in the yield of Paddy was observed because of adopting SRI cultivation.

H0: Null Hypothesis: There is no significant difference in the yield of Paddy through the Traditional Method and S.R. I Method of Rice cultivation.

HA1: There is a significant increase in the yield of Paddy due to S.R.I Cultivation as compared to the Traditional method of Paddy Cultivation.

HA2: There is a significant decrease in the yield of Paddy due to S.R.I Cultivation as compared to the Traditional method of Paddy Cultivation.

Mean yield before the Intervention in Kgs. /Per 50 cents	Mean yield After the Intervention in Kgs./50 cents	Standard Division before the Intervention	Standard Division after the Intervention	Stand ar Error of Mean Before	Standa rd Error of Mean After	P value
865	1110	57.98	87.56	18.33	27.69	0.0001

The mean yield of Paddy was 865 Kgs. for every 50 cents through the Traditional cultivation method and 1110 Kgs. for every 50 cents by the adoption of the S.R.I cultivation method.

There is an increase of 245 Kgs. in the yield of Paddy due to the S.R.I method of Cultivation. At a 95% confidence interval, this increase in Paddy yield could be from 185.51 Kg. to 304.49 Kg. The mean value p-value is less than 0.0001 and by conventional criteria, this difference is extremely statistically significant.

Hence the Null Hypothesis that there is no significant difference in the yield of Paddy through the Traditional Method and S.R. I Method of Rice cultivation is rejected and the alternative hypothesis that there is a significant increase in the yield of Paddy due to S.R.I Cultivation as compared to Traditional method of Paddy Cultivation is accepted.

Dharmalingam, a beneficiary from Veliampakkam, says ‘ TATA capital -NAFProject demonstrated S.R.I cultivation in my land. By the Traditional method, I used to be getting about 700 Kg. of rice in ½ acre of land and through the S.R.I method I was able to get about 900 Kg. of rice and this method saved water usage by 30-40% too.’

Impact: Statistically Significant change in Income through SRI cultivation observed

H0: Null Hypothesis: There is no significant difference in the Income of the farmers through the adoption of S.R.I cultivation rather than Traditional cultivation

HA1: There is an increase in the Income of the farmers by the adoption of S.R.I cultivation rather than Traditional Cultivation.

HA2: There is a decrease in the Income of the farmers by the adoption of S.R.I cultivation rather than Traditional Cultivation.

Mean Income before the Intervention in Kgs.	Mean Income After the Intervention in Kgs.	Standard Division before the Intervention	Standard Division after the Intervention	Stand ar Error of Mean Before	Stand ar Error of Mean After	P value
1800	5570	888.19	1637.78	280.87	517.81	0.0001

The mean Income of the farmers was Rs.1800/ through the adoption of the Traditional cultivation method and Rs. 5570/- through S.R.I Cultivation.

There is an increase of Rs. 3770/-in income of the farmers due to the adoption of the S.R.I cultivation method. At a 95% confidence interval, this increase in the area could be from Rs. 2532/- to Rs. 5007.80/-was observed. The mean value p-value is less than 0.0001 by conventional criteria this difference is statistically significant.

Hence the Null Hypothesis that there is no significant difference in the Income of the farmers through the adoption of S.R.I cultivation rather than Traditional cultivation is and the alternative hypothesis that there is a significant increase in the income of the farmers through S.R.I. Cultivation is accepted.

The Application of Integrated Pest Management in S.R.I cultivation



When the Research Team interviewed the Project Manager of TATA Capital - NAF Jal Aadhar Program, Mrs. Kanchana, she shared how IPM was used for maximizing the benefits to the farmers by curtailing the loss of crops due to Pest infestation. Some of the major features of IPM as shared was when there is a risk of Pest Population crossing the action threshold which means the likelihood of the pest population exceeding a certain level which indicates a concerted action to be taken to put them in control, identifying the pest species that invades, as all species need not be harmful, using techniques such as crop rotation, selecting pest-resistant plant varieties and also going in for cost-effective solutions which pose a low risk to people or environment. As an illustration, she explained the use of Yellow Traps, which are nothing but a piece of the yellow chart with glue applied to it, which can trap the pests at the earliest stages of their lifecycle. This can reduce the pest population as effectively as 80 to 90% which entails using fewer chemical pesticides and thereby reducing the money spent on it too. The use of Phermone Traps was also explained to the Research Team.



Yellow Trap

TATA Capital - NAF introduced Nagappan of Aanaikunam says

Impact: A moderate increase in expenditure for S.R.I cultivation noticed

H0: Null Hypothesis: There is no significant difference in the expense of the farmers for adoption of S.R.I cultivation rather than Traditional cultivation

HA1: There is an increase in the expenses of the farmers for the adoption of S.R.I cultivation rather than Traditional Cultivation.

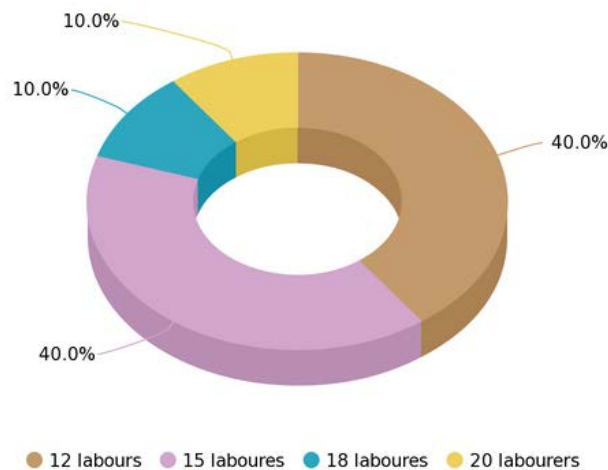
HA2: There is a decrease in the expenses of the farmers for the adoption of S.R.I cultivation rather than Traditional Cultivation.

Mean Expenses for SRI cultivation	Mean Expenses for Traditional rice cultivation in Rs.	Standard Division for SRI cultivation	Standard Division for Traditional Cultivation	Standard Error of Mean for SRI Cultivation	Standard Error of Mean for Traditional Cultivation	P value
12050	10700	1165.48	1398.41	365.56	442.22	0.0320

The mean expenses for Traditional Rice Cultivation are Rs. 10700/- and Rs. 12050 - for SRI cultivation. A mean increase of Rs. 1350/- per acre of cultivation has been observed because of the Intervention and at a 95% confidence level this difference could be between Rs. 145.28/-to Rs. 2554.72/-. Since the P value is less than 0.0320, this value is statistically significant. Hence the Null Hypothesis is rejected and the alternative hypothesis that there is a significant increase in the expenditure involved in the adoption of S.R.I cultivation is accepted.

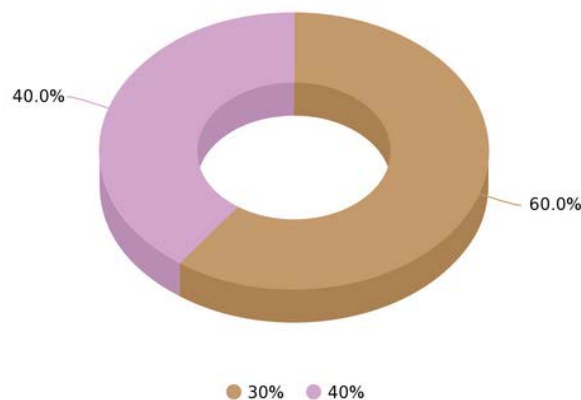
When the research team interacted with Vasudevan a beneficiary of S.R.I cultivation and asked him what changes he observed in the paddy plants, he answered that in S.R.I cultivation each plant had numerous tillers- much more than what he could see in plants cultivated by conventional method and he stated ' The roots of these plants are large and more spread out, as there is more spacing per plant to grow. The grains are dense and heavy in weight when compared to those cultivated by the Traditional method.'

Additional Labour employed for SRI cultivation



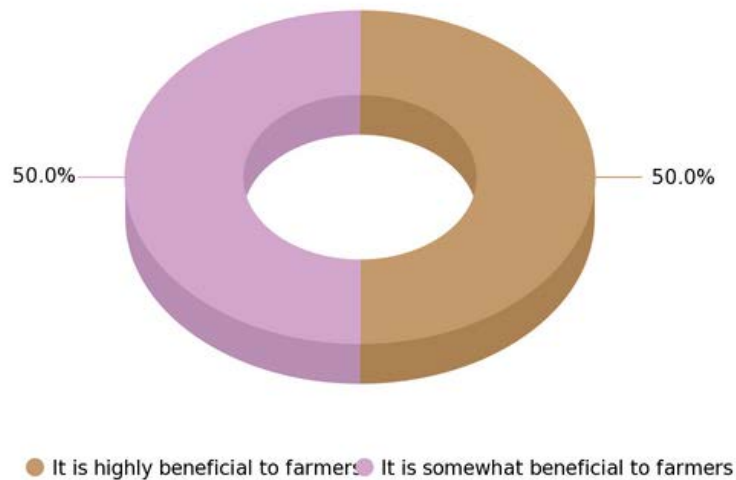
When the respondents were asked about how much extra labor was employed by them for SRI cultivation, 40% of the respondents stated that they required 15 extra labors while 40% of the respondents stated that they required 12 extra labors. 10% of the respondents stated that they required 18 labors and an equal percentage of respondents (10%) stated that they required 20 labors for S.R.I Cultivation. When the respondents were asked why they required extra labor for S.R.I. cultivation, it was shared that every single seedling required careful transplantation when it is just 12 days old, whereas that was not the case with the Traditional transplantation method.

Impact: Significant saving of water reported by farmers



When the farmers were asked whether they were able to save water for S.R.I. cultivation, 60% of the respondents stated that they were able to save 30% of water while 40% of respondents stated that they were able to save 40% of water by adopting S.R.I. cultivation. When the farmers were further asked how they were able to save water in S.R. I Cultivation, it was shared that conventional cultivation required the flooding of the seedbed with water to maintain moisture, whereas in S.R.I. cultivation even one inch of water is sufficient for adequate moisture.

Mixed opinion on SRI Farming



When the respondents were asked about whether they felt S.R.I Cultivation was beneficial to them, 50% of the respondents opined that is highly beneficial to the farmers while 50% of the farmers stated that it is somewhat beneficial to them.



Shanthi, S.R.I cultivator, Ammanampakkam says, ' The usual assumption we have that is paddy needs more water than other crops, to the extent of submerging. But with S.R.I. cultivation, it has been proven to be false. We were taught about alternate wetting and drying of the Field. We apply water to the field for 1-2 cm only during the seedling stage. Then we have to wait for the land to dry till cracks are visible. Then during the flowering stage, little amount of water is needed and again we have to wait till the field completely dries. Then we have to apply water during the harvesting time and that too in less quantity. Actually, S.R.I cultivation consumes very less water compared to the traditional cultivation method.'

-Shanthi, S.R.I Cultivator, Ammanampakkam.

Key Impact of the Project

Increase in the yield of Paddy

A Statistically significant increase in the yield of Paddy was observed because of adopting SRI cultivation -The mean yield of Paddy was 865 Kgs. for every 50 cents through the Traditional cultivation method and 1110 Kgs. for every 50 cents by the adoption of the S.R.I cultivation method. There is an increase of 245 Kgs. in the yield of Paddy because of adopting S.R.I cultivation.

Increase in Income of farmers

The mean Income of the farmers was Rs.1800/ through the adoption of the Traditional cultivation method and Rs. 5570/- through S.R.I Cultivation.

There is an increase of Rs. 3770/-in income of the farmers due to the adoption of the S.R.I cultivation method, which is statistically significant.

Conclusion

A significant increase in the yield of paddy through the adoption of the S.R.I method is observed, along with a moderate increase in the income of farmers. The expenses involved also seem to be moderately high for S.R.I. cultivation.

Social Initiative 8: Pulse Productivity

Though our country stands first in terms of area under pulse cultivation and production, the average productivity is less than the average productivity of countries producing pulses. It is to be noted that the productivity of pulses in Tamil Nadu is less than the national average and the production of pulses is not given prominence in the Vandavasi watershed area. Interactions with the farmers for the research study revealed that conventionally pulse is not grown as the main crop in the region and it is grown only as an intercrop along with Groundnut. TATA Capital NAF Project Team sensitized the farmers on the economic benefits that can be realized through pulse production as well the nutritional benefits to the family.

TATA Capital - NAF took up 19 farmers belonging to the villages of Eiyakkam, Anaikunnam, and Rajampalayam. Goonankaranai and Amanampakkam for the Front line Demonstrations. In order for the farmers to see for them the results of the Intervention on Pulse Productivity, the farmers were asked to carry on their conventional method of Pulse productivity on 50 cents of their land and 50 cents for the experimental purpose.

Soil testing was undertaken, and the farmers were instructed about the maintenance of proper spacing, use of seed treatment, and optimal use of fertilizer and pesticides. Farmers were also instructed about the use of yellow traps, pest management, and Integrated nutrient Management.



Selvadurai, 61 years, Anaikunnam says 'I was growing Pulse only as an intercrop before Tata Capital-NAF demonstration. I was asked to carry on my usual method of pulse cultivation in 0.50 acres and the pulse by following the instructions of NAF for another 0.50 acres. The pulse yield was around 15 Kg more per acre following the methods instructed by them. I was able to get Rs.2500/- more because of the increased yield.

-Selvadurai, 61 years, Anaikunnam

Observations of the Research Team on Pulse Productivity.

The beneficiaries who interacted with the research team and shared that they were educated on how growing pulse can contribute to soil health, as the roots of pulse crops help in Nitrogen fixation. This can lead to improved soil fertility and increased productivity for other crops when grown either as intercrop or grown sequentially. This can substantially reduce the application of Nitrogen in the form of DAP.

They were also told about the characteristics of Pulse crops in fighting off plant disease-causing pests, which can result in reduced dependency on chemical pesticides. The beneficiaries came to understand that knowing the chemical composition of the soil is very important for getting a better yield of pulses. TATA Capital – NAF also took their soil samples and get them tested.

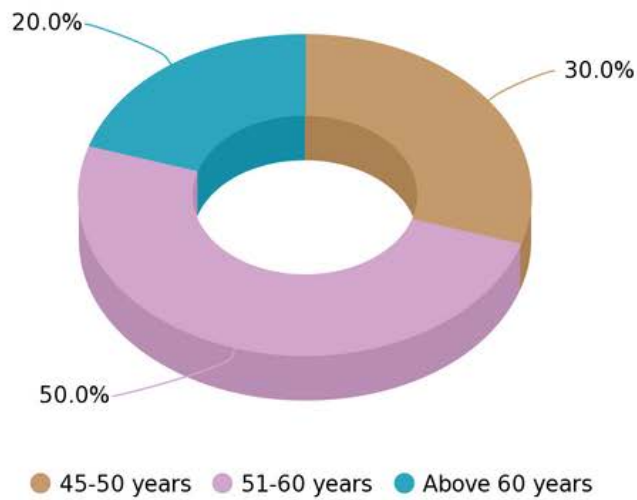
Interactions with the Beneficiaries revealed the following points.

The beneficiaries stated that earlier they were not aware of the importance of knowing the chemical composition of their soil. With the support of TATA Capital – NAF, they got their soil tested and they were advised to apply the proper nutrient content to the soil in appropriate quantities which can enable better productivity of the pulse variety.

The beneficiaries stated that they were not aware of the importance of maintaining adequate spacing between one plant and the other and that they were using Fertilizer and Pesticides according to what they thought to be the right amount and ended up applying more of them. Application of these chemical fertilizers led to the degradation of the soil condition that was not felt by them earlier. Use of more than the needed amount of Chemical fertilizers and pesticides also resulted in extra investment for them towards agricultural inputs.

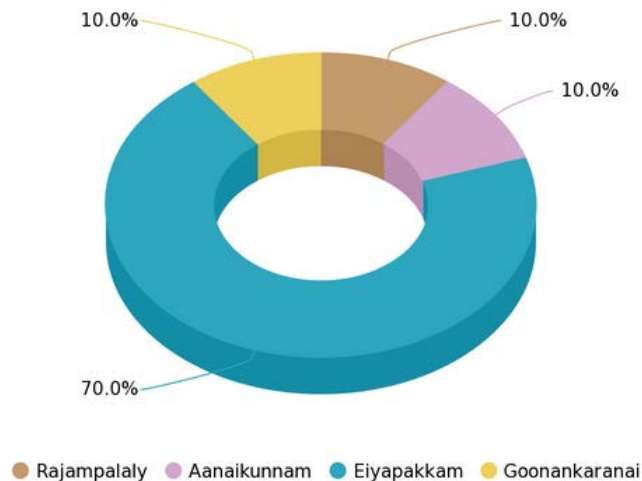
The beneficiaries also got to know the use of Panchakavya, which is an organic mixture prepared by a combination of cow dung, cow urine, curd, Ghee, milk, Banana, Tender coconut, and water. The beneficiaries stated that they were trained to use a 3% spray of the Panchakavya, two times once during the flowering stage and the next one 15 days after the flowering stage. The beneficiaries noted that Panchakavya had many beneficial effects like adding essential micronutrients to the soil. At the same time, they also noted that Chemical fertilizers for instance 2% DAP Spray were also needed for better results.

Distribution of the respondents by Age group



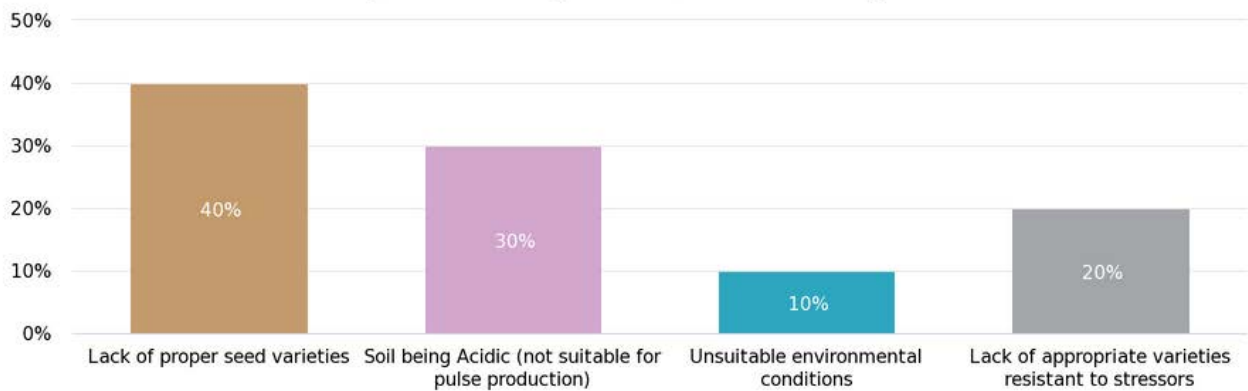
It can be observed that the majority of the respondents, i.e. 50%, belong to the age group of 51 to 60 years, while 30% of the respondents belong to the age group of 45-50 years. 20% of the respondents are above the age of 60 years.

Villages of the respondents



The chart displays the distribution of the respondents based on the villages they belong to. The respondents belong to the villages of Eiyapakkam (70%), Aanaikunnam(10%), Rajampalayam (10%), and Goonankaranai. (10%).

Constraints in Pulse Productivity before the Intervention



When the respondents were asked what the constraints faced by them were before the CSR Intervention of TATA Capital NAF, 40% of the respondents pointed to the non-availability of proper seed varieties. While 30% of the respondents noted that the soil was more acidic in nature, which was not suitable for pulse productivity, 20% of the respondents observed that the lack of appropriate varieties resistant to various stressors was the reason for less productivity of pulses before the CSR Intervention. 10% of the respondents also noted that unsuitable environmental conditions were responsible for the reduced productivity of pulses initially.

Impact: Less significant increase in the yield of pulses observed

H0: Null Hypothesis: There is no significant difference in the yield of pulses before and after the CSR Intervention.

HA1: There is an increase in the yield of pulses after the CSR Intervention.

HA2: There is a decrease in the yield of pulses after the Intervention.

Mean yield before the Intervention in Kg	Mean yield after the Intervention in Kg	Standard Division before the Intervention	Standard Division after the Intervention	Stand ar d Error of Mean Before	Standa rd Error of Mean After	P value
166	210	21.71	13.3	6.86	4.22	Less than 0.0001

The mean yield of pulses was 166 kg before the Intervention and 210kg. after the Intervention.

There is an increase of 44 kg in the yield of pulses due to the Intervention. At a 95% confidence interval, this increase in the area could be from 31.75 kg to 56.25 kg. The mean P value is less than 0.0001, and by conventional criteria, this difference is extremely statistically significant.

Hence, the Null Hypothesis that there is no significant difference in the yield of pulses is rejected, and the alternative hypothesis that the CSR Intervention has led to an increase in pulse productivity is accepted.

Impact: Significant increase in expenditure was noticed due to the CSR Intervention in Improving Pulse Productivity

H0: Null Hypothesis: There is no significant difference in the expenses by CSR Intervention on increasing pulse productivity before and after the Intervention.

HA1: There is an increase in pulse production after the CSR Intervention.

HA2: There is a decrease in pulse production after the CSR Intervention.

Mean Expenses Before the Intervention	Mean Expenses After the Intervention in Rs.	Standard Division before the Intervention	Standard Division after the Intervention	Stand ar d Error of Mean Before	Stand ar d Error of Mean After	P value
9700	11450	483.10	895.58	152.75	283.33	Less than 0.0001

The mean expenses before the Intervention were Rs. 9700/-, and after the Intervention it is Rs. 11450/-. A mean change of an increase of Rs. 1750 has been observed because of the Intervention, and at a 95% confidence level, this difference could be between Rs. 1073.74 to 2486.26/-. Since the P value is less than 0.0001, this value is extremely statistically significant. Hence the Null Hypothesis is rejected and the alternative hypothesis that there is a significant increase in expenditure due to the adoption of new techniques of pulse productivity is accepted.

Impact: Statistically Significant change in Income observed

H0: Null Hypothesis: There is no significant difference in the Income of the farmers due to improved Pulse Productivity before and after the Intervention.

HA1: There is an increase in the Income of the farmers due to improved Pulse Productivity after the Intervention.

HA2: There is a decrease in the Income of the farmers due to Pulse Productivity before the Intervention.

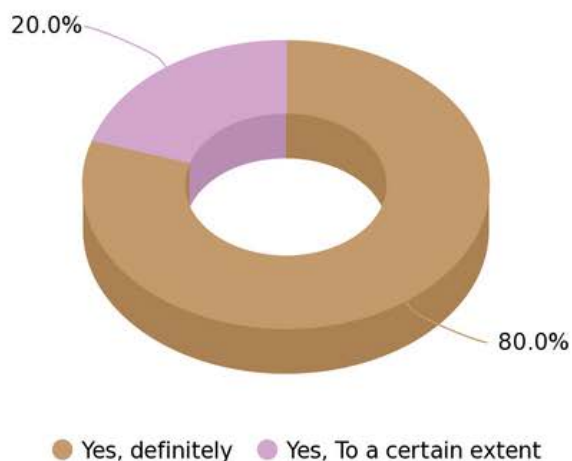
Mean Income before the Intervention in Kg	Mean Income After the Intervention in Kg	Standard Division before the Intervention	Standard Division after the Intervention	Standard Error of Mean Before	Standard Error of Mean After	P value
6200	9800	3852.85	3489.67	1218.38	1103.53	0.0419

The mean Income of the farmers was Rs. 6200 before the Intervention and Rs. 9800 after the Intervention.

There is an increase of Rs. 3600- in the income of the farmers due to the Intervention. At a 95% confidence interval, this increase in the area could be from Rs.146.41 to Rs.7053.59 was observed. The mean value p-value is 0.0419 by conventional criteria this difference is statistically significant.

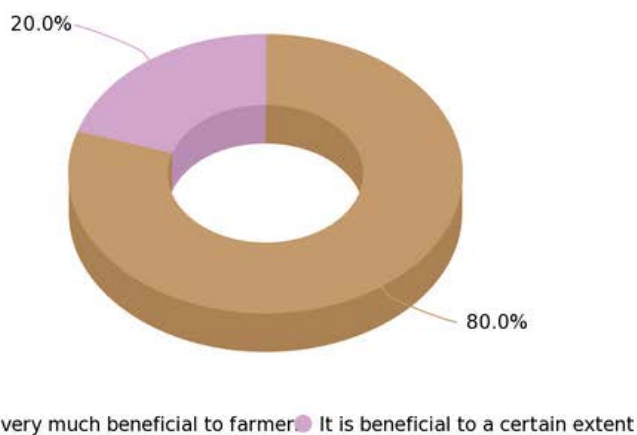
Hence the Null Hypothesis that there is no significant difference in the income of the farmers due to improved Pulse Productivity is rejected and the alternative hypothesis that there is a significant increase in the income of the farmers due to Improved Pulse Productivity after the CSR Interventions accepted.

Perception of farmers towards pulse productivity



When the farmers who were involved in the CSR Intervention of FLD were asked whether they would recommend it to other farmers, 80% of the respondents stated that would definitely do so. 20% of the farmers stated that they were not strong in their opinion about the same, but that they would recommend it to other farmers.

Opinion of the respondents on the pulse productivity facilitation done by NAF



When the respondents were asked whether they felt the training imparted to them by TATA Capital - NAF was beneficial to them, 80% of the respondents stated that it was very much beneficial to them. 20% of the respondents felt it was beneficial to a certain extent.

Key Impact of the Project

Increase in yield of Pulses

The mean yield of Pulses was 166 Kg. before the Intervention and 210 Kg. after the Intervention. There is an increase of 44 Kg. in the yield of Pulses Per 0.50 acres of land due to the Intervention.

Increase in the Income of farmers

The mean Income of the farmers was Rs. 6200 before the Intervention and Rs. 9800 after the Intervention. There is an increase of Rs. 3600/- per 0.50 acres in the income of the farmers due to the Intervention,

Conclusion

Pulse cultivation was undertaken only on a sustenance basis before the Intervention. Now pulse cultivation for commercial purposes is also observed in the Intervention villages.



Social Initiative 9: Vegetable Cultivation

The CSR Intervention on vegetable productivity was undertaken in 25 cents of the agricultural fields of 13 farmers belonging to the villages of Veliyampakkam, Eiypakkam, Rajampalayam, and Goonankaranai.

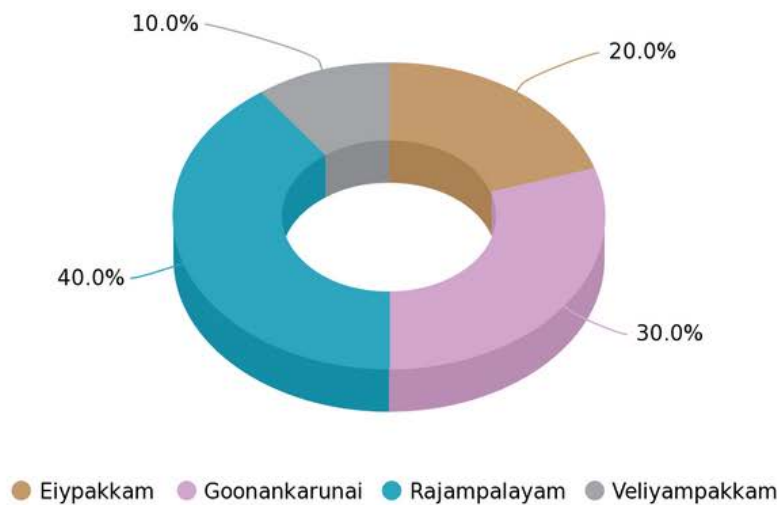
This study was conducted among 10 respondents who undertook vegetable cultivation in order to assess whether the said Intervention was effective or not, and if so to what extent.

This section contains the following:

Quantified findings on the yield, increase in land used for vegetable cultivation, income and expenses of the farmers in carrying out the Field Line Demonstrations of TATA – Capital – NAF, and the perception of beneficiaries towards the practice. A case study of one of the beneficiaries is also presented.



Distribution of respondents according to their villages



The sample consists of 40% of respondents from Rajampalayam, 30% from Goonankaranai, 20% from Eiypakkam and 10% from Veliyampakkam.

Size of farmland owned



It can be observed that 70% of the respondents held between 2 to 3 acres of land, and 30% of respondents owned between 1 to 2 acres of land. When the research team interacted with the respondents, it came to light that, with paddy being the major crop occupying the major cultivable land area in the project villages, a land size of at least more than an acre was felt to be necessary to carry out vegetable cultivation.

Receiving vegetable seeds



When the beneficiaries were asked the selling price of 1 kg of vegetables in the market, it was observed that the farmers sell brinjal to the market at Rs.20/- per kg, ladies finger at Rs.25/- per kg and cucumber at Rs.12/- per kg.

Siva, a farmer belonging to Eiypakkam village, Vandavasi Block, is a beneficiary of the TATA Capital- NAF's CSR Intervention of improving vegetable productivity. He says ' the NAF project staff created awareness on how to use various practices that can result in an increased yield of Brinjal. Initially, I was not very convinced of whether these things will work out or not. When they told me that I can carry on with my usual traditional way of cultivation in the 25 cents and allocate 25 cents for carrying out brinjal cultivation as per their instructions, to myself verify the results of yield, I got convinced. They gave me very useful ideas like the suggestion to use practices like mulching which can increase the humus content of the soil, how to prevent the growth of weeds and how to bring out better water retention in the soil even with less use of water.



I was able to produce an additional 400 kg . of brinjal than what I used to get by using the traditional methods. There was a profit of around Rs.1000/- from the yield in the demonstration field. The training imparted by TATA Capital - NAF was greatly beneficial, and it has motivated me to continue with vegetable cultivation.

Impact: Significant Increase in the area of vegetable cultivation was observed because of the CSR Intervention on vegetable productivity.

H0: Null Hypothesis: There is no significant difference in the area of vegetable cultivation before and after the Intervention.

HA1: There is an increase in the area of vegetable cultivation after the Intervention.

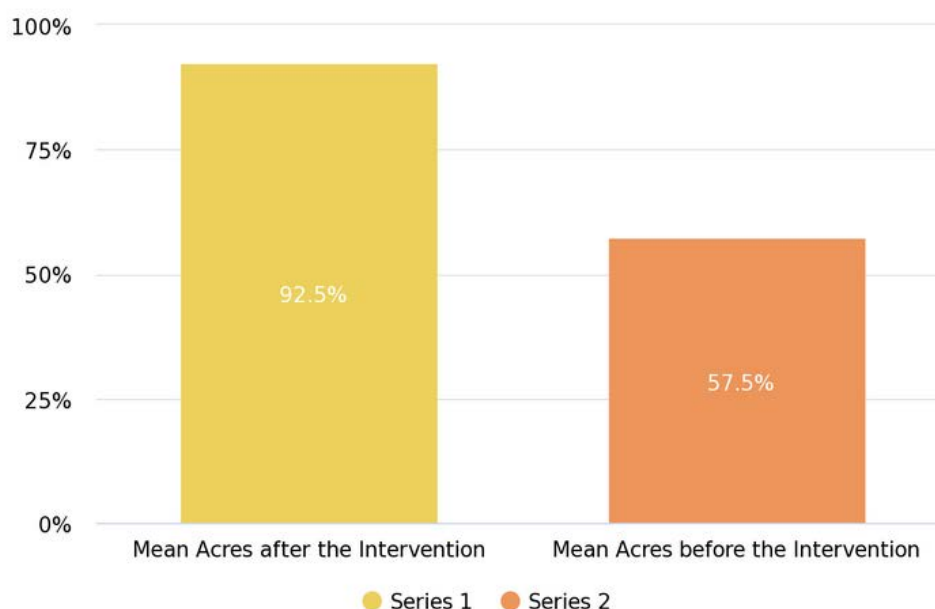
HA2: There is a decrease in the area of vegetable cultivation after the Intervention.

Mean Acres before the Intervention	Mean Acres After the Intervention	Standard Deviation before the Intervention	Standard Deviation after the Intervention	Stand ar d Error of Mean Before	Stand ar d Error of Mean After	P value
57.50	92.50	12.08	16.87	3.82	5.34	0.0001

There is an increase of 35 cents in the acres of cultivation used for vegetable production. At a 95% confidence interval, this increase in the area could be from 25.76% to 44.24%.

The difference is found to be extremely statistically significant. Hence the Null hypothesis is rejected, and the alternate hypothesis that there is a significant increase in the acres of cultivation of vegetables is accepted.

Change in Acres of Vegetable Cultivation



Impact: Less significant increase in the yield of vegetables observed

H0: Null Hypothesis: There is no significant difference in the yield of vegetable cultivation before and after the Intervention.

HA1: There is an increase in the yield of vegetable cultivation after the Intervention.

HA2: There is a decrease in the yield of vegetable cultivation after the Intervention.

Mean yield before the Intervention in kg	Mean yield After the Intervention in kg	Standard Division before the Intervention	Standard Division after the Intervention	Stand ar Error of Mean Before	Stand ar Error of Mean After	P value
1375	2565	458.51	3029.12	957.89	144.96	0.2288

The mean yield of vegetables was 1375 kg before the Intervention and 2565 kg after the Intervention.

There is an increase of 1190 kg in the yield of vegetables due to the Intervention. At a 95% confidence interval, this increase in the area could be from 894.71 kg to 3274.71 kg. The mean value P value is 0.22, and by conventional criteria, this difference is not statistically significant.

Hence the Null Hypothesis that there is no significant difference in the yield of vegetables is accepted.

Impact: No significant increase in expenditure is noticed due to the CSR Intervention in improving vegetable productivity

H0: Null Hypothesis: There is no significant difference in the expenses by the CSR Intervention in increasing vegetable productivity before and after the Intervention.

HA1: There is an increase in vegetable production after the Intervention.

HA2: There is a decrease in vegetable production after the Intervention.

Mean Expenses Before the Intervention	Mean Expenses After the Intervention	Standard Division before the Intervention	Standard Division after the Intervention	Stand ar Error of Mean Before	Stand ar Error of Mean After	P value
11250	11650	2708	1687	856.51	533.59	0.4620

The mean expenses before the Intervention are Rs.11250/- and after the Intervention, it is equal to Rs.11650/-. A mean change of increase of Rs.400/- has been observed because of the Intervention. At a 95% confidence level, this difference could be between Rs.777.87 to Rs. 1577.87/-. Since the P value is equal to 0.462, it is statistically insignificant. Which means the null hypothesis is accepted. Hence it can be inferred that there is not much significant increase in expenses is observed for adopting new methods of improving vegetable productivity.

Mean change in expenditure in Rs.



Impact: Statistically Significant change in Income observed

Statistically Significant Increase in Income observed.

H0: Null Hypothesis: There is no significant difference in the income of the farmers due to vegetable cultivation before and after the Intervention.

HA1: There is an increase in the income of the farmers due to vegetable cultivation after the Intervention.

HA2: There is a decrease in the income of the farmers after the Intervention.

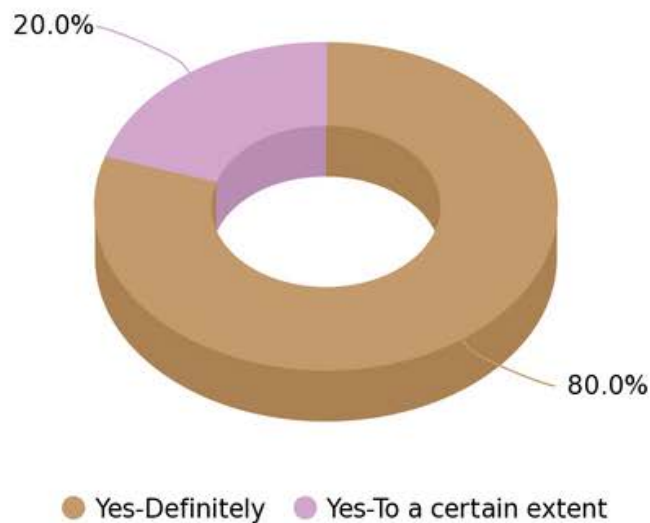
Mean Income before the Intervention in kg	Mean Income After the Intervention in kg	Standard Deviation before the Intervention	Standard Deviation after the Intervention	Standard Error of Mean Before	Standard Error of Mean After	P value
9670	19050	7187	10610	2272	3323.69	0.0371

The mean income of the farmers was Rs. 9670/- before the Intervention and Rs.19050/- after the Intervention.

There is an increase of Rs.9380 in the income of the farmers due to the Intervention. At a 95% confidence interval, this increase in the area could be from 920.68 to 17839.32. The mean value Pvalue is 0.0371. By conventional criteria, this difference is statistically significant.

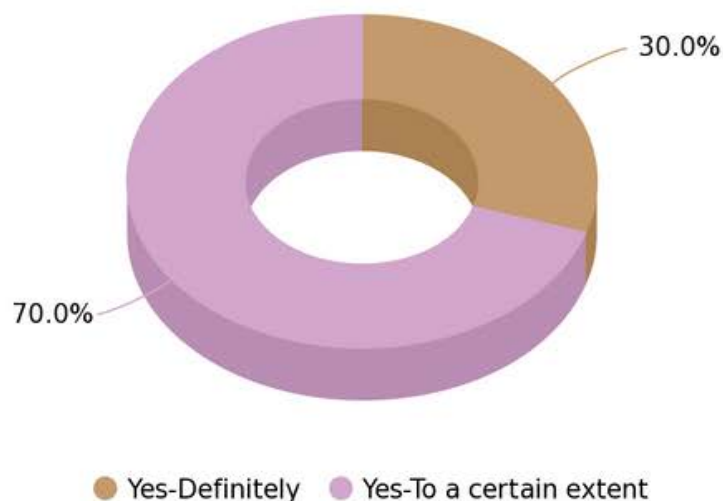
Hence, the Null Hypothesis that there is no significant difference in income of the farmers due to vegetable cultivation is rejected, and the alternative hypothesis that there is a significant increase in the income of the vegetable farmers is accepted.

Perception of Beneficiaries about the CSR Intervention of increasing Vegetable Productivity.



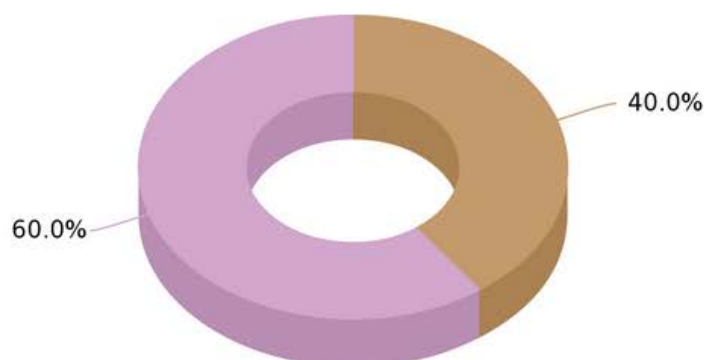
When the beneficiaries were asked whether they planned to increase the area of cultivation earmarked for vegetable cultivation in the near future, seeing the results of the CSR Intervention on increasing agricultural productivity, a majority of the respondents, that is 80%, stated that they would definitely increase the area under agricultural Productivity. 20% of the beneficiaries agreed to the statement, though only to a 'certain extent'.

The opinions of the beneficiaries on whether vegetable cultivation is more profitable than rice cultivation.



When the respondents were asked whether vegetable cultivation is more profitable to them than rice cultivation, a majority of the respondents, that is 70%, stated that it is profitable to a certain extent, while 30% of the respondents stated they felt it is definitely profitable to them.

The extent of the benefits of vegetable cultivation



● It is very much beneficial to farmer ● It is beneficial to a certain extent

When the respondents were asked whether they felt vegetable cultivation is beneficial to them, 60 % of the respondents stated it is very much beneficial, while 40% stated it is beneficial to a certain extent.

When the respondents were asked whether they would suggest vegetable cultivation to other farmers, all of the farmers (100%) stated they will definitely do so.

Key Impact of the Project

Increase in cultivable area of vegetable productivity

There is an increase in 35 cents in the acres of cultivation used for vegetable productivity. The difference is found to be extremely statistically significant.

Increase in the yield of vegetables

The mean yield of Vegetables was 1375 Kgs. before the Intervention and 2565 Kgs. after the Intervention of improvement in agricultural productivity. There is an increase of 1190 Kgs. in the yield of vegetables due to the Intervention.

Increase in Mean Income of farmers

The mean Income of the farmers was Rs. 9670/- before the Intervention and Rs.19050/- after the Intervention. There is an increase of Rs.9380/ in income of the farmers due to the Intervention of productivity of vegetables.

Conclusion

The research team was able to observe that 40% more farmers have taken up vegetable cultivation in the different project villages after seeing the benefits of vegetable cultivation.

Social Initiative 10: Pasture Development



Lakshmi, Manimangalam, Vandavasi, says ‘ I was encouraged to grow fodder grass CO-4 variety in 5 cents of my farmland by the TATA Capital project staff. My cows like to eat this grass variety. I was told that this grass has good protein content required for a good yield of milk. Now the milk yield of the cows has gone up by 1 to 1 1/2 liters after consuming this. Also, my expenses for buying fodder for cattle have come down largely. I thank TATA Capital for introducing the growing of this grass variety to me and this village. Before this activity was initiated in this village, we have not seen grass grown especially for fodder purposes. There are other farmers in this village who also have started growing this grass variety for cattle.’

Observations of the Research Team

Interactions with the beneficiaries and VDC members through FGD and Interviews revealed that farmers in the Project villages of Manimangalam and Seeyalam have now begun to practice developing pastures in their farmlands and prior to this CSR Project Intervention of TATA Capital – NAF this was not known and practiced by the farmers of these villages. Fodder cultivation has resulted in good milk yield of cows and cattle farmers have witnessed milk yield increased by 1 to 2 liters per cow per day. This has also reduced the economic burden of the farmers in feeding their cattle by 60 to 70%.

Social Initiative 11: Intercropping

The practice of Intercropping which refers to two or more, usually dissimilar crops on the same piece of land, was introduced in the Project villages of vandavasi by TATA Capital. This practice has been scientifically proven to improve soil health and nutrient availability and adds up to an additional income source for farmers. Intercropping has the potential of enriching the soil with organic carbon Nitrogen, Phosphorus, and Potassium thus enriching soil health. Interviews were conducted with 7 farmers practising Intercropping in Vandavasi to get insights about the same.

In the Project villages, the Research Team was able to observe the practice of Intercropping of growing Groundnut along with Black Gram.



Mr. Moorthy, aged 44 years, lives in Ammanampakkam, and has 5 acres of land; he also holds the position of Treasurer in the Village Development Committee since its inception. He is one among the 20 beneficiaries who received pulses- black grams from Tata Capital through NAF 2 times. From the discussion, it was observed that he had received black grams for two cultivations. He was oriented about Intercropping by TATA Capital- NAF and he was asked to sow the seeds of a Black gram in between groundnuts and green beans. He was able to harvest after 90 days of sowing of black grams. He says ' TATA Capital provided the Black Gram seeds which were of good quality. I was also taught the method of seed treatment before sowing. I received fertilizer free of cost and I was told to apply only the quantity of fertilizer as instructed by them. The amount of yield after following Intercropping is better than the usual method of cultivating black gram alone. The intercropping method has led to improved nutrition of the soil. I can see the weeds are very much reduced or else we have to spend a lot of effort to clear the weeds. I can see less infestation of pests by adopting intercropping. I was able to realize a yield of 100 Kg. during the first year and sold it at the cost of Rs. 25/- per kg and the next year I was able to raise about 250 kgs, of black gram. The Profit was pretty good. The community is largely benefitted from the village pond constructed by them and the water availability is very good compared to the situation 4 years back. I have also received 10 nos. of Teak Saplings through TATA capital. I thank TATA Capital for all their project activities which have improved the earnings of the farmers of villages of this region.'

Agroforestry and Drip irrigation



Mr. Radhakrishnan, 54 years, Ammanampakkam, owns 2 acres of land, and he is the Secretary for the Watershed Development Committee. He says ‘ The watershed development was one of the first committees to be formed as a part of the Jal Aadhar Project of TATA capital. The SHG federations were formed in the project villages only after that. They made me aware of Drip Irrigation, and its benefits. Though I was having little knowledge about it, I did not give it serious thought to giving it a try. TATA capital-NAF motivated me to install one drip irrigation, as it will be easy for me to carry out irrigation and it will be conserving much water too. The Team found my Land would be suitable for Teak cultivation and I got to know the economic benefits that would accrue because of Teak plantation. Teak saplings were given free of cost by Tata Capital and it is planted on the entire 2 acres of land. Since it is a long-term benefit, I am also growing green beans and vegetables also based on their advice. I like to thank TATA capital as the entire cost of Rs. 30, 000/- was facilitated by Tata Capital. For incidental expenses, I had to spend Rs. 4000/-, which is very minimal compared to the amount of benefit I do get from it. The teak plants will take around 12 years to grow fully and then they can be cut for timber.

Focus Group Discussion with community members at Edaiyur



Discussions with community members revealed how the community got benefitted from the various watershed Interventions of Tata Capital through increased water availability for irrigation and how the community got benefitted because of various methods to improve agricultural productivity by Tata capital NAF. Some of the major insights are documented here.

The Practice of constructing Farm bunds became more prevalent

The community members shared that only a few farmers had the practice of constructing Farm bunds. TATA capital - NAF project staff oriented the community members on the importance of constructing these retaining walls along the boundary of the farmlands. It was noted that these structures helped retain soil moisture for a long time after the rains. Also, the nutrients of the soil also get prevented from getting washed away with the runoff rainwater. Each farmer was able to bring in 25 cents to 50 cents of additional dry land under cultivation during the agricultural seasons. It was shared that some big farmers of the community have brought more than one acre of dry land under cultivation.

Community became aware of the importance of Soil Testing

The community got oriented about the importance of knowing the chemical composition of their soil so that the right mix of chemical fertilizers can be applied in the right quantities so that the soil does not become contaminated with the predominance of any one mineral/minerals, which can hamper the growth of particular plant varieties. The community members got to know whether their soils were acidic or alkaline and what sort of conditions will be suitable for the growth of Paddy, vegetables and Groundnuts.

Community got introduced to Farm Equipment

The community conceded that before the CSR Interventions of TATA capital- NAF, they were not much aware of the Farm Equipment. Though they have heard of the names of this equipment, they never saw them or gave serious thought to using them in their farmlands. To illustrate Farm Equipment, the members shared about the use of a **Power weeder** which is very helpful in removing weeds and grass. These have prongs that can work between crop columns. It was shared that the power weeders also helped them to mix the soil and break the blocks. One of the major advantages is that it can also be used by farmers with small farm holdings.

Use of Drum Seeder - One of the participants also mentioned the use of a drum seeder which has reduced human effort in transplanting paddy seedlings with even spacing in rows.

Exposure to Drip irrigation

The community members shared that they were given exposure to the use of Drip Irrigation and they feel that a good amount of water at least 40% to 50% can be saved if Drip irrigation is used instead of the conventional irrigation method.

Increased yield and no. of cropping

Community members agreed that the yield of different crops has got increased by about 10 to 20% for most of the farmers and the community has now been able to carry out two croppings when compared to a single cropping before.



RELEVANCE

The villages taken up in Vandavasi and Edaiyur Blocks were water stressed. Systematic studies were made to assess the water needs of these communities prior to constructing watershed structures.

The Participatory Rural Appraisals were conducted by TCHFL to assess the felt needs of the people.

Village Development Committees were formed to spearhead the initiatives and to mobilize the community.

RATING



COHERENCE

The Jal Aadhar Project has been found to further the Sustainable Development Goals of the U.N:

- Goal No.1 No Poverty
- Goal No.5: Gender equality
- Goal No.6: Clean water and Sanitation.
- Goal No.7: Affordable and clean energy
- Goal No. 8: Decent Work and Economic Growth.
- Goal no. 10 Reduced inequalities.

Hence the project is high in its coherence.

RATING



EFFECTIVENESS

The Project has achieved:

Improving the Ground water table by 3 meters in the project villages of Vandavasi block and 3.8 meters in Edaiyur Block against the projected 6-8 meters over 3 years of the project period.

Farm yield and Income has considerably increased through various social measures like Improvement in Pulse productivity, vegetable cultivation, Summer Ploughing, and Threshing yards, and environmental measures like percolation pond, check dams, and village ponds as documented in the study.

Self Help Group Federation has resulted in creating livelihood assets for women and a source of income supporting to support their family members. The Program has also led to the empowerment of these women.

Hence the project can be said to be high in its effectiveness.

RATING



EFFICIENCY

When the outcomes of the project are compared with the inputs for the project, it can be said the project is highly efficient in that it has created assets for the community, which are long-lasting and continue to provide benefits year after year to the community.

RATING



Index: 5 Points - Very High ; 4 Points - High ; 3 Points - Moderate ; 2 Points - Low ; 1 Point - Very Low

The creation of one asset does not stop in itself but continues to have ripple effects on several dimensions of rural livelihood.

The involvement of structures like Village Development Committees has resulted in increased operational efficiency of the Project.

The involvement of the women of the community through the SHG federation has increased the efficiency of the delivery mechanisms of the project in terms of sensitization, mobilization of the community, and garnering community support. Hence it can be said that the project is highly efficient.

IMPACT

RATING



The Project Interventions have impacted the community in the following ways.

- A changed mindset towards taking ownership of maintenance of community assets like Threshing yards, Percolation ponds, cattle ponds and check dams.
- Improved water availability has led to increased Farm yield and Agricultural income.
- An attitudinal change towards adopting Scientific Agricultural Practices.
- Increased empowerment of women by making them productively contribute to family income. Increased participation of women in community affairs.

Hence the Project can be said to be highly impactful.

SUSTAINABILITY

RATING



The project is highly sustainable. With the creation of Village Development Committees for overseeing the community assets and the assets now being part of the commonwealth of the community, the Project is highly sustainable in nature.

RECOMMENDATIONS

The following sections discuss some recommendations which can be considered for inclusion in future project activities.

Threshing yard

The threshing yard was found to be one of the most beneficial Social initiatives of TCHFL by the farmers as it is one resource, which is commonly used by all farmers in the village. There is a high demand for drying grains for most farmers around the same time and hence the farmers across project villages asked for the construction of more threshing yards in their villages.

In some of the villages, the threshing yards which were earlier constructed by the Panchayat were in a dilapidated stage and people have abandoned using them. If these threshing yards are repaired for use, they will serve as additional resources for the farmers.

Creating Farmers Club

Farmer's clubs are groups of farmers formed for realizing common benefits from farming and related activities exchanging farm-related information and expertise, linking with banks for getting credits, connecting with corporate suppliers for bulk farm supplies, and marketing their produce, etc., Farmers club help in facilitating socio-economic activities like community works, education activities, health concern, environment, and natural resources management. Farmer's Club help in technology transfer and promotion of technological adoption by farmers.

Scaling up Vermicomposting

The research Team was able to observe women in SHGs and farmers trained in vermicomposting. Till now vermicomposting has been undertaken only on a small scale for partial use in their farm lands. There is a good scope for reaping commercial benefits if vermicomposting is undertaken on a large scale. Hence training for commercial production of vermicompost and marketing can be organized as a part of future interventions.

Renewal of insurance for cattle

Cattle farmers interacted during the research and stated that they paid their first premium after receiving the loan from TCFHL for getting cattle. But in the subsequent years, cattle farmers could not continue paying for the renewal of their cattle insurance. Hence their cattle insurance lapsed depriving them of the benefits that come along with cattle insurance. TCHFL needs to set up mechanisms for motivating farmers to pay cattle insurance premiums every year for continuous benefits.

Sustaining Summer Ploughing

Farmers who interacted during the course of the study found summer plowing to be very much beneficial to them. After the exit of TCHFL from the project villages, many farmers have given up the practice of summer ploughing, mainly because of a lack of proper motivation to continue with the practice. Hence re-education strategies need to be adopted for making farmers resort to summer ploughing. Village Development Committees should also be motivated to make farmers take up summer ploughing again.

CONCLUSION

SoulAce Research Team was able to witness the myriad changes that have happened in the lives of the community people in the project villages of both Vandavasi and Thirukazhukundram Blocks. The communities have begun to show increased attention to the need for conserving the scarce water resources of the community. The increased water table has been achieved in the project communities through various watershed structures created like check dams, Gabion check dams, Supply channels, Percolation ponds, village ponds, and cattle ponds. The Project has resulted in improving the Ground water table by 3 meters in the project villages of vandavasi block and 3.8 meters in Thirukkazhukundram Block against the projected 5 to 7 meters over 3 years of the project period. The project has been able to achieve increased crop diversity in terms of growing pulses, vegetables, adopting Intercropping, etc., apart from the main crop of Paddy. The attitudes of farmers have changed favorably towards adopting scientific cultivation methods to improve agricultural productivity. The Project of Jal Aadhar is comprehensive covering various facets starting from entry point activities of the Threshing yard, Solar lights, and Syntax tanks, to training and capacity building activities and Income generating activities apart from numerous project tasks on improving agricultural productivity and allied activities. 4 years of a project period is too short to effect larger changes as planned but efforts had been taken in the right direction to achieve them. One of the key features of the Program is the empowerment of the community in the Project Interventions. Instead of just looking at the community as passive receivers of benevolence, the community has been made rightful owners of the Project Interventions. Community participation is not only involved at the stage of implementation but right from even before beginning any program. The needs of the community are identified and ascertained with the active participation of the community members by their fair representation in a structure called the VDC. The members of the VDC are seen to take an active role in giving their ideas in designing a program, alerting the Implementing agency on possible Pitfalls and how to foresee and overcome them, and sensitizing the community about the need for a Program. The involvement of VDC gives confidence to the community and is one of the important strategies adopted by TCHFL to build essential trust and rapport with the community members. TCHFL also has groomed Leaders in the community, especially women leaders, who can be seen to be exuberantly partaking in various project initiatives and in the forefront of persuading the male members in their households towards trying/experimenting with scientific agricultural practices or any other Interventions for the sake of the community. The Research Team could observe the amount of bonhomie that people in the project communities carry toward the Project Staff of the Implementing partner NAF. People in the project community identify the staff of the implementing partner with TCHFL easily and there is greater visibility towards the name Tata Capital rather than NAF, which is a rare phenomenon in comparison with CSR projects from other corporate houses, where people seldom recognize the Donor. In times when agriculture as a profession is becoming increasingly unproductive, interventions like Jal Aadhar which furthers the morale and spirit of the farmers are the need of the hour. The watershed structures created and the newer methods of improving agricultural productivity will go a long way in achieving the avowed ends in the future.

ANNEXURE

TATA CAPITAL took up the mission of holistic development of villages with water management as its central theme under its Corporate Social Responsibility (CSR) initiatives. In this connection, it had partnered with the National Agro Foundation (NAF), a Public Charitable Trust to execute the Integrated Watershed Development Project at Edaiyur, in Kancheepuram District, and the Sustainable Village Project at Vandavasi, in Tiruvannamalai District of Tamil Nadu.

Integrated Watershed Development Projects (IWDPs) aim to balance the conservation, regeneration, and use of land and water resources within a watershed by humans. Common benefits from successful Integrated Watershed Development Projects include improvement in groundwater harvesting leading to sustaining agricultural yields and increased access to drinking water. In terms of watershed development, the Sustainable Village Project has similar attempts.

Objectives

The objectives of the current assessment are to understand the following in the project area:

- Change/improvement of the groundwater table.
- Change in surface water holding capacity and reduction in runoff.
- Change in land use pattern, cropping pattern, and agricultural productivity.

The assessment included:

- Review of the topographic map and analysis of existing hydrogeologic data.
- Collection of field data from on-site assessments.
- Determine the change/improvement of the groundwater table (observatory wells and surface water bodies as per intervention).
- Determine the change in surface water holding capacity and reduction of runoff.
- Evaluate the change in land use pattern, cropping pattern, and agricultural productivity.
- Mapping of recharge conditions i.e., rainfall, groundwater levels, availability of water in the intervention villages through recharge, directions of groundwater, and the interaction of surface and groundwater in the project areas.



Gabion Dams - Edaiyur

Project Locations

The interventions under the project implemented in a total of 16 villages in the districts of Tiruvannamalai and Chengalpattu.

District	Tiruvannamalai	Chengalpattu
Taluka	Vandavasi and Madurangam	Edaiyur and Veerakuppam
No. of villages	11	5
Name of villages	Salavedu, Kavedu, Seeyalam, Badhur, Ammanambakkam, Mangalam, Veliyampakkam, Seeshamangalam, Rajampalayam, Porpanankaranai and Gunankaranai hamlets	Salur, Ponpadrikudam, Edaiyur, Narapakkam, Veerakuppam and Mambakka

Approach

Assessment of the impact of the interventions on the groundwater table was done in 3 key steps.

Step 1: Water Level Assessment

This step was to estimate the level of change in the water level in the observation wells. This involved comparison of the pre-intervention levels with the post-intervention levels and also accounted for the difference due to monsoons.

This difference in depth (Δ Depth) was plotted on a map and interpolated to understand the scenario throughout the area of intervention.

This step was useful to determine the following:

- Long-term water level
- The absolute difference in water level
- Rise/fall of water level in relation to the change in rainfall
- Rise/fall of water level in relation to the increase in groundwater development

Step 2: Assessment of Rainfall Influence

This step involved the assessment of the rainfall received in the intervention area throughout the duration of the project. This also involved the assessment of the rainfall trend over the intervention period. A regression analysis between both informed the levels of correlation and the strength of the relationship between them. This in turn helped to establish if the change in groundwater level was direct because of the rainfall patterns or if the interventions had a role to play. The Water-Table Fluctuation (WTF) method was used to establish the contribution of rainfall to the change in water levels. Further assessments were done to attribute the role of the intervention in the increase of the water depth.

Step 3: Attribution Assessment

In case of a positive or negative trend in the amount of rainfall received, further assessments were done to attribute the change in groundwater levels to the interventions done. This involved assessment of land use changes with regard to factors like changes in agricultural areas, changes in green cover, changes in water availability, cropping intensity, and so on.

Spatial assessment methods such as NDVI (Normalized Difference Vegetation Index) and NDWI (Normalized Difference Water Index) techniques were used, both spatially and temporally, to estimate the changes in the intervention area.



Check dams - Edaiyur

Data Collection

The following datasets were collected from the implementing partner, National Agro Foundation, to facilitate the objectives of the study:

- Depth to the water level in observation wells.
- Rainfall data for the block.
- The interventions that were done, and their details.
- Photos from the field survey.

The above datasets are provided in Annexure 1.

In addition to the above datasets, additional data was collected from various sources to validate the data from the implementing partner, which was used for the assessment of the impacts of their project. These are as follows:

- Depth to water level from Tamil Nadu Water Supply and Drainage Board (TWAD), and Central Ground Water Board (CGWB) (provided in Annexure 2).
- Rainfall data from Indian Meteorological Department (IMD) (provided in Annexure 2).

Other datasets that were used in the assessment are as follows:

- Soil types from Tamil Nadu Agricultural University (TNAU) (provided in Annexure 3).
- Aquifer system from Central Ground Water Board (CGWB) (provided in Annexure 3).
- Specific Yield from Groundwater Estimation Committee (GEC) (provided in Annexure 3).
- Land Use Land Cover change between 2018 – 2021 from ESRI Living Atlas[1].
- Normalized Difference Vegetation Index (NDVI) is obtained from the analysis of multispectral images obtained from Sentinel-2 (January 2018 - 2022).
- Cropping Intensity data obtained from GCI30: a global dataset of 30 m cropping intensity[2].

[1] Karra, Kontgis, et al. "Global land use/land cover with Sentinel-2 and deep learning." *IGARSS 2021-2021 IEEE International Geoscience and Remote Sensing Symposium. IEEE, 2021.*

[2] <https://doi.org/10.5194/essd-13-4799-2021>

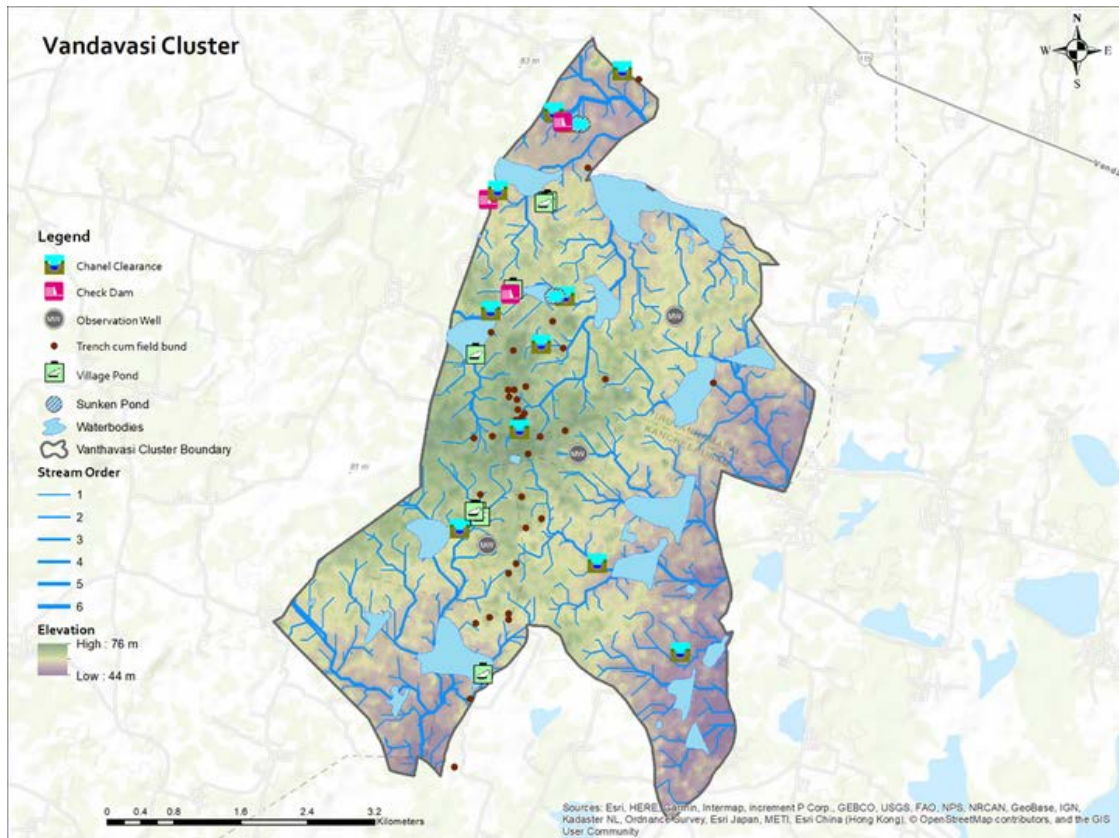


Figure 1: Location of Interventions - Vandavasi

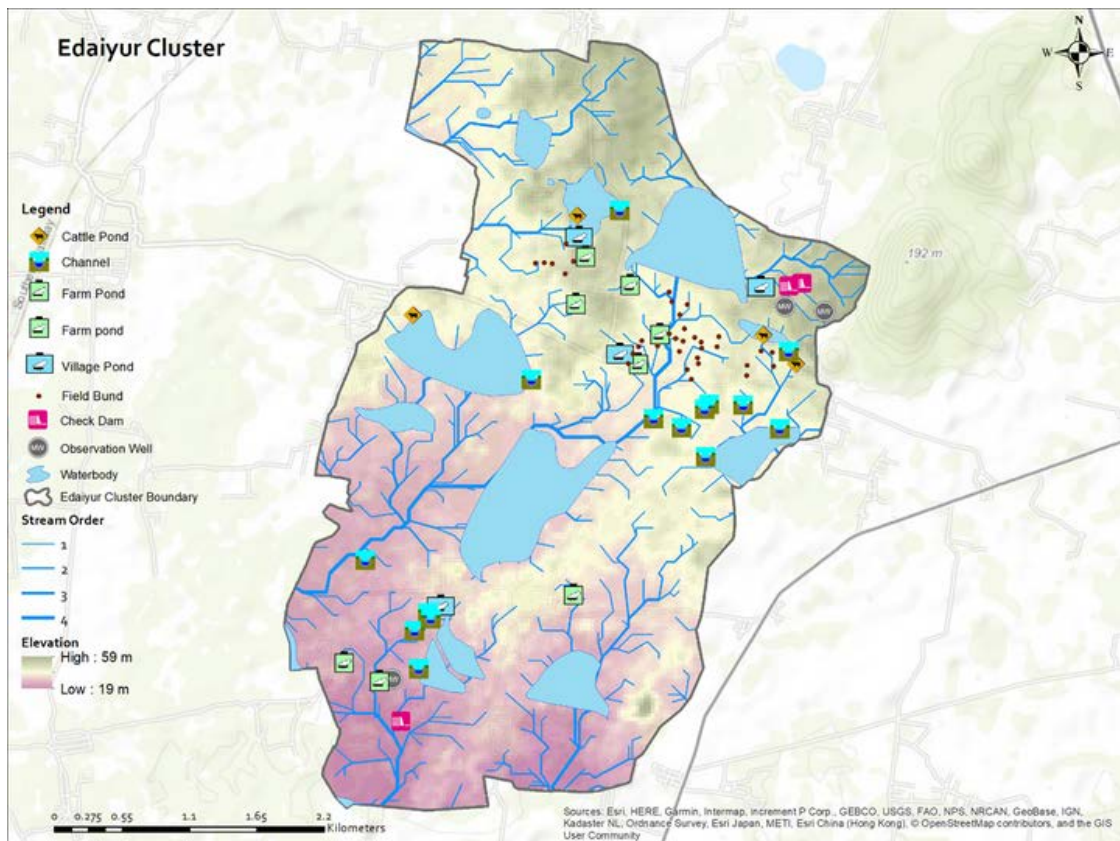


Figure 2: Location of Intervention - Edaiyur



Village Ponds - Edaiyur



Village Ponds - Edaiyur

Results

The results of the assessment to identify the impacts of the interventions on water management are presented in the following sections. It includes assessment of rainfall and water level trends, estimation of recharge due to rainfall, change in surface holding capacity and runoff reduction, change in land use pattern, and cropping intensity.

Analysis of rainfall and water level trends

Overall, both the values of rainfall and the depth to water level in Vandavasi and Thirukalukundram block, have shown a positive change throughout the intervention period. The following graphs show the trend in their change, over time.

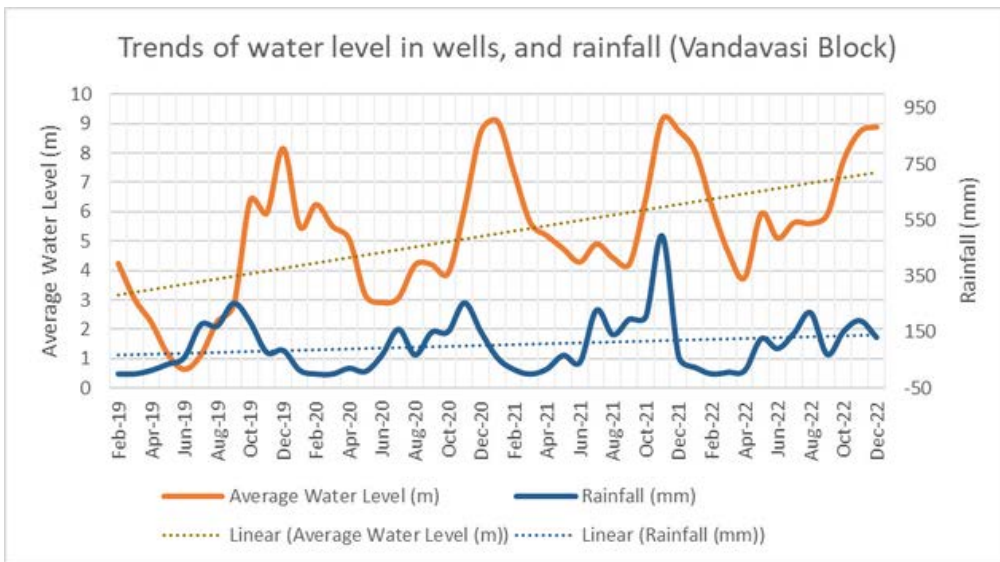


Figure 3: Trends of water level and rainfall - Vandavasi

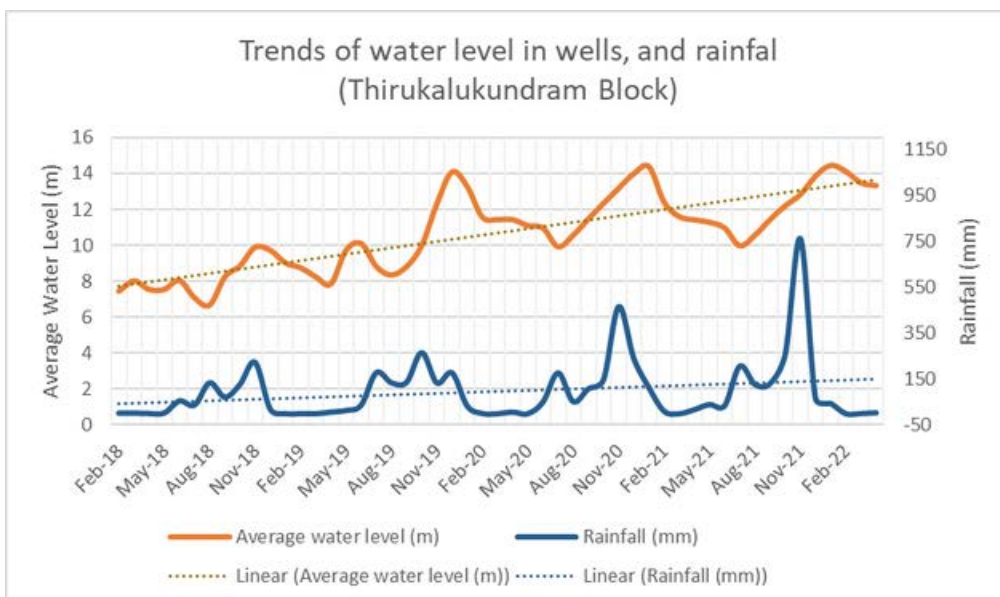


Figure 4: Trends of Water Level and Rainfall - Thirukalukundram

The depth to water level data from the implementing partner was compared with similar datasets from TWAD (Tamil Nadu Water Supply and Drainage Board) and CGWB (Central Ground Water Board) using correlation assessment. It was found that there was a high degree of correlation. However, the data available from the implementing partner was more complete and the same was used for further assessment.

Similarly, a correlation assessment was done between the rainfall data recorded by the implementing partner and the records from IMD, and a high degree of correlation was found there as well. Since the IMD records have better coverage, the same was used for further assessments.

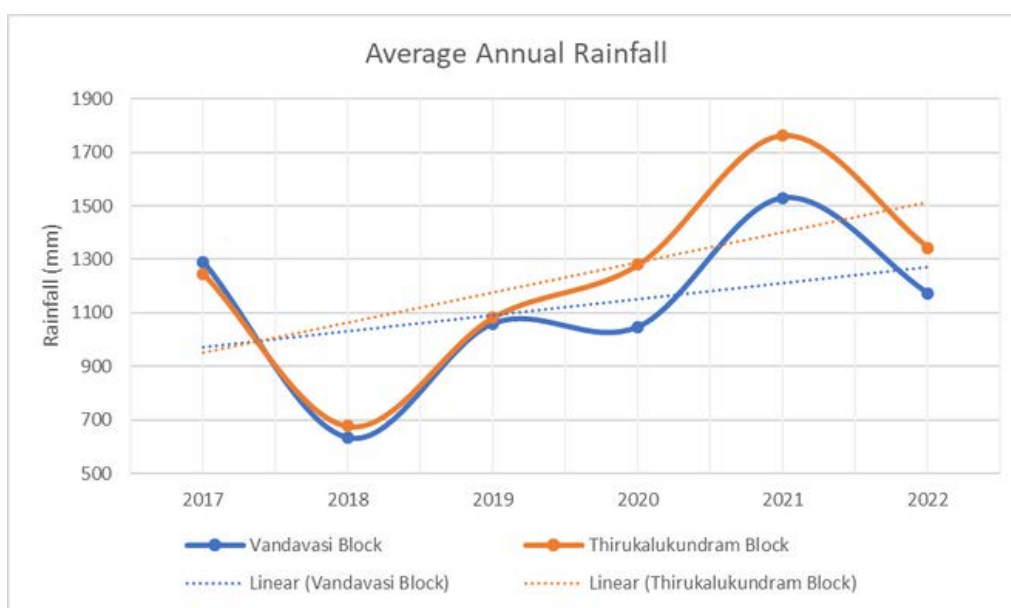


Figure 5: Average Annual Rainfall Trends

For the first step of the assessment, the rainfall data from IMD was compared with the depth-to-water level data from the implementing partner. The rationale behind this was that rainfall is the most critical variable that determines the level of water availability below ground. Thus, by establishing the role of rainfall in the change in water levels, we were able to identify the role of the measures implemented by NAF.

A regression analysis of rainfall and depth to water level was done for the same effect and the correlation coefficient (Multiple R) was calculated to understand the strength of the relationship between these two variables. The results are presented below:

Multiple R - Vandavasi Block				
2019	2020	2021	2022	Overall
0.017946556	0.109321	0.251736	0.393348	0.196234564

Multiple R - Thirukalukundram Block				
2018	2019	2020	2021	Overall
0.462938	0.423875	0.472061	0.163176	0.22505

The correlation coefficient (Multiple R) can have values ranging between -1 to +1, where the former indicates a strong negative relationship and the latter indicates a strong positive relationship. From the obtained values, it can be observed that the values lean on the positive side of the range, and are closer to zero than to +1, indicating that rainfall did have a positive relationship with the depth to water level, but was not a strong one however. It could be hypothesized that this gap in the relationship could be explained by the contributions that the various interventions have had on the depth to water level. The same will be explored further.

Change in water levels

The next step in the process was to establish the change in the depth of the water level over the intervention period. As mentioned above, since the implementing partner had the most reliable dataset for the depth of the well in the project area, the same was used for the estimation of the level of groundwater improvements. The data were analyzed and plotted accordingly (figure 6). It can be inferred from the figure that, the depth increased by an average of about 3 meters in the Vandavasi block and by an average of 3.8 meters in the Thirukalukundram block over the intervention period.

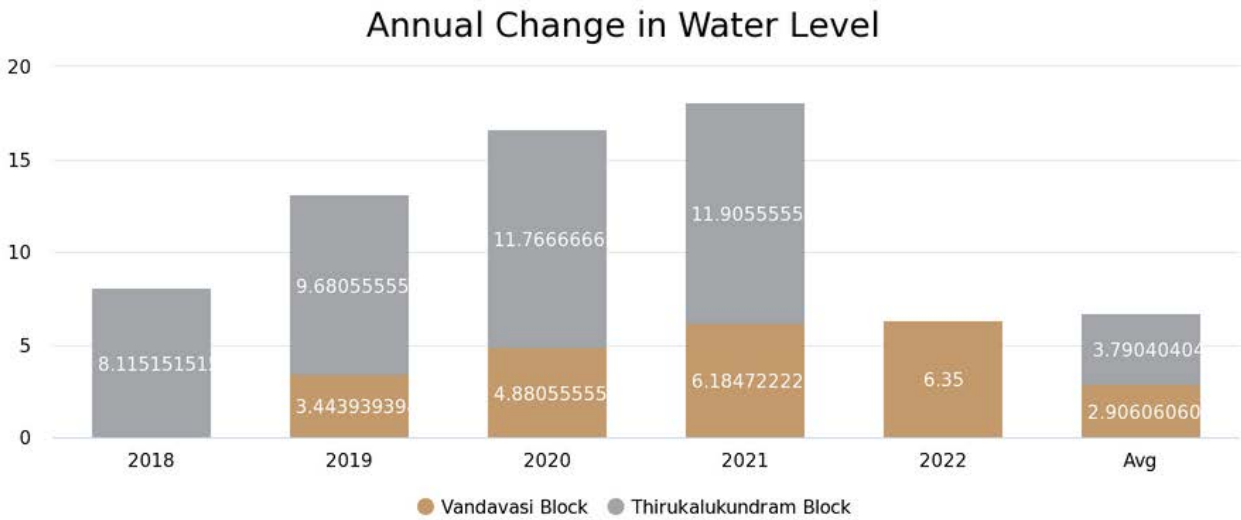


Figure 6: Annual Change in Water Level



Trench cum Field Bunds - Vandavasi

Estimation of recharge due to the rainfall

The water-table fluctuation (WTF) method provides an estimate of groundwater recharge by analysis of the water-level fluctuations in observation wells. The water-table fluctuation method is based on the premise that rises in groundwater levels in unconfined aquifers are due to recharge arriving at the water table. Recharge is calculated as the change in water level over time multiplied by specific yield[3].

$$R(t_j) = S_y * \Delta H(t_j)$$

where $R(t_j)$ (cm) is recharge occurring between times t_0 and t_j , S_y is specific yield (dimensionless), and $\Delta H(t_j)$ is the peak water level rise attributed to the recharge period (cm).

The specific yield values were obtained from the Groundwater Estimation Commission's report on groundwater resource estimation methodology.[4][5] As per the report, the specific yield values of 5% and 4% were used for Vandavasi and Thirukalukundram blocks respectively, based on the aquifer types of sandstone and charnockite observed in these regions. [6]

As per the results of the method, about 26.45% of the rainfall had recharged directly to the ground in the Vandavasi block and about 16.7% in the Thirukalukundram block. The remaining 73.55% and 83.3% respectively, were accounted for by surface storage, runoff, evapotranspiration, soil storage, and other losses. The results and calculations are presented below:

Vandavasi Block						
Upper Ridge						
Year	P	ΔH annual	S_y	Rm	Rmm	as % of P
2019	1060.04	6.8	0.05	0.34	340	32.07%
2020	1047.61	5.3	0.05	0.265	265	25.30%
2021	1529.07	4.1	0.05	0.205	205	13.41%
2022	1172.07	4.45	0.05	0.2225	222.5	18.98%

[3] USGS GWRP: Techniques/Methods -Water-Table Fluctuation (WTF) Method

[4] <https://cgwb.gov.in/Documents/GEC97.pdf>

[5] Detailed Guidelines (cgwb.gov.in)

[6] TamilNadu.pdf (cgwb.gov.in)

Middle Ridge						
Year	P	ΔH annual	Sy	Rm	Rmm	as % of P
2019	1060.04	6.8	0.05	0.34	340	32.07%
2020	1047.61	6.3	0.05	0.315	315	30.07%
2021	1529.07	6.15	0.05	0.3075	307.5	20.11%
2022	1172.07	4	0.05	0.2	200	17.06%

Lower Ridge						
Year	P	ΔH annual	Sy	Rm	Rmm	as % of P
2019	1060.04	9.05	0.05	0.4525	452.5	42.69%
2020	1047.61	6	0.05	0.3	300	28.64%
2021	1529.07	6.65	0.05	0.3325	332.5	21.75%
2022	1172.07	8.25	0.05	0.4125	412.5	35.19%

Average				
Year			Rm	as % of P
2019			0.3775	35.61%
2020			0.293333	28.00%
2021			0.281667	18.42%
2022			0.278333	23.75%
Total				26.45%



Percolations Ponds - Edaiyur

Thirukalukundram Block

Upper Ridge

Year	P	ΔH annual	Sy	Rm	Rmm	as % of P
2019	677.2	3.8	0.04	0.152	152	22.45%
2020	1083.2	4.8	0.04	0.192	192	17.73%
2021	1279.8	3.8	0.04	0.152	152	11.88%
2022	1761.8	4.05	0.04	0.162	162	9.20%

Middle Ridge

Year	P	ΔH annual	Sy	Rm	Rmm	as % of P
2019	677.2	3	0.04	0.12	120	17.72%
2020	1083.2	4.7	0.04	0.188	188	17.36%
2021	1279.8	4.1	0.04	0.164	164	12.81%
2022	1761.8	4.5	0.04	0.18	180	10.22%

Lower Ridge

Year	P	ΔH annual	Sy	Rm	Rmm	as % of P
2019	677.2	2.8	0.04	0.112	112	16.54%
2020	1083.2	11.1	0.04	0.444	444	40.99%
2021	1279.8	4.2	0.04	0.168	168	13.13%
2022	1761.8	4.6	0.04	0.184	184	10.44%

Average

Year		Rm		as % of P
2019		0.128		18.90%
2020		0.274667		25.36%
2021		0.161333		12.61%
2022		0.175333		9.95%
Total				16.70%



Channel - Edaiyur

Change in surface water holding capacity and runoff reduction

The rational method was used to calculate the peak runoff rate.[7] However, to suit the purposes of this assessment, the same approach, but with slightly different assumptions was used. The assumption was that instead of considering the area of the contributing watershed, we focused only on the area of the water body itself.

A simplified version of the rational method used here is:

$$\text{Storage Potential} = \text{area} * \text{annual rainfall} * \text{runoff coefficient}$$

The annual rainfall was calculated from the 4-year average of the intervention period for the respective areas, and a conservative value of 0.5 was assumed for the runoff coefficient. The results for Vandavasi and Edaiyur are as below:

Vandavasi			
S.No.	Interventions in Vandavasi	Water Holding Capacity (Cubic meters)	Storage Potential (Cubic meters)
1	Cattle Pond - Eyipakkam	2,400	1,442.64
2	Cattle Pond - Veliyampakkam	1,087.81	653.88
3	Cattle Pond - Ammanapakkam	1,500	901.65
4	Cattle Pond - Koonankaranai	2,625	1,577.88
5	Check Dam - Salavedu	25.2	15.15
6	Check Dam - Veliyampakkam	25.2	15.15
7	Check Dam - Ammanapakkam	25.2	15.15
8	Farm Pond - Manimangalam	399	239.84
9	Sunken Pond - Veliyampakkam	122.5	73.63
		145.78	87.63
10	Sunken Pond - Veliyampakkam	275.63	165.68
		267.62	160.87
11	Village Pond - Ammanapakkam	2,249.18	1,351.98
12	Channel (Clearance and Excavation)	15,595.02	9,374.15
13	Trench cum Field Bund	17,077.35	10,265.17
	Total	43,820.49	26,340.44

[7] https://ocw.camins.upc.edu/materials_guia/250144/2015/MetRacio1.pdf

Edaiyur			
S.No.	Activity	Water Holding Capacity (Cubic meters)	Storage Potential (Cubic meters)
1	Village Pond - Edaiyur	9,000	3,601.5
2	Village Pond - Veerakuppam	9,000	3,601.5
3	Village Pond - Ponpathirkudam	3,000	1,200.5
4	Village Pond - Salur	2,250	900.375
5	Percolation Pond - Edaiyur	3,850	1,540.54
6	Farm Pond - Veerakuppam	2,500	1,000.41
7	Farm Pond - Salur	1,000	400.17
8	Check dam	1,200	480.2
9	Chelliyamman Kovil Pond - Edaiyur	4,505	1,802.75
10	Perumal Kovil Pond	5,993	2,398.2
11	Veerakuppam Village Pond	3,355	1,342.56
12	Pallaveerakuppam Village Pond	3,251	1,300.94
13	Percolation Pond Edaiyur	2,340	936.39
14	Edaiyur Village Pond	1,200	480.2
15	Salur Village Pond	1,142	457
16	Edaiyur Channel	1,521	608.65
17	Edaiyur Channel	2,086	834.75
18	Salur Channel	3,521	1,408.98
	Total	40,476	24,295.72

The storage potential of the water bodies in the intervention areas amount to about 60% of their total capacity. Considering the total amount of rainfall, the capacity of the water bodies created, and the capacity of the existing water bodies, the amount of water from rainfall that can be stored in these water bodies amounts to less than 1% of the total rainfall received.

Assuming an evapotranspiration rate of 60-75%, [8] groundwater storage of 26.45% and 16.7% for Vandavasi and Thirukalukundram respectively, and the storage in surface water bodies of 1%, of the total amount of rainfall received, about 95% and 85% of the water is accounted for in the intervention areas of Vandavasi and Thirukalukundram respectively.

[8] https://agritech.tnau.ac.in/govt_schemes_services/govt_serv_schems_nadp_tn_7.html



Trench cum Field Bunds - Vandavasi

Change in land use pattern

The change in land use pattern in the project areas was identified using ESRI's land use/land cover time series of the world from their living atlas. LULC for each year is generated with the impact observatory's deep learning AI land classification model, trained using billions of human-labeled image pixels from the National Geographic Society. The global map was produced by applying this model to the relevant yearly ESA Sentinel-2 satellite imagery for the years. The algorithm generates LULC predictions for nine classes: water, trees, flooded vegetation, crops, built area, bare ground, snow/ice, clouds, and rangelands.

For this assessment, the layer on land use/land cover change between 2018-2021 was used, as the data for 2022 was not available. However, the land use/land cover for the year 2022 was also assessed and was used to complement the results of the assessment for the years between 2018-2021. The results for the intervention areas are presented below:

Vandavasi cluster

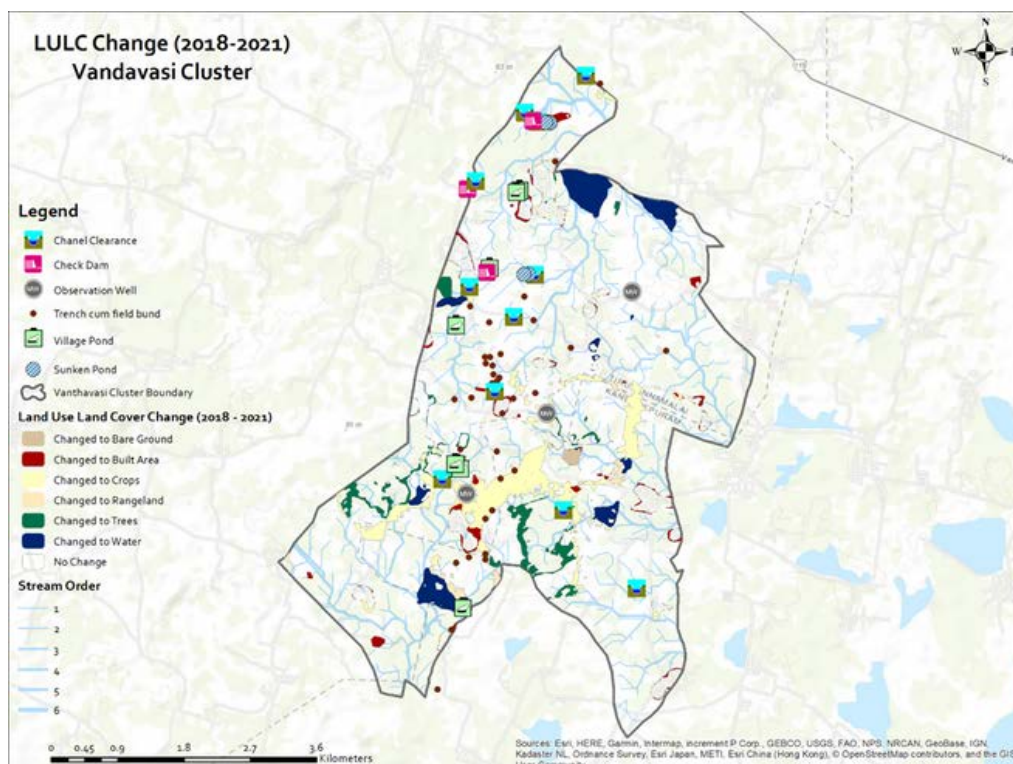


Figure 7: Land use/land cover change in Vandavasi cluster

S.No.	LULC Change	Area (Square km)	% of total area
1	Changed to Bare Ground	0.04212300000	0.15%
2	Changed to Built Area	0.30570300000	1.10%
3	Changed to Crops	1.34837000000	4.86%
4	Changed to Rangeland	0.12419400000	0.45%
5	Changed to Trees	0.48353600000	1.74%
6	Changed to Water	0.76254200000	2.75%
7	No change	24.67530000000	88.95%

From the table, it can be inferred that much of the area (88.95%) did not undergo any changes. Water, trees, and crops all show a marked improvement over the time period between 2018-2021. These changes were in tune with the efforts of the project, which aimed at improving water management, increased agricultural productivity, and afforestation.

Edaiyur cluster

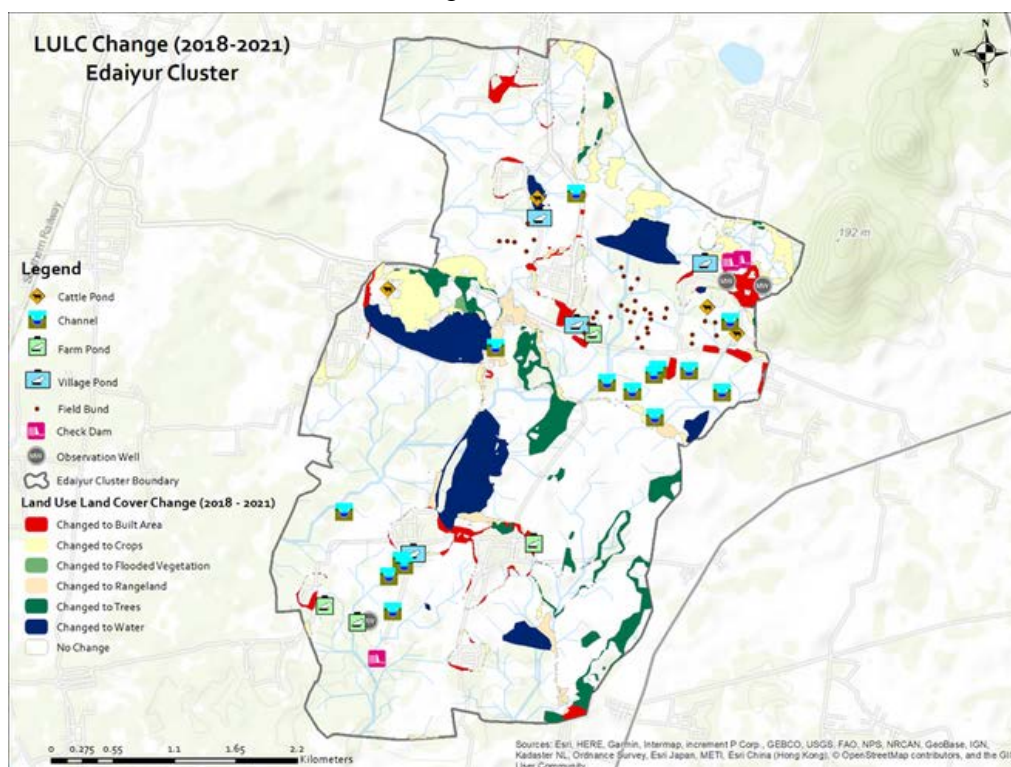


Figure 8: Land use/land cover change in Edaiyur cluster

S.No.	LULC Change	Area (Square km)	% of total area
1	Changed to Built Area	0.32502600000	1.82%
2	Changed to Crops	0.67824200000	3.79%
3	Changed to Flooded Vegetation	0.01064310000	0.06%
4	Changed to Rangeland	0.22151400000	1.24%
5	Changed to Trees	0.55947400000	3.13%
6	Changed to Water	0.95213000000	5.32%
7	No change	15.13780000000	84.64%

Similar to the changes observed in the Vandavasi cluster, a majority of the area (84.64%) in the Edaiyur cluster did not undergo any detectable change in the years between 2018-2021. Further, the area of water bodies, trees, crops, and rangelands had shown marked improvements, all of which were in line with the objectives of the project to improve water availability, crop production, and afforestation.



Edaiyur - Observation Wells

Vegetation Index

Vegetation Indices are combinations of surface reflectance at two or more wavelengths designed to highlight a particular property of vegetation. They are derived using the reflectance properties of vegetation. For the purpose of this assessment, the Normalized Difference Vegetation Index (NDVI) was used. NDVI is an indicator that shows the greenness, density, and health of vegetation in each pixel of a satellite image. The index detects and quantifies the presence of living green vegetation using this reflected light in the visible and near-infrared bands.

The standard formula for calculating NDVI is:

$$\text{NDVI} = (\text{NIR} - \text{red}) / (\text{NIR} + \text{red})$$

Where, NIR is the near infra-red, band 8, and red, band 4 of Sentinel-2 imagery. Images from the same month, February, was considered for this assessment to understand the changes between the pre-intervention and post-intervention states.

The NDVI value ranges from -1 to 1 and shows the vigor of the crop:

- Values close to 1: the more intense the green, the more vigorous the vegetation and vegetation cover. Considerations for the type of farming, bare soil, etc. must be made. The index also measures the vigor of the underbrush.
- Values close to 0: correspond to areas with very little vegetation, early stages of cultivation, bare soil, or non-productive areas.
- Negative values: usually associated with areas of water, snow, or clouds.

Vandavasi cluster

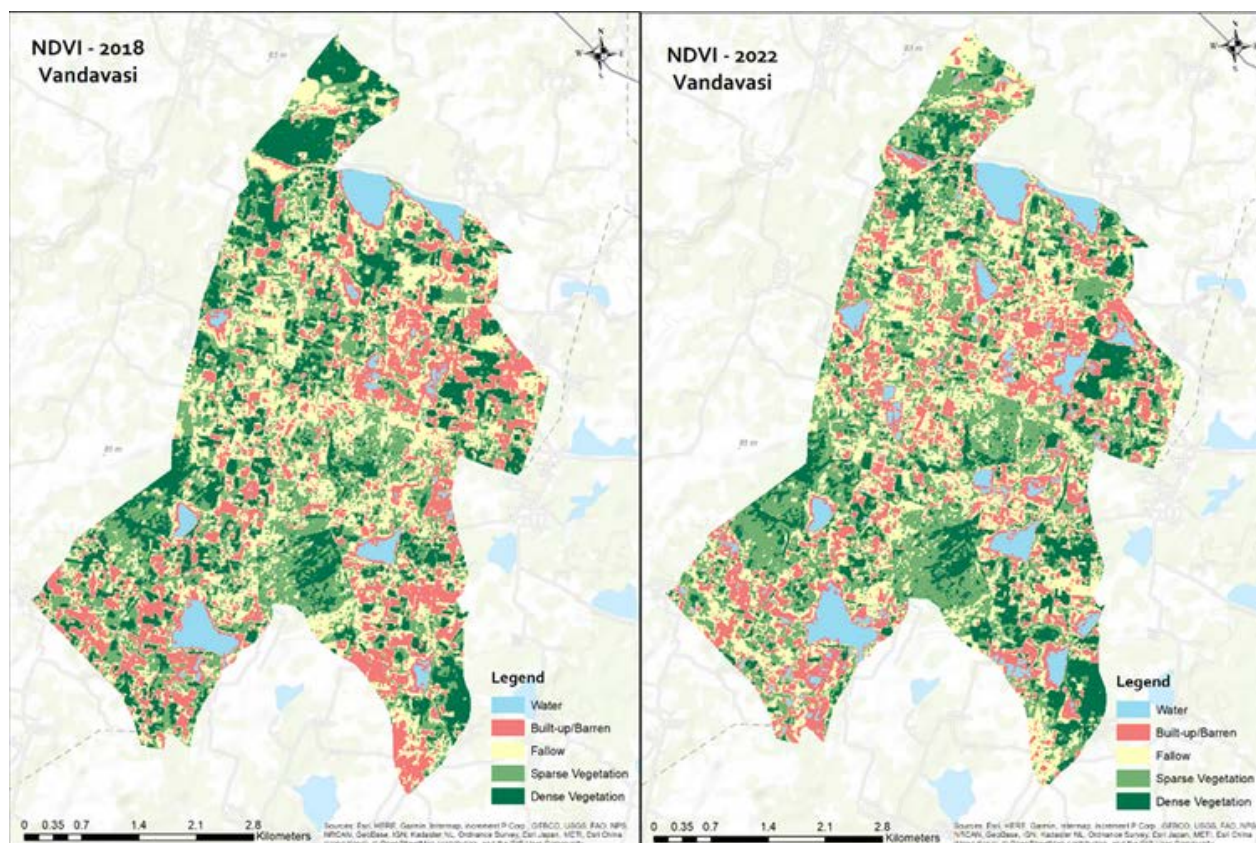


Figure 9: NDVI of Vandavasi cluster for 2018 and 2022

Classes	Area - 2018 (Sq. m)	Area - 2022 (Sq. m)	Percentage Change
Water	1114406.15589	1903683.59129	+71%
Barren	5508727.3312	5328613.25875	-3%
Fallow	8080758.5497	8270952.2171	+2%
Sparse Vegetation	7611932.51841	8295906.9643	+9%
Dense Vegetation	5415358.18286	3931729.67106	-27%

From the assessment, it should be noted that the area under water had grown significantly (71%) between 2018-2022. There was a marked reduction in the area of barren land (-3%) and area under dense vegetation (-27%). One of the factors that could explain this reduction was the impact of the intervention by NAF, where they had encouraged practices of multi-cropping, cultivation of vegetables, millets, pulses, and other less water-intensive crops. A marked shift from the cultivation of food crops to vegetable crops was observed among the farmers in the intervention area during the field surveys. Further, this could be indicated by the positive changes in the area under sparse vegetation (+9%) and fallow lands (+2%).



Figure 10: Cultivation of vegetable crops



Figure 11: Intercropping observed in the field

Edaiyur cluster

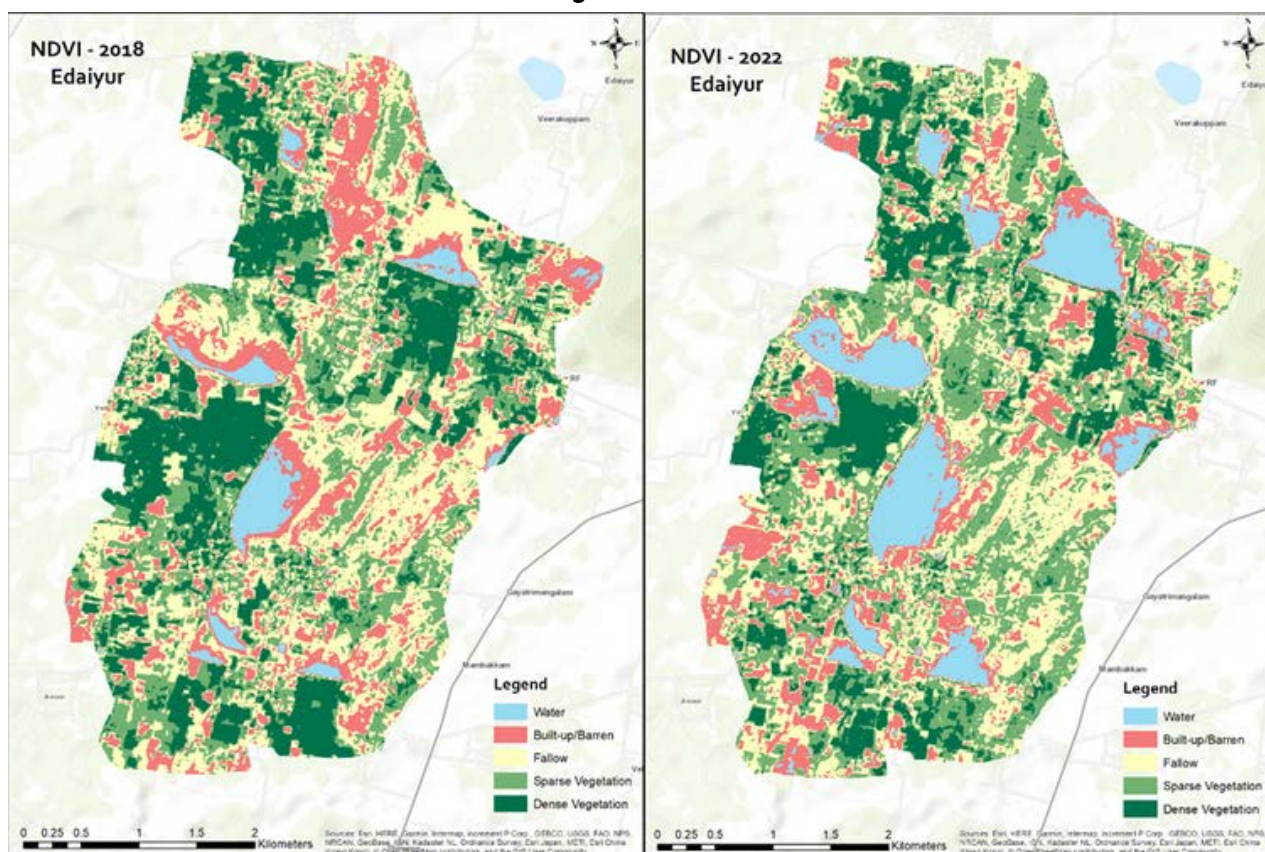


Figure 12: NDVI of Edaiyur cluster for 2018 and 2022

Classes	Area - 2018 (Sq. m)	Area - 2022 (Sq. m)	Percentage Change
Water	632006.082381146	1864845.48871457	+195%
Barren	3137119.54227	2672546.37808	-15%
Fallow	5435347.98004	5157152.22054	-5%
Sparse Vegetation	4766421.9889	5526467.11295	+16%
Dense Vegetation	3907418.60214	2657983.45398	-32%

From the assessment, it was evident that the area under water had shown a remarkable increase (+195%) and consequently, the area under barren lands (-15%) and fallow lands (-5%) had declined. Further, the reduction in the area under dense vegetation (-32%) and the increase in the area under sparse vegetation (+16%) goes on to be explained by the efforts of the intervention to encourage farmers to move away from water-intensive cash and food crops towards the cultivation of millets, pulses, and vegetable crops.

The above assessments shed some light on the impact of the interventions on agricultural practices and on the availability of water in the intervention areas, and the anecdotal evidence from the field confirms the same. However, in-depth assessments with higher-resolution imagery and strong evidence from the field is required to accurately quantify the impacts.

Cropping Intensity

Cropping Intensity refers to the number of crops grown in any given agricultural year in the same field. Due to the limitation in the availability of high-resolution imagery, detailed training datasets, and strong field validation, an openly available dataset, 'GCI30: Global Cropping Intensity at 30m resolution' was used for the assessment. This global cropping intensity product is the first 30m resolution cropping intensity dataset covering the global extent. Based on the reconstructed time series of Normalized Difference Vegetation Index (NDVI) from multiple satellite images including a full archive of Landsat, Sentinel-2, and MODIS data from 2016 to 2018, 30-m planetary-scale pixel-by-pixel cropping intensity products were generated by enumerating the total number of valid cropping cycles using a binary crop phenophase profile indicating growing and non-growing periods. The total number of valid cropping cycles was also divided by 3 (3 years from 2016 to 2018) to retrieve the average cropping intensity. Based on this, pixels/locations of single cropping, double cropping, and triple cropping were identified and mapped.

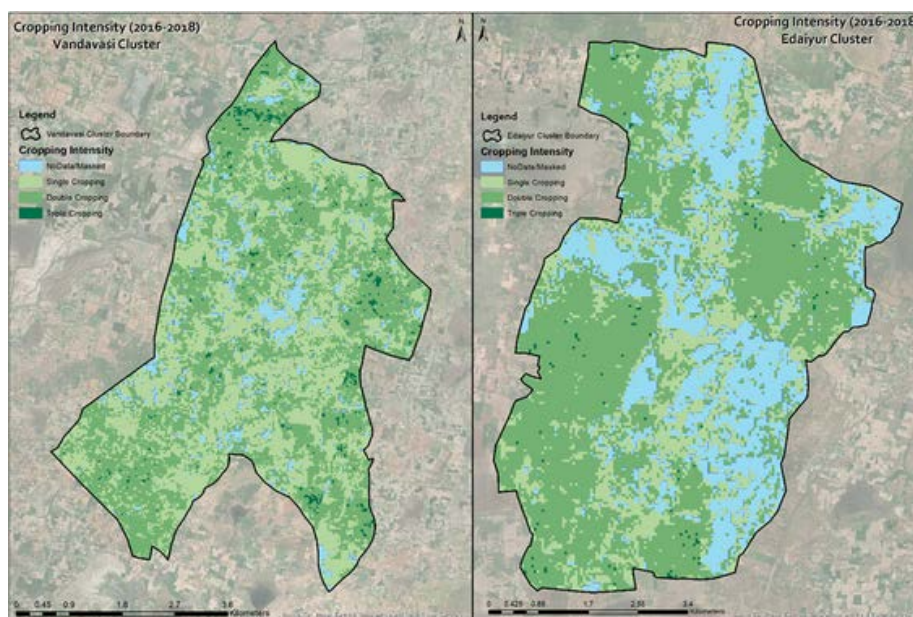


Figure 13: Cropping Intensity of Vandavasi and Edaiyur clusters (2016-2018)

Classes	Area (Sq. m)	
	Vandavasi	Edaiyur
Masked/No Data	17,56,027.29	45,88,082.91
Single Cropping	1,22,18,713.75	40,74,879.47
Double Cropping	1,33,33,460.92	91,33,636.18
Triple Cropping	4,33,522.81	88,243.79

[9]Zhang, M., Wu, B., Zeng, H., He, G., Liu, C., Tao, S., Zhang, Q., Nabil, M., Tian, F., Bofana, J., Beyene, A. N., Elnashar, A., Yan, N., Wang, Z., & Liu, Y. (2021). GCI30: A global dataset of 30m cropping intensity using multisource remote sensing imagery. *Earth System Science Data*, 13(10), 4799–4817. <https://doi.org/10.5194/essd-13-4799-2021>

Vandavasi and Edaiyur clusters

As can be seen in the figure, most of the area fell under single and double cropping, with patches of triple cropping. This is in tune with the agricultural practices of this region as was reported by the farmers on the field. However, it was reported that owing to the interventions that were done by NAF, increased water availability had made it possible to cultivate a third crop of rice.

Further, the crop diversity that was introduced as a part of the intervention also enabled them to cultivate crops other than rice and various cash crops. The interventions benefitted them in the dual way of ensuring increased water availability and encouraging a shift in agricultural practices to grow less water-intensive crops, and thus, diversified their crop production.

Owing to the limitation in the availability of high-resolution cloud-free data for all the harvest cycles leading up to the present, the assessment was limited to the data available from secondary sources and anecdotal examples from the field survey. Consequently, the assessment for years post-2018 was not done.

However, reports from the farmers do indicate that a third cycle of the crop has been possible in recent years because of the constant water availability in the wells and other surface water bodies. What was once a seasonal activity primarily dependent on rainfall has now become a routine through all seasons of the year.



Vandavasi - Observation Wells

CONCLUSION

This section provides a summary of the key findings of the assessment and the limitations encountered in the process of the assessment. For a more accurate quantification outcome, further studies will have to be done using datasets of higher details and corroboration from the field.

Key Findings

In summation, the key findings from the above assessments are as follows:

- The strength of the relationship between rainfall and the water level was positive and moderate.
- The depth had increased by an average of about 3 meters in the Vandavasi block and by an average of 3.8 meters in the Thirukalukundram block over the intervention period.
- About 26.45% of the rainfall had recharged directly to the ground in the Vandavasi block and about 16.7% in the Thirukalukundram block.
- Creation of surface storage of 43,820.49 cubic meters in the Vandavasi cluster and 40,476 cubic meters in the Edaiyur cluster, with a storage potential of about 60% of the capacity.
- Change in land use pattern indicated a marked growth in the area under water, crops, and trees in both the Vandavasi and Edaiyur clusters, which further suggested the success of efforts towards water management, agricultural productivity, and afforestation.
- NDVI analysis further showed that there was an observed shift from dense vegetation to sparse vegetation which could have been the result of increased crop diversity and the shift away from water-intensive crops.
- With regards to cropping intensity, double cropping appeared to be the most common practice followed by single cropping and triple cropping in the period of assessment (2016-2018). Reports from the farmers indicated that it was possible to cultivate a third crop owing to the interventions by NAF.

Limitations

The biggest limitation was the resolution of the available open-source satellite imagery being capped at 10m. Since the area of assessment was relatively small, the resolution of the available imagery was not sufficient enough to cover the interventions and changes on the ground accurately. Owing to the limitation in the availability of primary data, the assessments were based primarily on data from secondary sources, with the primary data being used wherever possible. Further, most of the secondary data that was available and obtained had shortcomings in one or more areas such as the temporal coverage or the spatial resolution. Certain assessments were not addressed in greater detail owing to time constraints. With enough time, an in-depth collection of primary data in the field can be undertaken, which can in turn produce more accurate results.



Cattle Ponds - Vandavasi

Annexure 1: Data obtained from National Agro Foundation

Depth

Date	Eyipakkam upper ridge			Badur- Mamangalam middle ridge			Velliyambakkam lower ridge			Average Water Level (m)
	Depth of well (m)	Reading taken (m)	Water level (m)	Depth of well (m)	Reading taken (m)	Water level (m)	Depth of well (m)	Reading taken (m)	Water level (m)	
Feb-19	10.6	5.75	4.85	8.9	5.65	3.25	10.9	6.3	4.6	4.233333
Mar-19	10.6	6.95	3.65	8.9	6.8	2.1	10.9	7.65	3.25	3
Apr-19	10.6	7.9	2.7	8.9	7.05	1.85	10.9	8.8	2.1	2.216667
May-19	10.6	8.6	2	8.9	8.65	0.25	10.9	9.75	1.15	1.133333
Jun-19	10.6	9.1	1.5	8.9	8.8	0.1	10.9	10.65	0.25	0.616667
Jul-19	10.6	8.8	1.8	8.9	8.4	0.5	10.9	9.9	1	1.1
Aug-19	10.6	8.05	2.55	8.9	7.15	1.75	10.9	8.45	2.45	2.25
Sep-19	10.6	7.4	3.2	8.9	6.7	2.2	10.9	7.85	3.05	2.816667
Oct-19	10.6	3.65	6.95	8.9	3.4	5.5	10.9	4.15	6.75	6.4
Nov-19	10.6	4.45	6.15	8.9	4.7	4.2	10.9	3.4	7.5	5.95
Dec-19	10.6	2.3	8.3	8.9	2	6.9	10.9	1.6	9.3	8.166667
Jan-20	10.6	5.3	5.3	8.9	4	4.9	10.9	4.6	6.3	5.5
Feb-20	10.6	4	6.6	8.9	3.6	5.3	10.9	4.05	6.85	6.25
Mar-20	10.6	4.4	6.2	8.9	4.3	4.6	10.9	5.2	5.7	5.5
Apr-20	10.6	4.6	6	8.9	4.65	4.25	10.9	5.95	4.95	5.066667
May-20	10.6	6.5	4.1	8.9	6.85	2.05	10.9	7.65	3.25	3.133333
Jun-20	10.6	6.65	3.95	8.9	7.15	1.75	10.9	7.9	3	2.9
Jul-20	10.6	6.7	3.9	8.9	6.8	2.1	10.9	7.7	3.2	3.066667
Aug-20	10.6	6.2	4.4	8.9	4.45	4.45	10.9	7.2	3.7	4.183333
Sep-20	10.6	5.4	5.2	8.9	6.15	2.75	10.9	6.25	4.65	4.2
Oct-20	10.6	5.5	5.1	8.9	7.05	1.85	10.9	6.15	4.75	3.9
Nov-20	10.6	3.8	6.8	8.9	4.2	4.7	10.9	4.05	6.85	6.116667
Dec-20	10.6	1.4	9.2	8.9	0.85	8.05	10.9	1.9	9	8.75
Jan-21	10.6	1.25	9.35	8.9	0.7	8.2	10.9	1.15	9.75	9.1
Feb-21	10.6	1.85	8.75	8.9	2.2	6.7	10.9	4.3	6.6	7.35
Mar-21	10.6	2.95	7.65	8.9	4	4.9	10.9	6.6	4.3	5.616667
Apr-21	10.6	3.4	7.2	8.9	4.8	4.1	10.9	6.65	4.25	5.183333
May-21	10.6	3.7	6.9	8.9	5.8	3.1	10.9	6.7	4.2	4.733333
Jun-21	10.6	4.3	6.3	8.9	5.95	2.95	10.9	7.3	3.6	4.283333
Jul-21	10.6	3.6	7	8.9	5.55	3.35	10.9	6.55	4.35	4.9
Aug-21	10.6	3.4	7.2	8.9	6.85	2.05	10.9	6.85	4.05	4.433333
Sep-21	10.6	4.8	5.8	8.9	6.65	2.25	10.9	6.3	4.6	4.216667
Oct-21	10.6	4.1	6.5	8.9	3.8	5.1	10.9	3.1	7.8	6.466667
Nov-21	10.6	0.7	9.9	8.9	1.55	7.35	10.9	0.65	10.25	9.166667
Dec-21	10.6	1.65	8.95	8.9	1.2	7.7	10.9	1.25	9.65	8.766667
Jan-22	10.6	1.6	9	8.9	1.85	7.05	10.9	2.8	8.1	8.05
Feb-22	10.6	4.3	6.3	8.9	2.4	6.5	10.9	5.1	5.8	6.2
Mar-22	10.6	4.35	6.25	8.9	4.55	4.35	10.9	7.65	3.25	4.616667
Apr-22	10.6	5.15	5.45	8.9	4.8	4.1	10.9	9.2	1.7	3.75
May-22	10.6	2.1	8.5	8.9	3.4	5.5	10.9	7.1	3.8	5.933333
Jun-22	10.6	3.5	7.1	8.9	4.8	4.1	10.9	6.8	4.1	5.1
Jul-22	10.6	3.2	7.4	8.9	4.4	4.5	10.9	5.9	5	5.633333
Aug-22	10.6	2.5	8.1	8.9	5	3.9	10.9	6.1	4.8	5.6
Sep-22	10.6	2.4	8.2	8.9	4.5	4.4	10.9	5.8	5.1	5.9
Oct-22	10.6	1.5	9.1	8.9	2.8	6.1	10.9	2.8	8.1	7.766667
Nov-22	10.6	0.7	9.9	8.9	2.5	6.4	10.9	0.95	9.95	8.75
Dec-22	10.6	0.7	9.9	8.9	1	7.9	10.9	2	8.9	8.9
Jan-23	10.6		10.6	8.9		8.9	10.9		10.9	

Edaiyur										
Date	Upper ridge			Middle ridge			Lower ridge			Average water level (m)
	Depth of well (m)	Reading taken (m)	Water level (m)	Depth of well (m)	Reading taken (m)	Water level (m)	Depth of well (m)	Reading taken (m)	Water level (m)	
Feb-18	15.5	6.7	8.8	14.6	6.1	8.5	11.8	6.7	5.1	7.466667
Mar-18	15.5	6.7	8.8	14.6	6	8.6	11.8	5.1	6.7	8.033333
Apr-18	15.5	6.7	8.8	14.6	6.5	8.1	11.8	6	5.8	7.566667
May-18	15.5	6.7	8.8	14.6	6.5	8.1	11.8	6	5.8	7.566667
Jun-18	15.5	6.5	9	14.6	5.4	9.2	11.8	5.8	6	8.066667
Jul-18	15.5	7.5	8	14.6	6.3	8.3	11.8	6.8	5	7.1
Aug-18	15.5	8	7.5	14.6	6.8	7.8	11.8	7	4.8	6.7
Sep-18	15.5	6	9.5	14.6	5.4	9.2	11.8	5.7	6.1	8.266667
Oct-18	15.5	5.5	10	14.6	4.8	9.8	11.8	5	6.8	8.866667
Nov-18	15.5	4.2	11.3	14.6	3.8	10.8	11.8	4.2	7.6	9.9
Dec-18	15.5	4.3	11.2	14.6	4	10.6	11.8	4.4	7.4	9.733333
Jan-19	15.5	5.5	10	14.6	4.5	10.1	11.8	4.8	7	9.033333
Feb-19	15.5	5.9	9.6	14.6	4.7	9.9	11.8	5	6.8	8.766667
Mar-19	15.5	6.4	9.1	14.6	5.2	9.4	11.8	5.5	6.3	8.266667
Apr-19	15.5	6.8	8.7	14.6	5.7	8.9	11.8	5.8	6	7.866667
May-19	15.5	4.5	11	14.6	4	10.6	11.8	4.2	7.6	9.733333
Jun-19	15.5	4.2	11.3	14.6	3.3	11.3	11.8	4.1	7.7	10.1
Jul-19	15.5	5.1	10.4	14.6	3.1	11.5	11.8	7.2	4.6	8.833333
Aug-19	15.5	5.8	9.7	14.6	3.2	11.4	11.8	7.8	4	8.366667
Sep-19	15.5	5.6	9.9	14.6	3.1	11.5	16.1	11	5.1	8.833333
Oct-19	15.5	5.3	10.2	14.6	3	11.6	16.1	7.9	8.2	10
Nov-19	15.5	5.1	10.4	14.6	2.2	12.4	16.1	2	14.1	12.3
Dec-19	15.5	2	13.5	14.6	1	13.6	16.1	1	15.1	14.066667
Jan-20	15.5	2	13.5	14.6	2.8	11.8	16.1	1.6	14.5	13.266667
Feb-20	15.5	3.9	11.6	14.6	4.2	10.4	16.1	3.4	12.7	11.566667
Mar-20	15.5	3.9	11.6	14.6	4.4	10.2	16.1	3.6	12.5	11.433333
Apr-20	15.5	4	11.5	14.6	4.4	10.2	16.1	3.5	12.6	11.433333
May-20	15.5	4.1	11.4	14.6	5	9.6	16.1	3.8	12.3	11.1
Jun-20	15.5	4.1	11.4	14.6	5.1	9.5	16.1	4.1	12	10.966667
Jul-20	15.5	5	10.5	14.6	6.2	8.4	16.1	5.2	10.9	9.933333
Aug-20	15.5	3.8	11.7	14.6	6.1	8.5	16.1	4.6	11.5	10.566667
Sep-20	15.5	3.6	11.9	14.6	5.1	9.5	16.1	3.1	13	11.466667
Oct-20	15.5	3	12.5	14.6	4	10.6	16.1	2.2	13.9	12.333333
Nov-20	15.5	2	13.5	14.6	2.6	12	16.1	2.1	14	13.166667
Dec-20	15.5	1.2	14.3	14.6	2.1	12.5	16.1	1	15.1	13.966667
Jan-21	15.5	1	14.5	14.6	1.6	13	16.1	0.5	15.6	14.366667
Feb-21	15.5	2.5	13	14.6	3.5	11.1	16.1	3	13.1	12.4
Mar-21	15.5	3.5	12	14.6	4.5	10.1	16.1	3.4	12.7	11.6
Apr-21	15.5	4	11.5	14.6	4.4	10.2	16.1	3.55	12.55	11.416667
May-21	15.5	4	11.5	14.6	4.55	10.05	16.1	3.8	12.3	11.283333
Jun-21	15.5	4.15	11.35	14.6	5.15	9.45	16.1	4	12.1	10.966667
Jul-21	15.5	5.05	10.45	14.6	6.1	8.5	16.1	5.1	11	9.983333
Aug-21	15.5	3.7	11.8	14.6	6.1	8.5	16.1	4.7	11.4	10.566667
Sep-21	15.5	3.6	11.9	14.6	5.1	9.5	16.1	3.2	12.9	11.433333
Oct-21	15.5	3.3	12.2	14.6	4.1	10.5	16.1	2.2	13.9	12.2
Nov-21	15.5	2.9	12.6	14.6	2.8	11.8	16.1	2.05	14.05	12.816667
Dec-21	15.5	1.7	13.8	14.6	1.9	12.7	16.1	1.1	15	13.833333
Jan-22	15.5	1	14.5	14.6	1.1	13.5	16.1	0.8	15.3	14.433333
Feb-22	15.5	1.3	14.2	14.6	1.4	13.2	16.1	1.2	14.9	14.1
Mar-22	15.5	2.1	13.4	14.6	1.8	12.8	16.1	1.9	14.2	13.466667
Apr-22	15.5	2.15	13.35	14.6	2.1	12.5	16.1	2	14.1	13.316667

Rainfall

Rainfall Data (mm) - Vandavasi

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Cumulative rainfall 2019	0	0	6.5	0	0	35	90.2	132.6	110.3	170.7	208.2	128	881.5
Cumulative rainfall 2020	40	0	0	44.9	38.8	73.3	187	120.1	174	182.2	277.64	205.21	1343.15
Cumulative rainfall 2021	58.7	42.7	0	19.13	90.6	74.6	153	66	90.6	142.5	630.4	72.19	1440.42
Cumulative rainfall 2022	45.02	2.84	8.95	46.6	150.9	114.4	136.1	208.2	213.1	286.9	187.4	128.2	1528.61

Rainfall Data (mm) - Edaiyur

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Cumulative rainfall 2018	1	0	0.5	0	0	1	4	1	19	36.5	20.5	0	83.5
Cumulative rainfall 2019	0	0	0	0	0	0	106.8	35.2	126.8	251.4	164	151.4	835.6
Cumulative rainfall 2020	28.9	0	0	21.7	8.1	17.12	226.4	0	30.8	18	322	138	811.02
Cumulative rainfall 2021	208.2	12.6	0	1.2	36.6	19.2	131.4	0	126.48	180.96	421	42.2	1179.84



Check dams - Vandavasi

Interventions

S.No.	Interventions in Vandavasi	Capacity	
		Cubic meter	Litres
1	Cattle Pond - Eyipakkam	2,400	24,00,000
2	Cattle Pond - Veliyampakkam	1,087.82	10,87,813
3	Cattle Pond - Ammanapakkam	1,500	15,00,000
4	Cattle Pond - Koonankaranai	2,625	26,25,000
5	Check Dam - Salavedu	25.2	25,200
6	Check Dam - Veliyampakkam	25.2	25,200
7	Check Dam - Ammanapakkam	25.2	25,200
8	Farm Pond - Manimangalam	399	3,99,000
9	Sunken Pond - Veliampakkam	122.5	1,22,500
		145.78	1,45,777.5
10	Sunken Pond - Veliampakkam	275.63	2,75,628
		267.62	2,67,624
11	Village Pond - Ammanapakkam	2,249.18	22,49,179
12	Trench cum Field Bund	17,077.35	1,70,77,350
13	Channel (Clearance and Excavation)	15,595.02	1,55,95,020

S.No.	Interventions in Edaiyur	Capacity	
		Cubic meter	Litres
1	Village Pond - Edaiyur	9,000	90,00,000
2	Village Pond - Veerakuppam	9,000	90,00,000
3	Village Pond - Ponpathirkudam	3,000	30,00,000
4	Village Pond - Salur	2,250	22,50,000
5	Percolation Pond - Edaiyur	3,850	38,50,000
6	Farm Pond - Veerakuppam	2,500	25,00,000
7	Farm Pond - Salur	1,000	10,00,000
8	Check dam	1,200	12,00,000

S.No.	Interventions in Edaiyur	Renovation Activity	Capacity	
			Cubic meter	Litres
1	Chelliyamman Kovil Pond - Edaiyur	Deepening/ Desilting	4505	4505000
2	Perumal Kovil Pond	Deepening/ Desilting	5993	5993000
3	Veerakuppam Village Pond	Deepening/ Desilting	3355	3355000
4	Pallaveerakuppam Village Pond	Deepening/ Desilting	3251	3251000
5	Perculotion Pond Edaiyur	Deepening/ Desilting	2340	2340000
6	Edaiyur Village Pond	Deepening/ Desilting	1200	1200000
7	Salur Village Pond	Deepening/ Desilting	1142	1142000
8	Edaiyur Chennal	Deepening/ Desilting	1521	1521000
9	Edaiyur Chennal	Deepening/ Desilting	2086	2086000
10	Salur Chennal	Deepening/ Desilting	3521	3521000



Field Ponds - Edaiyur

Annexure 2: Validation Data

Well Depth - TWAD

Tiruvannamalai District											
Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021	5 Years Pre-Monsoon (May) Average	5Years Post Monsoon (Jan) Average
10.9	15.0	3.5	7.8	7.2	15.9	5.1	10.7	2.5	5.5	10.9	5.8

Chengalpattu District											
Jan 2013	May 2013	Jan 2014	May 2014	Jan 2015	May 2015	Jan 2016	May 2016	Jan 2017	May 2017	5 Years Pre-Monsoon (May) Average	5Years Post Monsoon (Jan) Average
6.1	9.4	4.2	7.4	5.6	8.3	5.8	8.3	7.4	12.4	9.16	5.8



Percolations Ponds - Edaiyur

Well Depth - CGWB

State Name		Tamil Nadu
District		Tiruvannamala
Block Name		Vandavasi
Site ID		W123000079380001
Site Name		Vandavasi 2
Latitude		12°30'00"
Longitude		79°38'00"
Site Type		Dug Well
Depth to Water Level (mbgl)	May 17	6.91
	Aug 17	3.4
	Nov 17	1.97
	Jan 18	2.85
	May 18	5.1
	Aug 18	6
	Nov 18	4.6
	Jan 19	4.4
	May 19	6.28
	Aug 19	4.6
	Nov 19	2
	Jan 20	3.5
	May 20	4.55
	Aug 20	5.6
	Nov 20	2.3
	Jan 21	0.45
May 21	4.8	
Aug 21	4.6	
Nov 21	4.6	
Jan 22	1	

State Name		Tamil Nadu	Tamil Nadu	Tamil Nadu	Tamil Nadu	Average Depth
District		Kancheepuram	Kancheepuram	Kancheepuram	Kancheepuram	
Block Name		Thirukalukkundram	Thirukalukkundram	Thirukalukkundram	Thirukalukkundram	
Site ID		W123730080113001	W123113080090601	W123630079400001	W124345080113001	
Site Name		Mahabalipuram	Sadras	Tirukalukundram	Tiruporur	
Latitude		12°37'30"	12°31'13"	12°36'30"	12°43'45"	
Longitude		80°11'30"	80°09'06"	79°40'00"	80°11'30"	
Site Type		Dug Well	Dug Well	Dug Well	Dug Well	
Depth to Water Level (mbgl)	Jan 18	3.55	2.79	2.99	2.11	
	May 18	2.85	4.49	5.69	3.31	4.085
	Aug 18	4.8	5.74	5.89	2.66	4.7725
	Nov 18	3.95	3.94	5	1.21	3.525
	Jan 19	3.55	3.84	3.69	2.31	3.3475
	May 19	4.55	4.5	6.89	4.11	5.0125
	Aug 19	5.26	4.8	4.7	1.31	4.0175
	Nov 19	3.35	3.99	2.39	0.81	2.635
	Jan 20	3.05	2.49	1.34	1.46	2.085
	May 20	5.79	4.55	6.32	4.5	5.29
	Aug 20	5.2	4.75	4.5	2.5	4.2375
	Nov 20	4.6	4.1	3.75	1.83	3.525
	Jan 21	2.89	1.75	2.92	1.85	2.3525
	May 21	5.02	4.05	5.5	4.1	4.6675
	Aug 21	4.84	4.25	4.5	2.6	4.0475
	Nov 21	0.81	1.08	1.89	1.42	1.3
Jan 22	2.05	1.59	2.6	2.26	2.125	



Channel - Vandavasi

Rainfall - IMD

Month	Monthly average rainfall across all locations - Vandavasi Block (mm)					
	2017	2018	2019	2020	2021	2022
Jan	40.34	0	0.5	13.25	57.75	23.38
Feb	0	21.75	0.38	0	16.13	0.25
March	4.9	14.25	0.25	0	0	6.25
April	7.6	2.9	13.13	20.75	18.13	12.25
May	68.2	19.4	35.5	9.38	67.25	126.5
June	57.8	53.5	59.63	68.6	42	91.25
July	60.9	61.3	177.13	160.13	228.9	147.25
Aug	347	44.25	172.13	68.5	141	219.63
Sept	154.4	109.6	253.88	149.5	196.9	70.13
Oct	291	152.6	185.5	151.6	205.75	152.68
Nov	114.6	136.8	77.38	255	494.88	191.25
Dec	143.6	16.5	84.63	150.9	60.38	131.25
Total	1290.34	632.85	1060.04	1047.61	1529.07	1172.07

Month	Monthly average rainfall across all locations - Thirukalukundram Block (mm)					
	2017	2018	2019	2020	2021	2022
Jan	30.38	0.2	0.4	33.6	112.6	44.4
Feb	0	2.2	0.2	1	10.8	0
March	0	3	0	0	0	0.8
April	0.02	0.8	7.2	7	17.8	4
May	24.12	3.2	14	0.2	40	83.2
June	74.84	55.4	37.6	50	34.6	68.2
July	139.94	37.6	178.2	177	206.2	146.4
Aug	271.82	134.2	134.2	52	126.8	142.4
Sept	134.26	71.6	136.4	108	130.6	67.8
Oct	283.84	127.2	264.8	147	258.2	164.8
Nov	213.86	222.6	133.2	464	758.4	379.2
Dec	73.88	19.2	177	240	65.8	243.2
Total	1246.96	677.2	1083.2	1279.8	1761.8	1344.4

Annexure 3: Data from other sources

Soil Data[10]

Zone	Districts	Soil type
North Eastern Zone	Kancheepuram, Tiruvallur, Cuddalore, Vellore, Villupuram and Tiruvannamalai	Red Sandy Loam, Clay Loam, Saline Coastal Alluvium
North Western Zone	Dharmapuri, Krishnagiri, salem and Namakkal (Part)	Non Calcareous Red, Non Calcareous Brown, Calcareous Black
Western Zone	Erode, Coimbatore, Tiruppur, Theni, Karur (part), Namakkal (part), Dindigul, Perambalur and Ariyalur (part)	Red Loamy, Black
Cauvery delta	Thanjavur, Nagapattinam, Tiruvarur, Trichy and parts of - Karur, Ariyalur, Pudukkottai and Cuddalore	Red Loamy , Alluvium
Southern Zone	Madurai, Sivagangai, Ramanathapuram, Virudhunagar, Tirunelveli and Thoothukudi	Coastal Alluvium, Black, Red Sandy Soil, Deep Red Soil
High rainfall	Kanyakumari	Saline Coastal Alluvium, Deep Red Loam
Hilly	The Nilgiris and Kodaikanal (Dindigul)	Lateritic

Source:

<http://tnhorticulture.tn.gov.in/horti/agro-climatic-zones>

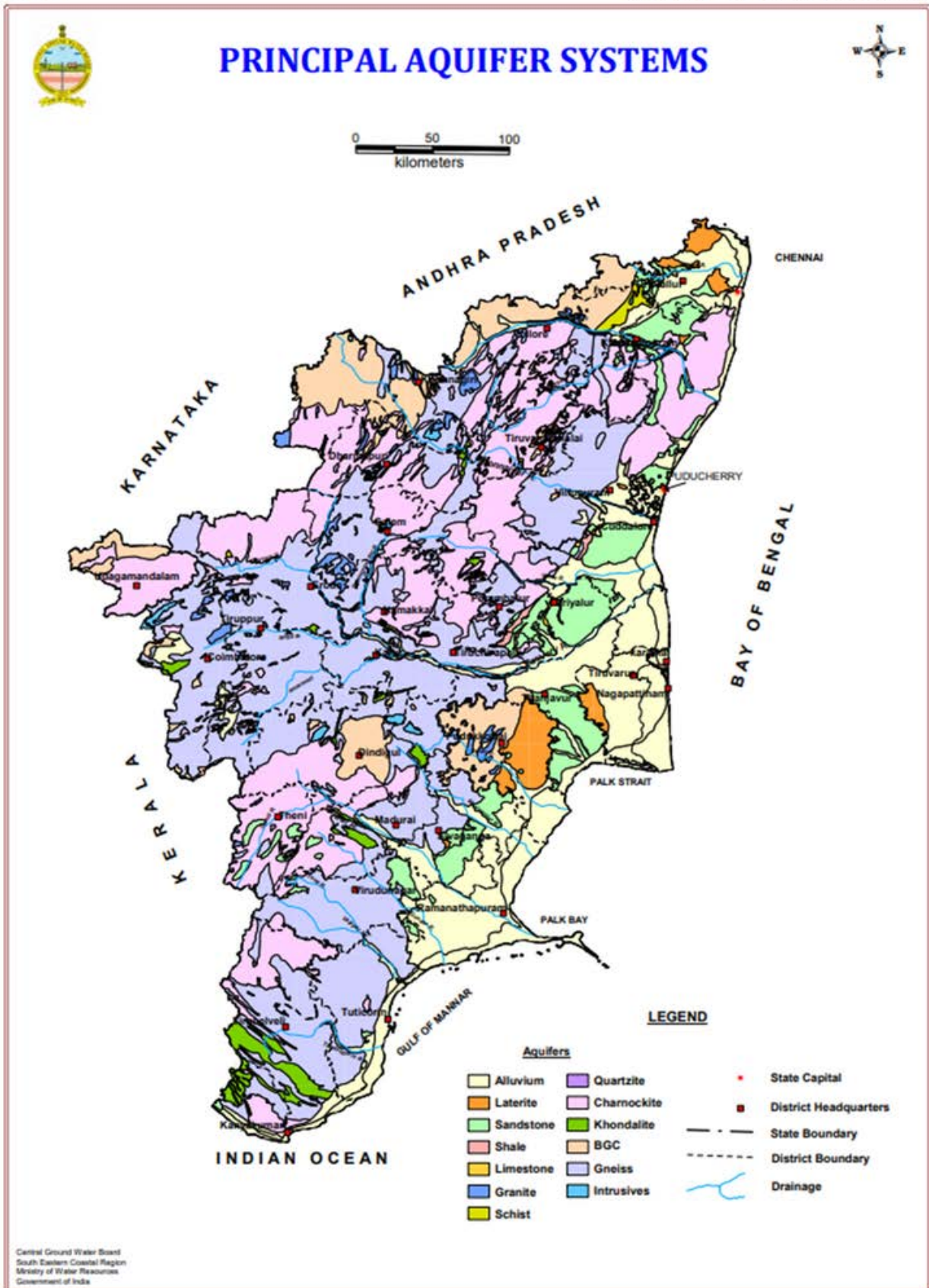


[10] Resource Manangement :: Soil :: Types of Soil - Agroclimatic Zones (tnau.ac.in)

Aquifer system[11]

PLATE-III

AQUIFER SYSTEMS OF TAMILNADU & PUDUCHERRY



[11] TamilNadu.pdf (cgwb.gov.in)

Specific Yield[12]

V. Norms Recommended for the Specific Yield

S.No	Principal Aquifer	Major Aquifers		Age	Recommended (%)	Minimum (%)	Maximum (%)
		Code	Name				
1	Alluvium	AL01	Younger Alluvium (Clay/Silt/Sand/ Calcareous concretions)	Quaternary	10	8	12
2	Alluvium	AL02	Pebble / Gravel/ Bazada/ Kandi	Quaternary	16	12	20
3	Alluvium	AL03	Older Alluvium (Silt/Sand/Gravel/Lithomargic clay)	Quaternary	6	4	8
4	Alluvium	AL04	Aeolian Alluvium (Silt/ Sand)	Quaternary	16	12	20
5	Alluvium	AL05	Coastal Alluvium (Sand/Silt/Clay)	Quaternary	10	8	12
6	Alluvium	AL06	Valley fills	Quaternary	16	12	20
7	Alluvium	AL07	Glacial Deposits	Quaternary	16	12	20
8	Laterite	LT01	Laterite / Ferruginous concretions	Quaternary	2.5	2	3
9	Basalt	BS01	Basic Rocks (Basalt) - Weathered, Vesicular or Jointed	Mesozoic to Cenozoic	2	1	3
10	Basalt	BS01	Basic Rocks (Basalt) - Massive Poorly Jointed	Mesozoic to Cenozoic	0.35	0.2	0.5
11	Basalt	BS02	Ultra Basic - Weathered, Vesicular or Jointed	Mesozoic to Cenozoic	2	1	3
12	Basalt	BS02	Ultra Basic - Massive Poorly Jointed	Mesozoic to Cenozoic	0.35	0.2	0.5
13	Sandstone	ST01	Sandstone/Conglomerate	Upper Palaeozoic to Cenozoic	3	1	5
14	Sandstone	ST02	Sandstone with Shale	Upper Palaeozoic to Cenozoic	3	1	5
15	Sandstone	ST03	Sandstone with shale/ coal beds	Upper Palaeozoic to Cenozoic	3	1	5
16	Sandstone	ST04	Sandstone with Clay	Upper Palaeozoic to Cenozoic	3	1	5
17	Sandstone	ST05	Sandstone/Conglomerate	Proterozoic to Cenozoic	3	1	5
18	Sandstone	ST06	Sandstone with Shale	Proterozoic to Cenozoic	3	1	5
19	Shale	SH01	Shale with limestone	Upper Palaeozoic to Cenozoic	1.5	1	2
20	Shale	SH02	Shale with Sandstone	Upper Palaeozoic to Cenozoic	1.5	1	2
21	Shale	SH03	Shale, limestone and sandstone	Upper Palaeozoic to Cenozoic	1.5	1	2

[12] Detailed Guidelines (cgwb.gov.in)

S.No	Principal Aquifer	Major Aquifers		Age	Recommended (%)	Minimum (%)	Maximum (%)
		Code	Name				
46	Quartzite	QZ02	Quartzite- Massive, Poorly Fractured	Azoic to Proterozoic	0.3	0.2	0.4
47	Charnockite	CK01	Charnockite - Weathered, Jointed	Azoic	3	2	4
48	Charnockite	CK01	Charnockite - Massive, Poorly Fractured	Azoic	0.3	0.2	0.4
49	Khondalite	KH01	Khondalites, Granulites - Weathered, Jointed	Azoic	1.5	1	2
50	Khondalite	KH01	Khondalites, Granulites - Massive, Poorly Fractured	Azoic	0.3	0.2	0.4
51	Banded Gneissic Complex	BG01	Banded Gneissic Complex - Weathered, Jointed	Azoic	1.5	1	2
52	Banded Gneissic Complex	BG01	Banded Gneissic Complex - Massive, Poorly Fractured	Azoic	0.3	0.2	0.4
53	Gneiss	GN01	Undifferentiated metasedimentaries/ Undifferentiated metamorphic - Weathered, Jointed	Azoic to Proterozoic	1.5	1	2
54	Gneiss	GN01	Undifferentiated metasedimentaries/ Undifferentiated metamorphic - Massive, Poorly Fractured	Azoic to Proterozoic	0.3	0.2	0.4
55	Gneiss	GN02	Gneiss -Weathered, Jointed	Azoic to Proterozoic	3	2	4
56	Gneiss	GN02	Gneiss-Massive, Poorly Fractured	Azoic to Proterozoic	0.3	0.2	0.4
57	Gneiss	GN03	Migmatitic Gneiss - Weathered, Jointed	Azoic	1.5	1	2
58	Gneiss	GN03	Migmatitic Gneiss - Massive, Poorly Fractured	Azoic	0.3	0.2	0.4
59	Intrusive	IN01	Basic Rocks (Dolerite, Anorthosite etc.) - Weathered, Jointed	Proterozoic to Cenozoic	2	1	3
60	Intrusive	IN01	Basic Rocks (Dolerite, Anorthosite etc.) - Massive, Poorly Fractured	Proterozoic to Cenozoic	0.35	0.2	0.5
61	Intrusive	IN02	Ultrabasics (Epidiorite, Granophyre etc.) - Weathered, Jointed	Proterozoic to Cenozoic	2	1	3
62	Intrusive	IN02	Ultrabasics (Epidiorite, Granophyre etc.) - Massive, Poorly Fractured	Proterozoic to Cenozoic	0.35	0.2	0.5