AF Ecology Centre-India

Anantapur and Satya Sai districts of Andhra Pradesh in India

2023

Rabobank

Introduction

This report represents a summary of the project details. It has been created in close collaboration between AF Ecology Centre and Acorn. A more detailed Acorn Design Document (ADD) for the project will be available on the Acorn platform. It can be requested by validation and verification bodies and certifiers for third-party oversight or quality checks. The number of participants described in this document reflects only those in the project's first year. Please see the Acorn website for the real-time number of participants at scale.

This Plan Vivo certified project run by AF Ecology Centre in India has been helping more than 6,000 smallholder farmers transition to agroforestry by planting a diverse range of border tree species that provide marketable products, such as timber and medicine, whilst improving soil health and fertility. The outcome of the project intervention will enhance farmer and community livelihood by diversifying, stabilizing, and increasing farmer income, while building resilience to climate change. AF Ecology aims to bring the benefits of agroforestry to more farmers in the district of Anantapur. It will do so by supporting an additional 3,000 farmers to move away from unsustainable agricultural practices, such as monocropping, and adopt sustainable agroforestry systems.

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Project Summary

Local partner

Project location

Anantapur and Satya Sai districts of Andhra Pradesh in India
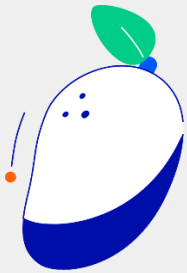
Ecoregion
The Deccan Thorn Scrub forests

Main crops

Groundnut, red gram, mango, sweet lime, tamarind, guava, sapota and jamun.

Minimum number of existing participants

6,715+

Potential number of additional participants

3,000+

Estimated total size of project area currently

8,421 ha

Project's aims and objectives

Through this project, AF Ecology Centre aims to:
• Develop sustainable models under the Acorn Framework to promote agroforestry and enable multiple co-benefits to smallholders.
• Provide additional income through Carbon Removal Units (CRUs), thereby improving the livelihoods of smallholder farmers.
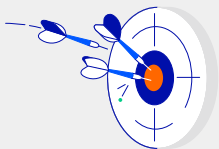
Impact to the farmer livelihood and environment

• Adopt regenerative farming methods
• Increased food security
• Resilience to climate change
• Diversified and increased income
• Increased and stable productivity
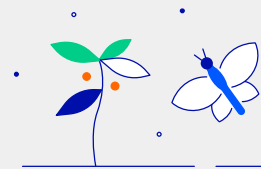
Additionality

This agroforestry project, led by AF Ecology Centre, was established in 2023 to reward farmers with carbon finance for maintaining the trees they have planted in their transition to agroforestry and to scale their agroforestry systems to make them more diverse and resilient long-term against environmental stressors. At the start of this Acorn project, approximately 70% of Participants had already begun their transition to agroforestry (i.e., planting one tree species with 1-2 annual crops) before, whereas approximately 30% of Participants had a monoculture consisting of one tree species.

The first trees were planted just after the onset of the monsoon (July-September) in 2018. Fruit tree seedlings were provided to these first farmers either for free by governmental or NGO schemes, such as the MGNREGA program or were paid for by the farmers themselves. The fruit tree species were selected according to their value in the market trend at that time.

As part of the Acorn project, AFEC will provide up to 7,000 farmers on 8,500 hectares of land with seeds and training on agroforestry practices. This will overcome the technical and knowledge barrier farmers face and allow them plant timber and medicinal trees in their transition to a long-lived agroforestry system and combat the effects of climate change.

Farmer Level

Agriculture is the primary source of income for local communities in the project area, which significantly increases their vulnerability to climate change and poverty as the project area is affected by soil erosion, severe droughts, pests and disease infestations and, due to the lack of a resilient and sustainable farming system and high prevalence of monoculture practices, food productivity is very low.. Smallholder farmers in the project area are forced to migrate to the city to earn money to provide for their families for at least half the year, leaving their families and farms vulnerable to increasing extreme weather events (i.e., droughts and flooding). Farmers lack skills and knowledge (in terms of spacing, pruning, species suitability and mixing, etc.) to be able to transition to a successful and diverse agroforestry system without the Acorn project. Additionally, farmers lacked the understanding of the importance of integrating trees into their lands to mitigate climate change, and nevertheless on carbon sequestration and carbon finance, which means that they were not able to optimize their lands to become resilient, productive, and be financially rewarded for such change.

Through the Acorn project intervention, AFEC will overcome the knowledge barrier by providing participants with the necessary information on; 1) agroforestry concepts, 2) the carbon sequestration process and the importance of maintaining the trees on their lands, 3) natural farming practices, such as manual preparations of biopesticides and biofertilizers, and 4) planting of border trees. To overcome the financial barrier these farmers face, AFEC will fully subsidize seed costs. The increase in productivity expected to take place with the implementation of agroforestry practices, along with the additional revenue from carbon credits, is expected to alleviate farmers' economic status, will prevent them from having to migrate to the city. Furthermore, the CRUs Acorn provides, offer farmers incentives to plant additional trees, diversifying their systems while keeping the

existing trees in the ground, which is not customary in traditional practices. The trees planted will increase soil health, regenerate the land from degraded cultivation and protect it from climate change.

Project Level

AF Ecology Centre has been working in the Anantapur district of Andhra Pradesh since 1982, committed to promoting livelihood security, self-reliance and human dignity for smallholder farmers through drought-climate resilient agroecology, agri-processing and non-farm livelihoods. AFEC saw in Acorn the opportunity to bring additional livelihood benefits to farmers through carbon finance whilst incentivizing regenerative agricultural practices. Nevertheless, due to the traditional ways in the region and knowledge barrier of the participants, agroforestry and carbon finance are still poorly understood. Therefore, the success of this project will serve as an example to other farmers in the region on how they can access carbon finance and understand the importance of tree ecosystem services. AFEC works within eight mandals in the Anantapur district. This project has expanded to 15 mandals in the Anantapur and Satya Sai districts to ensure more farmers benefit from agroforestry and carbon finance. The organization wants to expand its network of beneficiary farmers and reach a total of 10,000 farmers onboarded to Acorn in 2024. To achieve this goal and have the participants engaged and committed to the project, farmers must be rewarded with carbon finance, especially in a social context where farmers influence their neighbouring farmers.

In the case that farmers who transitioned to agroforestry with AFEC are not rewarded with income from the carbon credits, they may be discouraged from maintaining and scaling up their agroforestry interventions after all their hard work and lack of significant benefits. This lack of reward will reflect poorly on agroforestry schemes for other farmers in the community and region that have the potential to transition to agroforestry, resulting in a barrier to scaling up.

It is clear that the financial benefits (i.e., carbon finance and increased productivity) and environmental benefits (i.e., increased soil health and protection from extreme weather events) from transitioning to such a long-term agroforestry system will significantly increase farmer and family livelihood in the project area.

Project Baseline

Land use

Private smallholder farmers use the land in the project area to cultivate cash crops, including annual and perennial horticulture species. Cultivated tree species include mango, sweet lime, tamarind, jamun, sapota, guava and banana. Annual crops (3-4 months of the year) include tomato, chili, groundnut, chickpea, mung and cluster beans, castor oil plant, red and horse gram, ragi, onion, okra, malabari spinach, maize, fenugreek, cotton, and bitter melon. Farmers consume all these species; what is not consumed is sold at local markets.

For the eight mandals AFEC currently works with, pests are controlled on the farms through sticky traps and pheromonal traps, and some make biopesticides. Farmers only use chemical pesticides on their land as a last resort. On the remaining seven mandals that AFEC will work with, pesticide use is expected to be mainly chemical. On average, each farmer uses approx. 35 liters of pesticides per year. The most common pesticide used is insecticide, followed by fungicide and herbicide. Regarding fertilizers, each farmer, on average, uses approx. 2,709.6 kg of organic fertilizer per year, such as mulch, manure and compost, and 415.0 kg of inorganic fertilizer per year, including nitrogen and phosphorus. Both pesticides and fertilizers are applied on all crops.

Without the Acorn project intervention, the farmers would have no support to continue planting trees to optimize their agroforestry system and no incentive to maintain a sustainable agroforestry system. They could not afford to purchase new seedlings and would have only the tree species that the government selected on their land. Farmers would also not have the resources or skills to plant biofences or choose the best border planting species. Without the regular support and training on the importance of agroforestry systems provided by AFEC, farmers would likely cut down the trees in times of financial hardship or change their land use to cattle raising, and farmers who have not yet transitioned to agroforestry would continue practicing unsustainable farming practices such as monoculture plantation.

Habitat Species

Anantapur is characterized by its arid and drought-prone climate, red soils, and entirely agrarian economy. The hot and dry conditions and anthropogenic influence, mainly derived from unsustainable farming practices, have shaped the vegetation into low-canopied scrub and sparse, with short, thorny trees.

Species observed in the project area includes poplar sterculia, grass, helicopter trees, coconut palms, mangos, sweet limes, pomegranates, teaks, neems, etc. Animal species in the project area include lizards, monkeys, cattle, robins and peacocks.

Without the Acorn project intervention, the farmers would have no support to continue planting trees to optimize their agroforestry system and no incentive to maintain a sustainable agroforestry system. The financial and knowledge barriers would force farmers to continue their customary agricultural practices, which don't promote biodiversity and species richness. As a result, their lands would continuously lose fertility and resilience to the effects of climate change, which is predominant in the project region, and with that, food security is also at risk for the project communities, and.

Socio-Economic Benefits

Area	Indicator	Result
Local livelihood	Nutritional variety	The average farmer consumes 5 out of 12 food groups daily
	Farmer income	The average farmer has an average income of -31,466.7 INR.
	Agricultural land use and productivity	The average farmer produces about 44,026.8 kg/ha/year of cash crops (mainly from groundnut, sweet lime, maize, tomato, red gram and mango) from their farms.
Environmental improvement	Agricultural biodiversity	62% acceptable (according to the Gini-Simpson Index).

Nutritional variety

Most farmers eat three meals a day, and only two meals a day. In addition, most farmers do not usually skip meals, and the minority that do mainly do so on a daily basis. Farmers mainly source their food from their farms and local markets,, with up to 50% of their diet being grown on their farms.

Farmer diets mainly consist of vegetables, cereals and milk-derived products. In comparison, meat, seafood and sweets represent a smaller portion of a farmer diets.
Project intervention is expected to improve farmers' financial status and diet through additional carbon finance revenue and marketable products from trees (i.e., mango and sweet lime). The fruit trees planted under the Acorn project intervention are clearly of added value (i.e., leading to increased household nutritional intake), as only half of participants consume fruits in their diets.

Farmer income

Most farmers' financial state is poor, with a low per-capita income , due to the inadequate income from subsistence agriculture. Due to their low income, they are unable to afford high investment costs and fail to access bank loans, especially as a result of their high levels of illiteracy and poor education. As a result, farmers are highly dependent on cash crops the produce for income and food crops for self-consumption, which is unsustainable due to the rising impacts of climate change and high input costs. Majority of participants in this Acorn project describe their financial situation as having just enough to get by, and in some circumstances farmers are experiencing financial hardship, presenting a situation of risk and vulnerability to the livelihood of farmers in the long-term.
Most farmers' income is based on marketable products from their cash crops and livestock, although, on average, each farmer's primary revenue source is from the sale of crops. For example, if a farmer earns approx. 75,000 INR from agricultural produce and milk products, and their expenses include 120,000 INR for food maintenance, seeds, fertilizer, and animal medical investment, this results in a negative yearly balance. This is the case for more than half of the farmers in this project, resulting in an annual average income per farmer of -31,466.7 INR.

Project intervention is expected to improve farmers' financial status through additional income from CRUs and products from trees that are marketable (i.e., mango and sweet lime). There should be no long-term negative impact as the initial costs of planting materials and resources to transition (mainly free or subsidized by government) are outweighed by the income from carbon that farmers will receive over the life of the project.

Agricultural land use and productivity

In the project area, farmers plant various annual cash crops, which, amongst the most productive, include groundnuts (peanuts), maize, sweet lime, mango, red gram, and tomato. The farmer's main tree cash crop, which is currently the most productive, is sweet lime. The average productivity of cash crops per ha and year is 44,026.8 5,308.7 kg. Most farmers classify their productivity level as average, while some rank it as poor. However, the majority have unstable productivity, which has been the case for the past 10-12 years approximately.). The main reasons for unstable productivity include drought, high input and planting material costs, lack of shade, floods, pests, and diseases.

This Acorn project intervention will give farmers the necessary skills and resources to overcome the productivity challenges they face. The shade of the trees will increase soil health and resistance to drought and diminish the need for fertilizer, and the fruits of the trees will increase overall productivity. Border planting will be introduced to counteract the expected drop in productivity of the annual cash crops in the long-term (due to overshading from the mature trees).

Agricultural biodiversity

In the project area, majority of farmers believe they have a low level of biodiversity on their farms. However, the Gini-Simpson biodiversity index calculated for this project reflects the agricultural biodiversity as acceptable at roughly 62%. This score is a result mainly of the high diversity of crop species due to subsistence farming practices and the presence of livestock. This does not take into consideration the species richness of plants and wildlife. In fact, the presence of natural vegetation, trees, and pollinators was found to be below average, corresponding with farmers rating of biodiversity. Farmers report sometimes seeing wild animals such as rabbits, rats and snakes in the project area and less often bears, peacocks and wild pigs. There has been a report from a farmer that threatened species such as cheetahs and Indian cobras have been spotted rarely in the project area. The carbon finance will encourage farmers to maintain and further plant trees that will provide a safe space for wild fauna to pass through, support biodiversity.

Farmers plant various crops for self-consumption, and biodiversity is expected to be maintained while the agroforestry trees (e.g., mango, sweet lime, jamon, guava, sapota, and tamarind) are maintained and grow. Biodiversity is even expected to increase slightly as a result of this Acorn project intervention when border planting is introduced.
The trees planted can offer shade for native flora to grow and native fauna to seek refuge from the harsh climate. Furthermore, these trees can preserve soil during heavy rainfall and wind, thus promoting biodiversity.

As a result of the Acorn project intervention, farmers will be provided with the necessary know-how to support biodiversity (such as utilizing biopesticides and biofertilizers), and reduce the risk of diseases affecting the crop diversity.

Project Activities

The agroforestry system is classified as agrisilvicultural agroforestry in arid and semi-arid environments of Andhra Pradesh, where farmers grow a mix of fruit-bearing trees (e.g., sweet lime, mango, tamarind, pomegranate, guava, sapota and jamun) and annual crops (e.g., tomato, groundnut, castor, red gram, mung beans). The planting of border timber trees is also prioritized in this system.
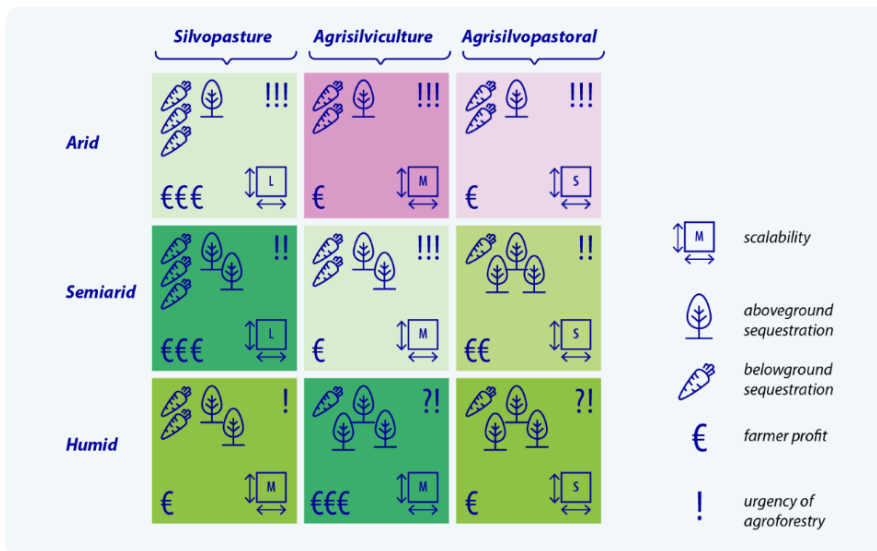
There are seven native or naturalized tree species promoted under the agroforestry design that offer i) livelihood benefits such as windbreak, timber, and medicine, and ii) ecosystem benefits such as soil carbon storage, soil erosion prevention and nitrogen-fixing. These species were chosen to increase biodiversity and the resilience of the smallholder's lands by offering soil nutrition and marketable tree products.

- *Tectona grandis*
- *Swietenia mahagoni*
- *Pterocarpus santalinus*
- *Saoindus mukorossi*

- *Sesbania grandiflora*
- *Azadirachta indica*
- *Terminalia sp.*

The agroforestry approach consists of further improving existing agricultural systems and supporting the transition to brand new agroforestry systems. Farmers will plant border trees (4 to 5 species each) to increase the farm biodiversity and diversify their income. The tree species in the agroforestry design were chosen during community meetings, facilitated by the field supervisors, for the range of livelihood and environmental benefits these provide. The timber species (e.g., teak, mahogany, and red sandalwood) will provide economic cushions when harvested for farmers in need, act as windbreaks, and increase soil fertility and moisture retention. Each of the timber trees have different harvesting periods to guarantee that the tree cover is kept on the farm, providing continuous soil benefits and, contribution to long-lasting climate resilience of the land. Species like neem and soapnut will also serve as windbreaks, promote soil enrichment and erosion prevention, and provide marketable/medicinal products. In addition, all biomass that is derived from pruning will be used for mulching and fodder for livestock.

AFEC began the distribution of border tree seeds in August of 2023, with farmers receiving between 250g and 1kg, depending on the farm's acreage. Planting is done at a distance of 1.5m between seedlings after the onset of monsoon. In 2023, the state of Andhra Pradesh has been experiencing severe droughts, which delayed the planting activities. During the seed distribution, farmers are also given pamphlets with training material on when to plant and how many to plant for optimum survival rates (86%).

AFEC discourages farmers from using chemical fertilizers and pesticides, while green manure, mulching and composting are encouraged. Training on making biopesticides and biofertilizers will be provided to farmers. The proposed agroforestry system intends to positively impact the land by providing more shade to crops and increasing the soil organic matter and available nutrients, thus increasing productivity. Incorporating fast-growing leguminous and nitrogen-fixing trees will provide additional nutrients to food crops. Higher productivity and more shade will also attract more insects and pollinators, thus increasing the overall biodiversity of the area. Finally, tree cover will ensure carbon sequestration and prevent soil erosion through roots binding the soil to sloping ground.

Organizational Capacity

Accion Fraterna Ecology Centre (AFEC) is a Trust founded by Father Vincent Ferrer in 1982, actively involved in rural communities' empowerment through natural resources management, watershed development, drought management, environmental development and policy advocacy in the drought-prone district of Anantapur. Since 2000, AFEC has been focusing on environment development, promoting native agrobiodiversity, sustainable agriculture and drought mitigation in Anantapur. The Trust is well known in the development sector for its participatory approach, high-quality watershed development on a sizable scale, people-centric policy advocacy, and lobby work. AFEC is also famous for developing agroecology-based drought mitigation technologies and diversified crop models for Rainfed Agriculture, having made an outstanding contribution to poverty alleviation, livelihood development, reviving rainfed agriculture, ecology restoration and biodiversity conservation in the Anantapur district. AFEC has been relentlessly striving to secure the livelihoods of the rural poor, especially women, through participatory watershed development, natural resources management, drought mitigation, sustainable agriculture and diversification of rural livelihoods.

AFEC works in 8 mandals in the Anantapur district in Andhra Pradesh, propagating innovative technologies and practices which are drought tolerant and suitable for rainfed lands of. These include farm pond lining, protective irrigation, rainfed mixed cropping models, multiple fruit tree models etc. For this Acorn project, AFEC is expanding its network of mandals from 8 to 15, including the Satya Sai district, so that more farmers can benefit from agroforestry practices and carbon finance.

As a result of this Acorn project, gender equality is expected to improve. AFEC will focus on alleviating the status of women farmers. AFEC's policy of gender inclusivity gives preference to women farmers, women employees, women-led nurseries, women resource persons, women-led farmers, etc. AFEC is actively forming Women Self Help Groups (WSHGs) and Women Producer Organizations (WPOs) exclusively for women farmers to build their capacity, leading to women empowerment.

Farmer Payment and Benefit Sharing

To ensure the CRU payments (10% for AFEC and 80% for farmers) received by the Local Partner are transparent, AFEC will disburse farmer payments through bank transfer, as all farmers engaged in the project have their bank accounts and provided such information during the onboarding. There will be no in-kind payments; farmers will receive 80% of carbon revenues as a purely monetary benefit. This payment method allows farmers to choose what they spend their carbon income on, ensures traceability, and prevents AFEC from drawing over 10% of sales for ongoing coordination, administration and monitoring costs. In addition, AFEC has opened a separate bank account exclusively for the Acorn project to ensure further transparency and traceability of the carbon payments.

Technical Specifications

Leakage

There is no expected loss in productivity due to the Acorn project intervention and no displacement of farmers' activities, as the project intervention aims to enhance current farming practices and increase the biodiversity and productivity of the farmer's plots. The existing mango, tamarind and sweet lime trees, planted between 2018 and 2021, are not fully productive yet, and, as a result, some farmers (approx. 70%) have intercropped their farms with annual crops. As the trees mature, the annual crops will become overshaded and unproductive, something the farmers knew and expected before the project intervention. Therefore, AFEC wants to promote the planting of diverse tree species on the existing farmland to increase the biodiversity of their lands and promote additional revenue for farmers through marketable tree products (e.g., timber).

The possibility of deforestation inside or outside the project area is very low due to the additional income farmers will receive from tree-based products and carbon finance and the awareness training conducted by AFEC. Logging for firewood is not expected as the area has availability of natural gas and, in some cases, biogas. Logging for timber outside of the project area is also not as common as the region is characterized by cropland and degraded land, and farmers will not need to seek additional income in this manner with the marketable tree products and carbon income received in this project. In the future, the project could be affected by decreased productivity due to natural disasters, although the frequency of such destructive disasters is low in the area, but farmers would have a financial buffer from carbon income to prevent activity shifting.

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