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Community Farming and Structural Interventions - Study from Anantapur District - Andhra Pradesh

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ABSTRACT

A well-developed agrarian sector is essential for the overall development of the economy. The study focuses on the functional efficiency of the Foundation for Ecological Security (FES) in the district of Anantapur – Andhra Pradesh, as it produced some compelling results. The study focuses on the FES organization and its transformation of farming activities among small and marginal farmers. A survey was undertaken to collect information from 70 farmers benefiting from FES from 5 villages. The data was collected through questionnaire and interview methods regarding the education and job profiles, method of cultivation, changes brought by the FES, new methods introduced by FES in their fields, changes in farmer's life and related migration, etc. The multistage purposive sampling methods were used for collecting the data. The result shows that FES enhances the irrigation facilities, leading to the use of Borewells by most farmers, i.e., 57.1 per cent. At the same time, 28.5 per cent of farmers depend only on rain-fed. The farmers start using modern technology, i.e., 94.2 per cent of farmers. The cost of cultivation has increased, but with the subsidy from the FES, the costs are minimized, so the profitability has increased. The profits from Paddy cultivation were Rs. 5000-10000 before FES per acre, which was increased to Rs.15000-20000 per acre. FES is enhancing sustainable agriculture. The utilization of chemical fertilizer is reduced by 22.8 per cent. FES positively impacts farming and the environment through ecological restoration, proper irrigation, efficient logistics, market facilities, etc.

Keywords: *Agricultural Sustainability, Foundation for Ecological Security, Ecological restoration, Logistics.*

INTRODUCTION

Agricultural sustainability is the base of sustainable development. Sustainable agriculture and sustainable development are closely related to each other. The world needs to catch up in achieving Sustainable Development Goal - 2 (Zero Hunger) by 2030. The global problem of food scarcity and hunger is worsened by the persistent increase in the world's population. The population is increasing at an increasing rate, but the production and productivity of crops are not growing accordingly. Sustainable agriculture does not return to pre-industrial revolution methods but combines traditional conservation-minded farming techniques with modern technologies. Sustainable farming is an environment-friendly technique of farming that uses modern equipment, certified seed, soil, practices of water conservation, and, apart from that, the latest innovations in livestock.

The main emphasis is crop rotation, soil building, crop diversification, livestock management, and natural control of pests (Robertson, 2015). Sustainable farming is a way of farming to meet the needs of existing generations while being conscious of the prospects of future generations. It favors environmentally friendly cultivation techniques that preserve soil fertility, prevent water pollution, and conserve biodiversity. Sustainable agricultural practices complement achieving sustainable development goals, including zero hunger. It is economically viable, socially responsible, and ecologically complimentary (UC Sustainable Agriculture

Research & Education Program, 2021). The greening of the economy with agriculture initiatives seeks to contribute to the definition and implementation of the green economy with a particular emphasis on food security (FAO, 2012). Sustainable agriculture involves building the strengths of natural ecosystems into agroecosystems purposely disturbed to produce food and fiber. The overall strategies include using practices that (a) grow healthy plants with good defense capabilities, (b) stress pests, and (c) enhance populations of the beneficial organism. Globally, conservation agriculture has provided a common thread for applying five sustainability principles—efficient water use, reduced use of agrochemicals, improved soil health, adaptation to climate change, and doubling farmer income. The sustainability of agriculture depends on soil management systems. It ensures food security, healthy soils, and ecosystem services and prevents resource degradation (Gupta *et al.,* 2018). To reduce the environmental impacts of agriculture, low- and high-yield regions must practice agriculture with vastly greater efficiency: far more crop output per unit of water, fertilizer, and energy.

The fundamental challenge for sustainable agriculture is to use available biophysical and human resources better. This can be done by minimizing external inputs, optimizing the use of internal resources, or by combinations of both. This ensures the efficient and effective use of what is available and that any improvements will persist as dependencies on external systems are kept to a reasonable minimum. Sustainable agriculture seeks the integrated help of various pest, nutrient, agroforestry, soil, and water management technologies. By-products or wastes from one component or enterprise become inputs to another. As natural processes increasingly substitute for external inputs, the environmental impact is reduced (Pretty *et al.,* 1996).

India is predominantly an agrarian economy, where the primary sector contributes to 14 per cent of the Nation's Gross Domestic Product (GDP) (Solanki *et al.,* 2020). It accommodates 43 per cent of the total workforce in 2019 (International Labour Organization, 2021). India has about 160 M ha of arable land, the second largest after the United States of America. It experiences all 15 prominent climates with 46 of 60 soil types (India Brand Equity Foundation, 2022). About 50 per cent of its total geographical area is cultivated, which ranks it among the top users of land for agriculture. Today, India is the largest producer of Milk, Pulses, and Jute and the second largest producer of Rice, Wheat, Cotton, Fruits, and Vegetables worldwide because of agricultural scientists' active efforts and contributions. It is also one of the leading producers of Spices, Fish, Poultry, Livestock, and plantation crops (Pathak *et al.,* 2022). It is herculean to imagine prosperity in India without the prosperity of agriculture. This is essential to achieve the goal of sustainable, healthy diets for all (Global Panel on Agriculture and Food Systems for Agriculture, 2000)**.** However, the Indian agricultural sector has long suffered a plethora of structural infirmities that have contributed to the continuing crisis (Dhar and Kishore, 2021). Especially the farming community, more particularly the small and marginal farmers/tenants, has been exposed to the vagaries of agricultural distress (Sen and Ghosh, 2017). Farming has faced severe challenges in

terms of irregular monsoon (only 40 per cent of land is irrigated), depleting public Gross Capital Formation (GCF, manifested in terms of the creation of capital assets like irrigation projects, marketing avenues, storage, transport), Minimum Support Price (MSP), Institutional Credit facilities, crop insurance and finally the climatic catastrophes (De *et al.,* 2017). The smallholders face high transaction costs in marketing their produce owing to low marketable surplus, low market density and poor market connectivity, low bargaining power, and colossal transaction costs in selling their produce (Pingali *et al.,* 2019). At this cost, there has been deep distress among the farming community as most have been slowly quitting agriculture, which is very much as the number of the farming community is dwindling while that of agricultural labour is on the rise (Birthal *et al.,* 2015). Meeting the growing urban demand for food and other agricultural products and non-farm employment provides new growth opportunities for rural economies; the challenge is to ensure that it is inclusive of the poor (Pingali *et al.,* 2019). Nevertheless, employment opportunities in non-agricultural sectors are not growing fast enough (Nadkarni, 2018). In this context, we may be exposed to immediate threats like food insecurity – hunger, increased poverty levels, rural distress, migration, and social gaps.

The FES was established because "ecological security" is the pillar of equitable development and sustainability (Annual Report-FES 2020-21). Committed to improving, reviving, or, where needed, restoring is the process of conservation and ecological succession in terms of forest, water resources, country, and land. Ecological of land and water resources in the country's highlands and the other environmentally sensitive, degraded, and marginal zones to initiate a coordinated human effort and governance process, significantly helping the poor. Work towards recovery and conservation. Work with Panchayat Raj and other democratic village agencies and appropriate civil society organizations to achieve social and civil goals and provide technical and financial support. FES works with governments and civil society organizations on the ground and in rural communities, at scale, and in various settings. What began as a field-level experiment in a few villages in a few lands in 1986 has now grown to thousands of villages throughout 10 Indian states. FES aims to make significant and demonstrable progress toward its long-term vision of gender equality and the inclusive community led by commons governance to improve rural people's economic and ecological outcomes. The institutional and governmental factors to change, which influence the livelihood of the people who depended on the Commons, are fixed deeply. There is an urgent need to change the system so programs and policies link ecosystems to rural economic prospects. The policy objective, legal mandate, local ability, and the agency and leadership of the local communities are all better-aligned thanks to India's announced national and global commitments. FES works directly with the village communities to protect and strengthen collective action for inclusive natural resource governance and community land rights and to rebuild landscapes with the help of public funds. They reach scalability by integrating knowledge, information, and analytics into core activities and landscape-level conservation planning. FES builds collaborations to utilize Commons in government and non-governmental organization programs

and address local stewardship and conservation. FES collaborates with the local governments, International and national NGOs, and their networks to assist on-the-groundwork and the policy's implementation and enable governments and NGOs to access the power of information technology to take informed action at scale. FES primarily aided in the fields of agriculture and forest recreation.

In this context, we have tried to examine the performance assessment of an organization named FES that has been working over many states with a prime focus on rural empowerment. We have adopted to study their functional efficiency in the district of Anantapur – AP, among the small and marginal farmers, as it produced some compelling results. The study focuses on the FES organization and its transformation of farming activities through community participation. It aims to find FES's direct and indirect impact on farmers' livelihoods in the Anantapur district. Due to heavy agricultural loss, loans, and fewer agriculture returns, many farmers left agriculture and migrated to nearby cities in the study area. So, one of the main aims of this research is to find out the intervention and impact of FES in this region.

STUDY AREA

Anantapur District

Anantapur district is in the state of Andhra Pradesh, India**.** The community is in the northern part of Kurnool District, in the southeast by Chittoor District, in the east by YSR District, and in the southwest and west of Karnataka state. The district is located between the eastern latitude of 76° 47' and 78° 26'E and the north latitude of 13° 41' and 15° 14'N. The district has a population of 40, 83,315 people, representing 4.82 per cent of the state's overall population and a 12.16 per cent decadal growth (Census, 2011). The district has five revenue divisions, each with 63 mandalas. Nambula Pulakunta is a village in the Anantapur district. It is the administrative center of the Kadiri Revenue Division's Nambula Pulakunta Mandal. According to the Geological Survey of India, Pyrophyllite and chloritoid radiating crystals are found in the valleys north of Nambula Pulakunta. N. P. Kunta is located west of Kadiri town, 29 km away. The Ultra Mega Solar Park in the Nambula Pulakunta area, which generates 200 Megawatts (MW), is the world's largest solar power plant.

Agriculture is the mainstay of the economy of the Ananthapuram district, with 85 per cent of the farmers being small and marginal farmers. The main crops grown in the district are Ground Nut, Red gram, Jowar, Rice, Maize, Castor, Cotton, and Bengal gram. Total Gross Cropped Area and Net Sown Area are 11.06 lakh ha and 10.39 lakh ha, respectively. The low cropping intensity at 106 per cent is because only 12.56 per cent of the net sown area has irrigation facilities, and vast tracts of land are cultivated under rainfed conditions.

MATERIALS AND METHODS

This research is based on the primary data collected in 2023. The location was decided based on multistage purposive sampling. The sample for this study was selected from a Mandal named Nambula Pulakunta, Anantapur district, Andhra Pradesh. The district of Anantapur was selected because FES works in this district. This is the most dry area in the state. The location was chosen because the FES

works in N. P. Kunta Mandal under the Thambalapally block, Anatapur. The sample consists of 70 random farmers who are getting benefits from FES. These 70 samples were collected from 5 villages, i.e., Somarajukunta, Dhaniyalacheruvu, Kottamvari Palle, Golla Palli, and Kuntla Palli. The primary data is collected through a basic questionnaire and interviews. The questionnaire consists of both open-ended and objective-type questions. The questions were related to production, productivity, changes in market avenues, new methods introduced by FES in their fields, changes in farmers' lives and related migration, etc. In particular, questions were related to the irrigation facilities - use of borewells, rain-fed wells, use of technology and storage, soil fertility test, subsidies and loans from the FES, etc. Descriptive statistics, like the mean and median, are used to analyze the data.

RESULTS AND DISCUSSION

FES and Irrigation

Borewells, wells, canals, lakes, and rainfed irrigation are the most common types of irrigation systems. Farmers who are unable to use irrigation depend on rain-fed cultivation. Rain-fed locations have lower cultivation costs than other areas, yet yield is also lower due to single-line planting and limited water supply. However, they sow seeds in multi-rows under borewells and other structures as they have enough water for their crops. When borewells and wells are low on water, they make the most of it by utilizing sprinklers, drip irrigation, and other methods. Even with little water availability, more areas can be covered, although the technique is expensive.

However, the outcomes are good for farmers. The reliance on agricultural productivity on shared infrastructure requires sufficient collective action for infrastructure maintenance and water allocation under environmental variability (Vallury *et al.,* 2022). Adaptive management emerges out of the uncertainties in groundwater management. While surface water reserves are primarily determined by catchment efficiency and institutional factors governing their equitable distribution and sustainable use and are thus more amenable to consistent management systems across spatial scales, groundwater is complex because it has both the finite and the unconfined reserves. At FES, we believe that water is a common that is finite and therefore subtractable and involves significant costs of exclusion, unlike a public good that is non-subtractable and non-excludable. All water bodies, such as ponds, tanks, canals, and groundwater, are common pool resources and must be managed and governed as legal property regimes. We help bring in robust institutional arrangements based on principles of universal membership, social inclusion, and social justice to foster collective action, develop locally agreed norms for resource usage, democratize decision-making processes, and improve the governance of common land and water resources. We nurture a ‘systems perspective’ towards establishing and reinforcing the interlinkages between different resource systems (forest-farm-water) and production systems (commons agriculture-livestock) (FES, 2015)

Table 1.1. Irrigation Facilities

Source	Frequency	Percentage (%)
Borewells	40	57.1
Rain fed	20	28.5
Wells	12	17.1
Lakes	14	20

n=70

Table 1.1 illustrates that fifty-seven per cent depend on Borewells for irrigation and, 29 per cent rely on rain, 17 per cent depend on wells, and the remaining 20 per cent depend on lakes. The majority depend on Borewells for irrigation. Water is an essential element in agriculture. Borewells are necessary for irrigation. Those with enough water can grow two or three harvests every year. Borewells and wells existed before the FES, but their utilization could have been better due to low groundwater levels. After FES began working, and because of sustainable practices efforts to raise groundwater levels, *Borewells and wells began to fill up with water once more, and farmers began to reuse borewells*. *FES helps to determine the water-holding capacity and texture. FES carries out a variety of activities in farmers' fields to improve groundwater levels, including deep ploughing, silt application by removing soil from deeper lakes and canals, stone bunds, plantation, RFDs*, *check dam construction to store water for future summers, etc.* The district's irrigation sources include the Upper Pennar Project, Guntakal branch canal, Bhairavanithippa Project (BT project), Chennaraya Swamy Gudi project, Tungabhadra Project High-level canal (TBHLC), tanks, wells, bores, and filter point. FES has restored the environment through various community farming/sustainable farming practices. The discount percentage has also increased. When there is more rainfall in the area, lakes, borewells, and wells are automatically filled with water. Although the FES did not participate in any new borewells, the groundwater level increased due to their actions and practices like restoration, community participation, and maintenance. Farmers could even utilize the old abandoned borewells post-FES intervention.

FES and Change in the Production

FES primarily assists farmers in introducing modern technologies and farming methods. Almost every farmer in the FES program used the organization's technology. It helps introduce new imported machinery into fields, subsidized prices, and low-cost HYV seeds. All these benefits reduce the overall cost of agriculture, allowing farmers to avoid making significant investments.

FES primarily assists farmers in utilizing modern technologies and farming methods. Almost every farmer in the FES program used the organization's technology. To increase yield, FES implemented revolutionary farm techniques in the fields. Deep ploughing for soil loosening, silt application to enhance soil moisture, stone bunds to prevent soil erosion, tree planting, Sankalp pits for irrigation, HYV seeds to increase yield, RFDs to

store water, and increase groundwater level can also come from check dams, soil testing. To improve irrigation facilities, FES has undertaken various steps such as groundwater treatment, afforestation, and construction of check dams. The ecological restoration and recreation of forest areas are more critical to FES. Because it benefits society, farmers, and the environment in various ways, they restore trees and plants to replace those that have died due to droughts and forest fires. They reconstruct and restore the forests of the past. The FES community looks after the plants and trees, such as plantation, water supply, and maintenance. FES plants them to help the environment to maintain greenery and try to facilitate timely monsoon seasons. The community allows others to cut down trees for firewood and other household requirements.

Table 1.2. Changes Brought by FES in Production

Changes	Frequency	Percentage (%)
Technology	66	94.2
Storage	60	85.7
Market Facilities	70	100
Providing Plants	16	22.8

n=70

Table 1.2 manifests change by FES in the farmer's field. Out of 70 respondents, 66 use sprinklers, a new type of fertilizer, tractors, etc. The use of technology in the field leads to a decrease in human resources, a cost reduction, and an increase in yield levels. Technological inputs have been provided to the farmers at subsidized rates. Training and fieldwork are also offered to farmers to help them understand and operate the new technology. Eighty-six per cent of 70 respondents store their produce in storage to go down cold storages, enabling farmers to sell the produce during the season while storing them in the off-season to get better returns. One hundred per cent of respondents use market facilities. FES organization also buys the farmers' produce at a reasonable rate compared to the rate given by the middleman. They sell the produce to the government or private enterprises, thus helping farmers discover better prices and avoid any probable loss. FES credits the total amount directly to farmers without taking any commission. In the study area, there is a threat of wild animals spoiling the crops; to counter this, FES provides thorny plants to protect the crop. FES is also committed to long-term development. It operates totally in association with the community. It always wants to modify the agricultural sector to increase returns and output. FES also engages field classes to farmers to sensitize and enable them concerning farming practices and technology utilization in cultivating different crops.

Table 1.3. Innovative Farm Techniques Introduced by the FES

Type of measure	Frequency	Percentage (%)
Deep ploughing	16	22.9
Silt application	42	60
Stone bunds	52	72.3
Plantation	12	17.14
Providing HYV seeds	22	31.43
RFD (Rock Filled Dams)	16	22.9
Canals	8	11.43
Soil Testing	14	20

n=70

Table 1.3 describes the innovative farm techniques introduced by the FES. For new approaches like deep ploughing, 22.9 per cent of respondents could practice and benefit from this. Slit application, i.e., 60 per cent of respondents use works related to mud and Fragmentation of land holdings. Stone bunds are used for boundaries by 72.3 per cent of respondents to protect from wild animals. The plantation is used by 17 per cent of respondents, and High Yield Variety (HYV) seeds have been utilized by 31.43 per cent of respondents to increase yield and decrease pests. Rock Filled Dams (RFDs) are used to improve groundwater levels; it is constructed by keeping stones around a small pond. RFDs have constructed the foothills to collect and store rainwater. Canals are built to connect check dams and agricultural fields. The FES organization also tests soil to enable farmers to select their crops for cultivation and apply fertilizers. FES communities conduct soil fertility tests regularly and supply organic fertilizers to farmers to help them avoid using synthetic fertilizers. These organic fertilizers are highly beneficial to farmers in the field. FES carries out a variety of activities in farmers' fields to improve soil fertility and groundwater levels, including deep ploughing, silt application stone bunds, plantation, RFDs, check dam construction, and soil testing.

Table 1.4. Exclusive Benefits under FES

Type of Benefit	Frequency	Percentage (%)
Decreased cost of cultivation	52	73
Soil fertility test	54	77.1
Storage/Go downs	42	60
Credit facility	42	60
Reduction in the usage of Chemical Fertilizers	16	22.8

n=70

Table 1.4 explains the exclusive benefits of FES. Farmers' cost of cultivation has decreased due to the subsidized inputs/practices/interventions provided by FES, like machinery, seeds, and fertilizers. The farmers regulate unnecessary usage of fertilizers and HYV seeds because the organization educates them on using fertilizers, weedicides, and pesticides. Nearly 77 per cent of respondents undergo soil tests in their field according to season. FES organization suggests season-wise cultivation of crops only after evaluating results from the 'soil test.' The crop loans are vided with low-interest rates, i.e., sixty per cent of respondents opined that they have benefited from this kind of crop loan from FES. The chemical fertilizers are reduced because FES organizes farmers to cultivate the crop sans chemical fertilizers. These are the primary benefits acquired through FES.

Table 1.5. Response to Organic Fertilizers

Rating points	Frequency	Percentage (%)
3	16	32
4	18	36
5	16	32

n=70

Table 1.5 depicts the response to the utilization of natural organic fertilizers. FES has Provided organic fertilizers to 50 out of 70 respondents. Almost all rated above 3 out of 5. This means all are satisfied with fertilizers. This is a positive indication and result of farming assistance offered by FES. The FES organization promotes organic farming through Neem oil, Navaamrutam, Neem cake, Samrum, and others. They process neem leaves to produce neem oil and also stor the neem oil leaves for an extended period. Neem oil is high in nutrients such as NPK. The Neem oil could enhance the yield by 15 to 25 per cent over regular periods. FES provides neem oil to farmers either for free or at subsidized pricing. Navvamrutha and Samrum are also beneficial to increasing yield. FES provides all these fertilizers at a reduced cost or, occasionally, for free. These organic fertilizers can help farmers enhance their harvest prospects.

FES and Efficiency in the Market

Farmers' income can improve substantially if they can capture a more significant share in the supply chain from farm gate to consumer. For this to happen, farmers must be free to sell what they want, where they want, and when they want without any restrictions on stocking, movement, and export of farm produce. These will require legal and institutional changes, significant investments in market infrastructure and storage (including cold-chain storage), and incentives for creating and operating infrastructure (Gulati *et al.,* 2020).

Unsustainable agriculture may lead to additional indebtedness and migration among farmers. Farmers have a perfect market avenue because of FES. It protects farmers from intermediaries and other private individuals who take crops at a low price. Regarding weighing crops, intermediaries need more transparency and offer significantly

lower production prices to increase their commission. Farmers faced numerous issues because of all of this. However, with the support of the village community, FES created an ideal market platform.

Table 1.6. Marketing Avenues

Platform	Before F.E. S	After F.E. S
Government	00	70
Local Private Market	56	00
Middleman	66	00
Collection centres	10	00

n=70

The organization itself initiates and sells the crop to the government. Before the induction of the FES, crops were only sold to middlemen; after the arrival of the FES, the leading platform for selling and money-making was the marketing avenue. Farmers stopped selling their harvests to middlemen and other mediator firms after the FES arrival. With the help of FES, they began to understand actual prices and sold only to FES marketing people. FES forms village communities with local people. They pay all farmers the exact amount and transparently weigh them. Money is directly deposited into farmers' bank accounts quickly, with no intermediary commission or charge.

Apart from that, FES provides loans to farmers at a low-interest rate of 12 per cent without requiring collateral. The FES village community serves as a link between the bank and the farmer. It benefits many farmers. It is especially beneficial to small farmers and tenant farmers. Because of the high-interest rates, people need help to obtain loans from private banks or money lenders. Even if they are willing to pay interest again, they demand collateral such as house and land documents or gold.

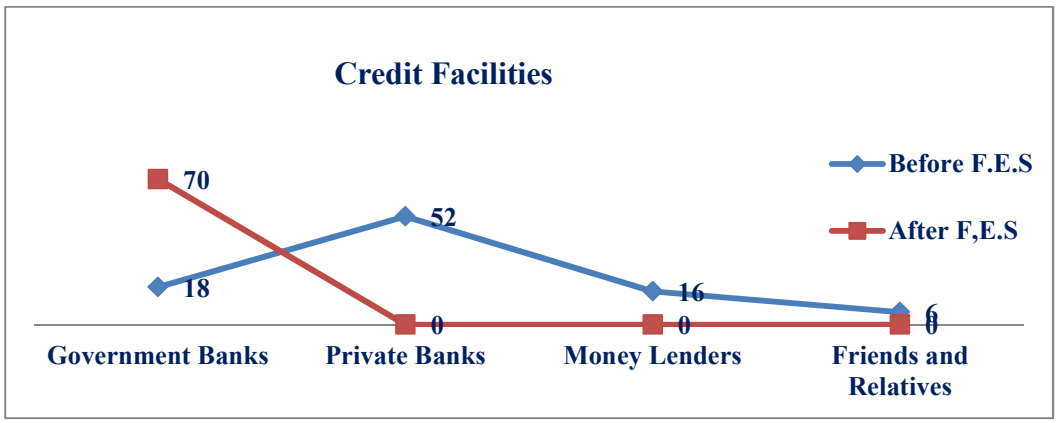

Fig 1.1. Credit Facilities

Graph 1.1 explains the credit facilities. Before FES, the government banks provided a loan for 18 respondents. After FES, all the respondents took loans from government banks because the interest rate was low. Fifty-two respondents before FES took a loan from private banks; after FES, no one took credit from private banks. Sixteen respondents borrowed money from money lenders, and post-FES, no one borrowed from money lenders. Earlier, six respondents got credit from relatives and friends; after the arrival of FES, no one took credit from relatives and friends. FES provides loans to eligible persons with certain specifications with the support of village-level communities. Farmers do not need to provide any documentation as verification while banking with the FES community. Community members serve as trustees and issue loans with lower interest rates. Farmers can invest more money in agriculture and allied activities, resulting in higher yields. These banks grant loans up to a certain amount suggested by the community members.

Table 1.7. Availing Subsidies and Loans from FES

Panel (a): **Availing Subsidies from FES**		
Response	**Frequency**	**Percentage (%)**
Yes	54	93.1
No	4	6.9
Panel (b): **Loans from FES**		
Response	**Frequency**	**Percentage (%)**
Yes	42	60
No	28	40

n=70

Panel (a) explains the availing of subsidies by the farmers. FES provides subsidies to farmers with small holdings and living below the poverty line. 54 out of 70 respondents, i.e., 77 per cent received seed subsidies, fertilizers subsidies, machinery subsidies, etc. By taking this subsidy, the cost of production has decreased. Panel (b) illustrates the loans from FES. Forty-two respondents, i.e., 60 per cent got a loan from FES without any documents. The remaining 40 did not receive because some have more land or are above the poverty line. The respondents who do not have assets can also get loans with the help of the village community in government banks. The FES works as a medium in this scene. Tenant farmers can compete with the big farmers because of the FES's intervention.

FES and Cost-Benefit Analysis of Crops

Groundnut

Groundnuts are the fourth most important source of edible oil and the third most important source of vegetable protein worldwide. Groundnut is an

important oilseed crop in India and an important agricultural export commodity. Globally, Groundnut covers 315 lakh ha with a production of 536 lakh tonnes with a productivity of 1701 kg per hectare (kg/ha) (FAOSTAT, 2020). With annual all-season coverage of 55.71 lakh ha, globally, India ranks first in Groundnut area under cultivation and is the second largest producer in the world with 102 lakh tonnes with a productivity of 1831 kg/ha in 2020-21 (agricoop.nic.in). In Kharif 2021-22, groundnut production was 82.54 lakh tonnes (1st advance estimates) in an area of 49.14 lakh ha (agricrop. nic). Groundnut is cultivated in one or more (kharif, rabi, and summer) seasons, but nearly 90 per cent of acreage and production comes from the kharif crop (June-October). In Andhra Pradesh, groundnuts are cultivated in an area of 8.7 lakh ha with a production of 7.78 lakh tonnes (Reddy *et al.,* 2022). It contributes 7.63 per cent to India's groundnut production (des.ap.gov.in) for 2020-21. According to second advance estimates during 2021-22, groundnuts were grown in 8.09 lakh ha with a production of 5.35 lakh tonnes, and productivity was 661 kg/ha.

Table 1.8 compares the cost of cultivation of Groundnut per acre before and after the FES organization, which exhibits an unprecedented change in the research area in the agriculture sector of the Anantapur district. If we analyze the table, the labor wage has doubled because the wage rate has increased and living standards have been improving consistently. The cost of the seed has been slightly improved. The cost of fertilizers and pesticides has improved, i.e., nearly Rs.6000. After getting a subsidy from the organization, it has been decreased to 100 per cent, which comes to Rs. 4,500, which has benefited the farmers highly. Harvesting under bore wells has increased due to high machinery, and more laborers are needed. Its cost has increased from Rs.1000 to Rs.3000. Because of FES, the number of bags increased from 12 to 20 under the bore well. The net profit gained for bore wells and rain-fed has doubled due to EFS. The cost of cultivation under bore wells has doubled by nearly Rs.15000 to Rs.25000.

Table 1.8. Cost of Cultivation for Groundnut

Unit = Rs.000 per Acre

Division	Before FES	After FES
Labour wage	1.5	3
Seed	5	8
		Without subsidy 10 - 12
Fertilizer and Pesticides cost	2	4.5
		Without subsidy 6
Harvesting (under Borewell)	2	5
Harvesting (Rain fed)	1	3
Total Cost of Cultivation	15 – 20	25 - 30 under Borewell
		15 - 18 under Rain fed

n=70

Compared to regular and FES farmers, total cultivation costs are reduced from Rs.8,000 to Rs.10,000. FES delivers low-cost machinery and fertilizers. A typical farmer's overall cost of cultivation is roughly Rs.35,000 to Rs.35,000 per acre. However, under FES, the cost of cultivation under a borewell has decreased from Rs.25,000 to Rs.30,000. In the case of rainfed, there has not been much tremendous change after the FES organization. FES made a massive change in the research area, which has been very helpful for farmers in those regions compared to others. The organization provides financial support in the form of subsidies. It decreases the cost of cultivation and increases output so that farmers benefit. Cultivation of groundnut per acre requires a total of 60 working days. For a family, it requires 20 working days for weeding out, 10 days for sowing, three days for spraying, and six days for harvesting, including both men and machine power.

Table 1.9. Total output for Groundnut

Unit: Output =Bag (Each bag 44kg) & Income = Rs.000

Division	**Output**		**Income**	
	Under Borewell	Under Rainfed	Under Borewell	Under Rainfed
Before F.E. S	12	8 – 10	10	5 – 8
After F.E. S	20 - 25	12 - 15	20	12 - 15

n=70

In the case of rainfed, it increased slightly from 8 to 12 bags. Borewell output is higher than rainfed output. The production under borewells was 12 to 15 bags before FES began working. Each bag weighs 44 kg. However, after FES arrived, bags grew from 20 to 25. It shows how well FES has performed in the field. They implemented innovative methods to boost output. Rainfed output was 8 to 10 bags before FES, but once FES began working, it climbed to 12 to 15 bags. The percentage of rainfall in the research area increased dramatically due to ecological restoration and other FES activities. In agriculture, farmers make income and occasionally lose money. Rain-fed farmers profited between Rs. 5,000 and Rs. 8,000 before FES, and after FES began working, they benefited between Rs.12,000 to Rs. 15,000. FES gave The crops a good market platform and a reasonable price. As a result, it has a positive impact on farmer profits.

Paddy

Table 1.10 explains the paddy cultivation cost per acre before FES. This labor wage includes high machinery works, which show increased by nearly 80 per cent from before, shown in the above table, from Rs.6000 to Rs.10000. The seed cost has been improved from Rs.1500 to Rs. 2500. On the other side, the fertilizer and pesticides have doubled from Rs.4000 to Rs.8000 after FES. The cost of cultivation has been tremendously increasing, nearly doubling from Rs.10000 to Rs. 20000.

Table 1.10. Cost of Cultivation for Paddy

Unit: Rs.000 per acre

Division	Before FES	After FES
Labour wage (including machinery)	6	10
Seed	1-5	2.5
Fertilizer & pesticides	4 to 5	8
Total Cost of cultivation	10 to 15	20 to 22

n=70

Compared to pre- and post-FES, the cost of cultivation has increased due to increases in wage rates and machinery usage in rice fields. However, compared to other farmers, those who are part of the FES have lower cultivation costs. It is due to the FES subsidies and interventions. It provides subsidized machinery, fertilizer, and organic fertilizers on occasion. Compared to ten years ago, the entire cost of cultivation has nearly doubled. It is because prices have been rising. The total working days for paddy cultivation for an acre require 50 days. For a whole family, working days will be 15 days. A paddy crop is a three-month crop. Coming Labour days, eight days for preparing the land, seven days for sowing, ten days for weeding, four days for sprinkling fertilizers, and one day for threshing and harvesting by the machinery.

Table 1.11. Total Output for Paddy

Unit: Output =Bag (Each bag 44kg) & Income = Rs.000 per acre

Division	**Output** (Each Bag 44kg)	**Profit (**Rs.000)
Before FES (Rs.000)	20 to 25 bags	5 to 10
After FES(Rs.000)	35 bags	15 to 20

n=70

The final output was improved from 20 to 35 bags per acre. The net profit has tripled from Rs.5,0000 to Rs.15,000, which is a good sign for the farmers in the research area of Anantapur district. The rise in the output indicates how well FES performed in the agricultural fields. The output grew by approximately ten to fifteen bags. Each bag is 44 kg in weight. Farmers' revenue grew due to increased output, which nearly doubled profits. It only occurs when output rises at a rapid rate.

CONCLUSION

FES enhances the irrigation facilities, leading to the use of Borewells by most farmers, i.e., 57.1 per cent. At the same time, 28.5 per cent of farmers depend only on rain-fed. The farmers start using modern technology, i.e., 94.2 per cent of farmers. They are now more familiar with

different logistics facilities. With modern technology, logistics, etc., production and profits have increased. It is evident from our analysis that the profitability of Groundnut and Paddy has increased. The cost of cultivation has also increased, but with the subsidy from the FES, the costs are minimized, so the profitability has increased. The profits from Paddy cultivation were Rs. 5000-10000 before FES per acre, which increased to Rs.15000-20000 per acre. The major hindrance to the farmers is market facilities. FES enhances the market facilities for farmers. After the advent of FES, crops were sold to the Government by the organization; before FES, it was sold to the middleman, collection centers, and local private market. In such a way, FES is making agriculture sustainable. After FES began to operate, the entire agricultural landscape was transformed in our study area from a dry and tropical region to a land of intense farming.

REFERENCES

Birthal, P. S., Roy, D., Khan, M. T. and Negi, D. S. 2015. Farmers' preference for farming: Evidence from a nationally representative farm survey in India. *Developing Economies*, **53**(2): 122–134. https://doi.org/10.1111/deve.12072

Foundation of Ecological Foundation. 2015. *Book on communities as local stewards*.

Food and Agriculture Organization of India. 2012. Greening the economy with agriculture. https://www.fao.org/3/i2745e/i2745e00.pdf .

Chand, R. and Singh, J. 2022. Workforce changes and employment some findings from PLFS data series NITI Aayog government of India, New Delhi.

De, S., Shantanu, R. and Roy, D. 2017. *Economic reforms and agricultural growth in India*.

Dhar, B. and Kishore, R. 2021. Indian agriculture needs a holistic policy framework, not pro-market reforms. *Economic and Political Weekly,* **56**(16).

FAO, IFAD, UNICEF, WFP and WHO. 2022. The state of food security and nutrition in the world. Repurposing food and agricultural policies to make healthy diets more affordable. Rome, FAO. https://doi.org/10.4060/cc0639en.

Gulati, A., Kapur, D. and Bouton, M. M. 2020. Reforming Indian agriculture. *Economic and Political Weekly.* **55**(11).

Gupta, R., Mehra, M., Sahoo, R. N. and Abrol, I. 2018. Indian agriculture redefining strategies and priorities. *Economic and Political Weekly*. **53**(41).

Nadkarni, M. V. 2018. Crisis in Indian agriculture: Can it be overcome? *Economic and Political Weekly.* **53**(17).

Pathak, H., Mishra, J. P. and Mohapatra, T. 2022. Indian agriculture after independence. *Indian Council of Agricultural Research*, New Delhi, 426.

Pingali, P., Aiyar, A., Abraham, M. and Rahman, A. 2019. Transforming food systems for a rising India. http://www.palgrave.com/gp/series/14651

Powell, J., Short, C. and Ashbrook, K. 2017. *A Companion to IASC Commons Conferences*.

Preface.

Pretty, J. N., Thompson, J. and Hinchcliffe, F. 1996. International Institute for Environment and Development Sustainable Agriculture: Impacts on Food Production and Challenges for Food Security.

Robertson, P. 2015. A sustainable agriculture? *Daedalus*, **144**(4): 76-89. Stable URL: https://www.jstor.org/stable/24711565

Sen, A. and Ghosh, J. 2017. Indian agriculture after independence. *The Bangladesh Development Studies.* **40**(1): 53–71. https://doi.org/10.2307/26572744

Solanki, S. and Murthy, K. 2020. Sectoral contribution to economic development in India: A time-series co-integration analysis. *Journal of Asian Finance, Economics, and Business*, **7**(9): 191–200.

Sustainable Agriculture Research and Education Program. 2021. https://sarep.ucdavis.edu/sustainable-ag

FAO. 2022. *The State of Food Security and Nutrition in the World 2022*. https://doi.org/10.4060/cc0639en

Vallury, S., Shin, H. C., Janssen, M. A., Meinzen-Dick, R., Kandikuppa, S., Rao, K. R. and Chaturvedi, R. 2022. Assessing the institutional foundations of adaptive water governance in South India. *Ecology and Society*, **27**(1). https://doi.org/10.5751/ES-12957-270118

Websites

''International Labour Organization, 2021'' (https://www.ilo.org/global/lang--en/index.htm)

''India Brand Equity Foundation, 2022''(https://www.ibef.org/)

''Global Panel on Agriculture and Food Systems for Agriculture, 2000'' (**https://www.glopan.org/)**

"Agriculture in India" Government of India (https://www.india.gov.in/sectors/agriculture).

FES, Annual Reports

https://www.fes.org.in/