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Impact Analysis of Empowerment Programmes of Tribal Community in East Godavari, Andhra Pradesh, India

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Authors' contributions

This work was carried out in collaboration between all authors. Author KSK designed the study, wrote the protocol and first draft of the manuscript. Author CCR and TGKM managed the analysis of the study. Author KSK managed the literature searches. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

The tribes of Andhra Pradesh present a fascinating diversity with its variegated socio-cultural traditions and diversified occupations.
Aim: The objectives of the study are to facilitate adoption of appropriate agricultural technologies, to enhance the productivity level of the agro-based farming systems and to conduct need based extension activities in various agro-based technologies to improve the knowledge, skills and abilities of tribal farmers.
Research Design: Expost-facto research design.
Place and Duration of the Study: A project for a period of three years (2009 – 2012) was proposed and approved by Department of Biotechnology (DBT), New Delhi for empowerment of tribal farmers to be carried out in the Tribal areas of East Godavari district, Andhra Pradesh, India.
Methodology: The level of knowledge content of the farmers was analyzed by the use of pre-tested schedule before and after implementation of the interventions viz., after a period of three years. About 250 farm families in general and 100 tribal farmers in specific among ten villages of two panchayats from Rampachodavaram mandal were selected based on

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multistage sampling technique.
Results: A total of hundred selected farmers were trained in the areas of agriculture, horticulture, poultry and animal husbandry and value addition programmes. Interventions through training programmes, awareness camps, front line demonstrations and method demonstrations were conducted to improve the knowledge skills and abilities of tribal farmers. A set of agricultural technologies which were simple, effective and need based were selected and implemented to improve the knowledge, skills and abilities of the tribal farmers in the selected villages. The impact was analyzed after a period of three years of implementation of the project and presented. The proposed interventions in agriculture, horticulture, poultry, animal husbandry and value addition programmes have enhanced the knowledge, abilities, skills and income level of the tribal families by improving their living standards.
Conclusion: A desirable change was brought in economic, social, health and livelihood aspects of tribal farmers.

Keywords: Agricultural technologies; impact analysis; knowledge skill and abilities; empowerment.

1. INTRODUCTION

The tribal farmers in East Godavari follow primitive methods of agriculture, known as podu cultivation and shifting cultivation [1,2]. Tribals mainly subsist on agriculture and cattle rearing, while kammaras are the traditional artisans. The Konda reddies are still in primitive stage of hunting. The majority of the farmers clear away the forest lands on hill slopes by cutting and burning the trees. The tribes thus depend on various occupations viz., hunting, hill cultivation, simple artisan, pastoral and cattle-herder, folk-artist and agricultural and non-agricultural labour [3]. Nearly 30% of the total area is under forests with vide variety of fauna and flora. They raise minor millets like jowar, bajra, tapioca along with paddy which are staple food for them. Apart from agriculture they also follow seasonal occupations viz., tadi extraction, palm fibre production, tamarind combing, adda leaf collection and other minor forest produce (MFP) for their livelihood. The knowledge, awareness and adoption level of tribal farmers regarding agricultural technologies are very meager and insignificant [4,5]. The farmers do not aware of the recent agricultural technologies viz., seed treatment, green manuring, high yielding varieties, advanced agriculture implements and new breeds of poultry and cattle[5]. A set of agricultural technologies which were simple, effective and need based were selected and implemented to improve the knowledge, skills and abilities of the tribal farmers in the selected villages. An externally funded project was undertaken supported by Department of Bio-Technology (DBT), New Delhi in order to improve the livelihood security of tribal farmers with the following objectives.

1. To facilitate adoption of appropriate agricultural technologies.

2. To enhance the productivity level of the agro-based farming systems by dealing with the local problems effectively.

3. To conduct need based extension activities in various agro-based technologies to improve knowledge, skills and abilities of tribal farmers.

2. METHODOLOGY

A project for a period of three years (2009 – 2012) was proposed and approved by DBT for empowerment of tribal farmers of East Godavari district. Pedageddada, Cheruvupalem, Chinageddada, Dokulapadu, Gandhi-nagaram, Bhupathipalem, Bandapalli, Thallapalem, Tativada, Pedapadu villages were selected from Rampachodavaram mandal / block, East Godavari district of Andhra Pradesh based on purposive random sampling. About 250 farm families in general and 100 tribal farmers in specific among ten villages of two panchayats from Rampachodavaram mandal were selected based on multistage sampling technique. Two key farmers from each village and a total of ten farmers were identified from five villages in the first stage where each key farmer has again identified another ten farmers in the second stage. Due this sample technique, several barriers like social and cultural obstacles were vitiated and the farmers were convinced. Problems in agro related aspects were identified through participatory rural appraisal (PRA) techniques and solutions were worked out. An interview schedule was developed, pre tested and incorporated. Interviews were conducted with farmers to elicit data before and after implementing interventions. Interventions through training programmes, awareness camps, front line demonstrations and method demonstrations were conducted to improve the knowledge, skills and abilities of tribal farmers. The impact of the project was analyzed by using summations and percentages. The rate of adoption and improved knowledge, abilities and skills in all the key areas were analyzed and presented. The maps of Andhra Pradesh state is shown in Fig. 1 and East Godavari district is shown in Fig. 2 were given below.

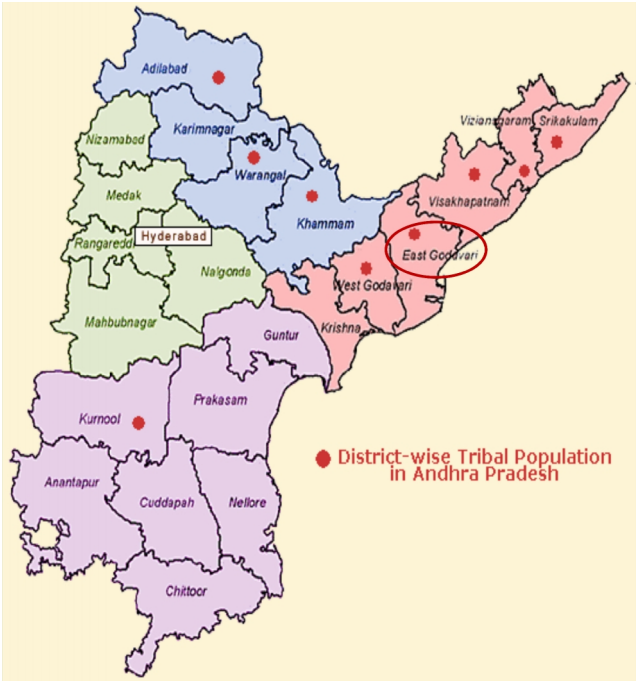

Fig. 1. Tribal population In Andhra Pradesh

Fig. 2. East Godavari district of Andhra Pradesh

3. RESULTS AND DISCUSSION

As the tribal farmers were highly conventional, they were reluctant at the beginning, but motivated afterwards by recognizing the benefits received by the key farmers in the adopted villages. The knowledge, socio-economic status, education, literacy levels are low in tribal communities on comparison with others [6]. The land holdings are very small and marginal [6]. The following technologies were incorporated and the impact was analyzed under the following sub heads. The following activities viz., facilitation of agricultural technologies, agro-based farming systems, need based extension activities have created a tremendous impact on the empowerment of tribal families [5].

3.1 Facilitation of Adoption of Appropriate Agricultural Technologies

Under this objective, various frontline demonstrations on high yielding varieties (paddy), nutrient management and pest management in paddy crop, green manuring, soil test based fertilizer application, inoculation of bio-fertilizers viz., azospirillum to jowar seed, fertilizer management in paddy etc., were conducted to improve the awareness and reduced the adoption gap. The introduced technologies have created good impact in the adopted villages as shown in Table 1. Recent advances in agricultural technologies will have a good impact in improving the un-employment and increasing the family income of tribal farmers [4].

Table 1. Introduction of high yielding varieties and improved management practices

Activities	Results obtained	Impact
Front line demonstrations on Paddy high yielding varieties - (MTU-1001, MTU-1010, BPT-3626), INM-(Zinc sulphate - 50kg/ha), IPM in paddy (Chloropyriphos/ acephate-2-2.5ml/lt) Green manuring (sunnhemp – 50kg/ha); Seed treatment of paddy (carbendazim /capton/thyram-2.5g/kg seed); Soil testing and water analysis (NPK levels, chloride content in water); soil test based fertilizer application; fertilizer management in paddy (split application of N-three times);	Due to the conduct of Front Line Demonstrations (FLDs) and method demonstrations, the tribal farmers are well acquainted with the improved agricultural technologies. The adoption gap was reduced, constraints were resolved and 80% farmers in the adopted villages started cultivating high yielding varieties and recommended scientific practices.	About 1200 kg/ha (35%) increase in yield was observed in paddy crop. The awareness of the tribal farmers regarding scientific know-how is significantly improved. The adoption gap was reduced. Varieties were popularized and entered into the seed chain. The area under cultivation of HYV was improved significantly. It has reached to an extent of 5000 hectares.

Front line demonstrations were conducted in the proposed adopted villages to acquaint the farmers with latest varieties and advanced technologies in pulses for period of three years (2009-2012) which has improved the farm productivity, net returns of the tribal farmers, as shown in Table 2.

Table 2. Introduction of mosaic resistant varieties in black gram and improved management practices

Activities	Results obtained	Impact
Front line demonstrations – high yielding varieties (LBG-623, LBG-752); inoculation of Rhizobium culture to pulse seed(rhizobium-200gm/10kg seed); IPM (Mancozob – 2.5gm/lt)	The tribal farmers have learnt the skill of inoculation of rhizobium culture. Farmers have identified that new varieties were giving good yields. The family diets were enriched with pulses along with cereals.	Yield improvement was observed up to 20% in black gram. The tribal farmers have improved their knowledge and skills. The adoption rate was increased up to an extent of 75 to 80%.

Season-wise front line demonstrations were conducted in the proposed adopted villages to acquaint the farmers with latest high yielding varieties and advanced technologies in cashew for period of three years (2009-2012) which has improved the farm productivity, net returns of the tribal farmers and presented in Table 3. Crop calendars were prepared where a set of management practices and instructions were given from time to time [7].

Table 3. Improved technologies for higher productivity in Cashew orchards

Activities	Results obtained	Impact
Front line demonstrations (pest management); pesticide application as a prophylactic measure. IPM in cashew (Monocrotophos-0.05% at flushing stage, endosulfan - 0.05% at flowing stage and carbaryl – 0.01% at fruiting stage)	Massive spray was done in cashew orchards in adopted villages. The pest incidence (T-mosquito and Stem borer) was controlled effectively with the help of monocrotophos (@ 0.05 %) at flushing stage, endosulphon (@ 0.05 %) at flower stage and carbaryl (@ 0.1%) at fruiting stage. There was significant reduction in panicle damage.	Improved yield up to 30% in cashew due to the reduced pest incidence. The tribal farmers have improved their knowledge and skills. The adoption rate was increased to up an extent of 90%.

Front line demonstrations were conducted in the proposed adopted villages to acquaint the farmers with latest varieties and advanced technologies and cashew for period of three years (2009-2012) which has improved the skills in spraying, INM and IPM [8]. The farmers were trained in inoculation of bio-fertilizers.

3.2 To Enhance the Productivity Level of the Agro-Based Farming Systems

In interior tribal areas, lack of artificial insemination facilities, lack of awareness, lack of storage facilities of semen (cattle breeds), lack of technical expertise, location of tribal hamlets far from the insemination centers, has created a need to introduce high yielding male murrah buffalo in the tribal area. The murrah buffalo was introduced for the purpose of breed up-gradation. Due to this activity, about 23% animals were conceived and calves of murrah breed were born in the adopted villages and surrounding hamlets as shown in Table 4 & Fig. 3. The tribal families were benefitted by improving their family income of Rs.5000/- to Rs. 9000/- per month per family both by sale and consumption of the milk. The AP co-operative dairy society of Chekka Nimmalapalem village, Addategala Mandal got benefitted by introducing this buffalo in their dairy unit by improving the breed (33%). Awareness regarding murrah breed was also created among the tribal farmers. The fodder blocks, health camps, introduction of mineral mixtures, silages have improved the milk yields of cattle from 500 liters to 800 liters and eggs of poultry improved from 80 to 150 per annum as shown in Table 4 & Fig. 4. Animal husbandry and livestock are the components to be introduced for improving the health and nutritional status in tribal areas [4].

Table 4. Introduction of breed improvement programme (Murrah and Vanaraja)

Activities	Results obtained	Impact
Introduction of male murrah buffalo in cattle and vanaraja in poultry.	Due to the up-gradation of poultry breed, the productivity level (egg laying capacity - 120 to 150) was improved significantly. The buffalos started conceiving and the progeny was improved significantly (80%) as the male buffalo was introduced in the villages which do not have a male previously.	Due to the up-gradation of cattle and poultry breeds, the productivity level was improved significantly (conception rate to an extent of 33.33% in cattle and breed up gradation to an extent of 25% in poultry). Awareness was created among farmers (80%).

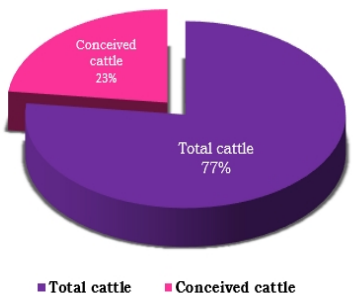

Fig. 3. Cattle conception

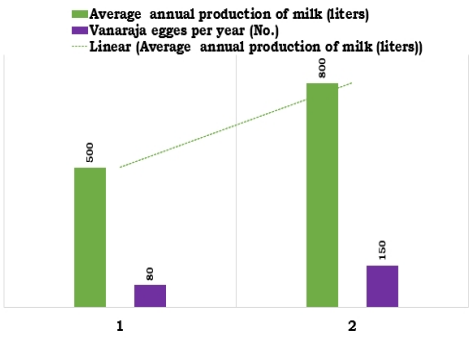

Fig. 4. Breed upgradation

The tribal farmers were well acquainted with the seed treatment, balanced fertilizer application and other advanced technologies for period of three years (2009-2012) which has improved the concept of seed village and thus seed multiplication was improved in tribal hamlets (Table 5).

Table 5. Paddy nursery management & field crop management

Activities	Results obtained	Impact
Application of carbofuran or phorate granules @1.5-2.0 kg/ha in paddy nurseries; treatment of paddy seedlings with carbendazim; micro-nutrient management (zinc application); seed village concept (2 villages); balanced fertilizer application; splitting the nitrogen fertilizer into three stages (basal, tillering and panicle formation).	Foundation seed was developed from breeder seed.	Breeder seed was multiplied by five progressive farmers and supplied to the village and hamlets.

The tribal diet is deficient both in macro and micro nutrients [6].The kitchen garden component in the farming system has reduced family expenditure and improved the family income & tribal diets as shown in Table 6. Inclusion of kitchen gardens in backyards will reduce the mal-nutrition of pregnant and lactating mothers in tribal societies [4].

Table 6. Nutritional security through backyard kitchen gardening, poultry, horticulture and animal husbandry

Activities	Results obtained	Impact
Front Line Demonstration (vegetables HYV-arka Vijay); vegetable seed (IIHR varieties); establishment of Kitchen garden; maize as Rabi crop.	Farming systems concept was popularized among the farmers.	Health and nutritional status of the tribal women and children was improved significantly. Disease incidence (scurvy, rickets, protein energy malnutrition, skin diseases) were reduced. Rs.6000/- p.a was supplemented towards family income.

Hill broom as a crop was readily accepted by the tribal farmers under podu cultivation. Income from other sources viz., labour works, collection of MFP, agricultural wage earnings form a major part of family income for tribals [6].This hill brooms seeds was supplied and cultivation was taken up by the marginal farmers and the family income was improved (Table 7).

Table 7. Need based programmes for rainfed upland agriculture

Activities	Results obtained	Impact
Supply of hill broom seedlings	Hill broom cultivation was found suitable for rain-fed areas.	Additional annual income of (Rs.5000/year) due to cultivation of hill brooms on hill-slopes.

The tribals depend on forests for food, fuel and fiber needs [9]. Non-timber forest produce place a very important role in the tribal economy. Bio-gas plants were established for the benefit of tribal farmers which has saved the expenditure on fire wood. The introduction of bio gas units have reduced the family expenditure on fuel consumption, pollution, health problems and drudgery (Table 8).

Table 8. Alternative fuel programme

Activities	Results obtained	Impact
Establishment of bio-gas plants	Farmers established three bio-gas plants in the villages. Introduction of bio-gas units reduced the family expenditure on fuel consumption, pollution, health problems and drudgery. Deforestation was minimized.	Fuel saved and expenditure reduced to an extent of Rs. 5000/year. Better waste management, resource recovery and environmental conservation were observed due to the introduction of bio-gas units.

Awareness, knowledge and abilities of the tribal farmers were improved significantly (80%). General awareness programmes have a tremendous impact in improving the knowledge content of tribal farmers [4].

3.3 To Conduct Need Based Extension Activities in Various Agro-Based Technologies

Awareness and knowledge of the tribal farmers were improved significantly with the set of technologies transferred through training programs (Table 9). Thus a set of agricultural technologies with focused objectives create qualitative and quantitative changes in socio-economic parameters [10]. On an average by introduction of all the technologies in the tribal hamlets, there is an improvement of annual family income from Rs. 10,150 – 15,550 in agriculture, Rs. 15,500 – 19,500 in horticulture, Rs. 9,500 – Rs. 18,500 in livestock management, Rs.5,500 – Rs.15,000 in poultry + kitchen garden + MFP components and thus a total annual family income increased from Rs.40,650 – Rs. 68,550 (Fig. 5). Thus percent of increase in income was achieved to an extent of 68.63%.

Table 9. Conduct of training programmes

Activities	Results obtained	Impact
Paddy nursery management, Backyard kitchen gardening, Field crop management in paddy, integrated nutrient management in paddy, integrated pest management in paddy, package of practices in blackgram, integrated pest management in cashew, health and nutrition education, inoculation of Rhizobium to pulse seed, azospirillium inoculation in jowar, seed treatment, pesticide application in cashew, value addition to Minor Forest Produce(MFP), fruit and vegetable processing, green manuring, vermi-compost making, kitchen gardening etc.,	About thirty five training programmes were organized to create awareness in improved agro-based technologies.	The yield, production and productivity of field crops were increased to an extent of 35%. The total annual family income of the tribal community was enhanced. The knowledge level and skills of the tribal farmers was improved significantly. Linkages with resource agencies were developed. The adoption rate was improved to 80% regarding the latest technologies.

Awareness and knowledge of the tribal farmers were improved significantly with the set of technologies transferred through extension activities (Table 10).

Table 10. Conduct of extension activities

Activities	Results obtained	Impact
Exposure visits, Kisan melas (massive awareness programme comprising a group of farmers followed by exhibition), Field days, Diagnostic visits, Method demonstrations, Publications in regional language.	The extension programmes have increased the awareness and knowledge content of the tribal farmers. The communication skills of farmers were developed.	Technical know-how in recent agricultural technologies was enhanced. The awareness was created among tribal farmers.

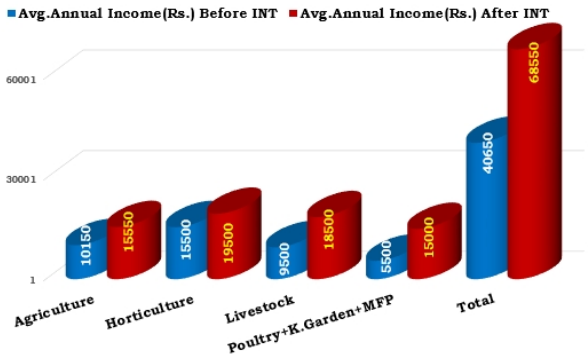

Fig. 5. Annual income of tribal families

- The farmers started adopting the need based improved technologies. The yield and productivity of the field crops were increased. The total family income of the tribal community was enhanced. The knowledge level and awareness of the tribal farmers were improved significantly. The crop productivity and family income level of the tribal families were significantly improved.

- The farmers have introduced kitchen gardening, horticulture and poultry to enhance farming system. The technologies introduced have intensified the existing farming system. Health and nutritional status of the tribal population in the adopted villages were improved significantly due to the implementation of backyard kitchen gardening.

- By the introduction of bio-gas units the family expenditure on fuel consumption, pollution, other associated health problems and deforestation were minimized.

- Low cost, improved farm agricultural implements were supplied and popularized. Improved agricultural implements have saved the drudgery and time. After introduction of drudgery reducing agricultural implements (dry land weeders, cono weeders, wind mill, pedal operated winnowing fans, adda leaf plate making machine), the occupational health hazards and drudgery of farm women were reduced to an extent of 50% and the farm efficiency was enhanced. The farmers acquired wide multiple skills in farm mechanization and the livelihood pattern was improved by implementing all the above technologies.

- An additional yield of 35% was recorded in paddy, over the local varieties. The seed village concept was popularized and the seed was multiplied. The paddy row seeder technique has saved the time and labour cost. The soil test based fertilizer application has improved the yields significantly.

- Due to the up-gradation of poultry breed, the productivity level (egg laying capacity – 150 eggs / annum) was improved significantly. The breed up-gradation in cattle was achieved to an extent of 23% in tribal villages and its surrounding hamlets. The fodder blocks and health camps have improved the milk yields.

- Need based, technologically sound and economically productive appropriate agricultural technologies were facilitated through conduct of training programs on

soil and water sampling procedure, soil test based fertilizer application, green manuring, INM and IPM technologies in paddy, blackgram, cashew, vegetables, jowar; backyard kitchen gardening, cattle health care, drudgery reducing agricultural implements, nutrition and health education, preparation of low-cost millet based recipes, value-addition to minor forest produce (adda-leaf plate making and amla products).

- The existing farming systems were modified and intensified by supplementing additional agro-based components for dealing the local problems and augmenting the family income of the tribal farm families. About 1200 kg/ha (35%) increase in paddy yield, 20% raise in black gram productivity, 30% improvement in cashew yields were observed. Breeds were up-graded; milk yields in cattle and egg laying capacity in poultry were enhanced. Thus the productivity level of the agro-based farming system was enhanced, net-returns were increased and an additional family annual income was gained after introduction of improved technologies in agriculture.

- Establishment of bio-gas plants and vermi-compost units helped in reduction of family expenditure on fuel consumption, and health problems of farm women. Homestead units were established to provide technical backup and marketing assistance in establishment of value added products viz., adda leaf plate making, hill brooms making, herbal powder making, post-harvest product management and MFP unit in order make the tribal youth self-reliant. Family income increase to an extent of Rs. 5000/-per season after introduction of homestead units.

- Various extension activities viz., Kisan Melas (massive awareness programme comprising a group of farmers followed by exhibition), method demonstrations, exposure visits and diagnostic visits were conducted from time to time in order to equip the tribal farmers with improved technologies and latest technological know-how. Awareness was created in adoption of technologies. The knowledge level and skills of the tribal farmers were enhanced significantly. A total of 35 training programmes, 22 front line demonstrations, 2 Kisan Mela, 11 field days, 15 diagnostic visits, 16 method demonstrations, were organized for 250 families among ten villages of two panchayats.

4. CONCLUSION

The proposed interventions in agriculture, horticulture, poultry, animal husbandry and value addition programmes have enhanced the knowledge, abilities, skills and income level of the tribal families by improving their living standards. A desirable change was brought in economic, social, health aspects of tribal farmers. Such type of inventions are required to improve the primitive groups and hence can be replicated in the similar situations. The project can be replicated by adopting same type of interventions through introduction of farming system in rural and tribal India.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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