Indian Farming **71**(10): 132–137; October 2021

Socio-economic upliftment of tribal farmers

through suitable agricultural enterprises integration in rice fallow pulse cropping system

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Keywords: Custom hiring centre, Kitchen gardening, Oyster, Protected cultivation, Rice fallow, SRI

Location and selection of area

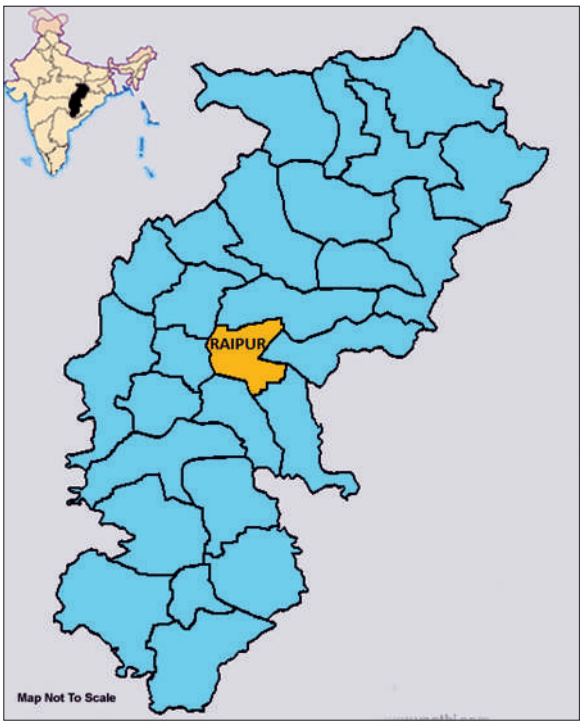
Baloda Bazar district in Chhattisgarh state was selected as study area for this Farmer FIRST project. Baloda Bazar, located at 30.67°N 82.17°E, is also called Cement hub of Chhattisgarh because there are many reputed cement plants. This town was very famous for its cattle market (*Bhaisa Pasra*) in the region, which still exists. Totally, 500 tribal farm families were selected from the cluster of 5 villages namely Kharaha, Bamhani, Kurraha, Kharri and Bakla of Baloda Bazar district.

Major agricultural issues in the study area

- Rice fallow lands (82% of land left fallow after *kharif*).
- Low production and productivity.
- Low level adoption of high yielding varieties.
- Unawareness of GAPs and modern management strategies.
- Lack of knowledge in plant protection measures and technical know-how.
- Shortage of valid and timely farming information.
- Lack of alternative livelihood options.
- Inability to do higher investment.
- Lack of marketing network.
- Shortage of skilled labour.
- Mono cropping (rice-rice-rice).
- Lace of awareness on conservation of biodiversity and importance in sustainability of homestead system.
- Subsistence nature of farming.

OBJECTIVES

- To study the existing rice fallow pulse cropping system, livelihood pattern, problem identification, priority setting, information need, perceived constraint and socio-economic profiling of the resource poor farmers.
- To augment the capacity building at field level for farmer-participatory research and extension in adoption and expansion of selected interventions on crop, livestock, horticulture and NRM based enterprises.
- To develop, establish and evaluate the sustainability of integrated livelihood generating farming models for resource poor rural farmers.
- To evolve suitable up scalable farm technologies for women farmers to address drudgery reduction, income enhancement and livelihood security.
- To develop and test the effectiveness of Educational Multimedia Training Modules (EMTMs) on biotic stress management technologies in rice fallow pulse cropping system.
- Research backstopping for further improvement of crop, livestock, horticulture, rice fallow pulse and NRM based enterprises for desirable traits preferred by the farmers and stakeholders.



INTERVENTIONS

Rice fallow pulses through zero tillage

Introduced and demonstrated improved low ODAP content varieties of–lathyrus (Prateek and Mahateoda), chickpea, lentil, black gram, linseed, and mustard, introduced happy seeder and aqua ferti seed drill. Capacity building programmes were conducted and four custom hiring centres were established. Chhattisgarh, traditionally known as the Rice

Bowl of Central India, has about 4.1 million ha under rice cultivation which is mostly rainfed, covering both uplands and shallow lowlands. Here, majority of the tribal farmers are still practicing the traditional methods of rice cultivation, resulting in low growth rate and productivity. To overcome the multiple rice production constraints in the state, rice-pulse cropping system is the ideal solution. The rice-pulse system reduces water requirements, increases land productivity, and promotes less reliance on artificial fertilizers, pesticides, herbicides, and other agrochemicals. Inclusion of rice-pulse cropping system can raise tribal household incomes, enhance soil fertility, and protect crops against climatic, pest, and disease stresses.

Outcome

In the first *rabi* crop in 2018, we covered 50 acres of rice fallow area, and harvested the sumptuous yield of lathyrus (4.48 q/acre) and chickpea (5.90 q/acre). The majority of the farmers adopted rice fallow pulses in *rabi*. In addition to that, the farmers have started the cultivation and seed production of improved variety, the rice farmers in the tribal area covered 52 acres (2019) and 25.50 acres (2020) respectively under cultivation. Farmers received an average B:C ratio of 3.26 and ₹ 29,006 income/ha from all the crops.

Establishment of custom hiring centres (CHCs)

Established five custom hiring centres (CHCs) in the remote tribal villages, created five farmers interest groups (FIGs) to operate the CHCs, and charges for the use of equipment are kept very nominal for maintenance purpose. Five CHCs were opened with the objectives to make available various drudgery reduction farm machinery / equipments to small, marginal and specially women farmers, offset the adverse economies of scale due to high cost of individual ownership, improve mechanization in places with low farm power availability and to provide hiring services for various agricultural machinery/ implements applied for different operations.

Outcome

- Farmers adopted zero tillage and conservation agriculture through happy seeder and aqua ferti seed drill.
- Performance increased in the farm operations and drudgery of the farm women reduced.
- Additional income generated by the tribal farmers.

Rice cultivation through SRI (System of Rice Intensification) technology

Farmers were practicing the traditional way of rice farming and facing problems like low production, high input cost, high biotic stress, and higher seed rate. To overcome this problem, we introduced SRI technology with needed inputs and technological supports, which gives higher yield in less input.

Outcome

Initially, we demonstrated in half hectare of land and received very good yield (21 q) and generated ₹ 31,850 net profit with 3.61 B:C ratio. SRI technology helped to reduce biotic stresses, input cost and increased production.

Goat farming with improved breed

Goat farming is an income-generating activity that has enormous potential to increase income and improve nutrition for resource-poor farmers, especially in remote tribal and ecologically vulnerable areas. Introduced improved goat breeds such as Jamunapari, Sirohi and Barbari and distributed to the tribal farmers. Five Farmer Interest Groups (FIGs) created and various training programmes conducted on scientific management of goat farming. In the FFP villages, we found that the monoculture cropping system (rice), lack of suitable breeds, lack of alternative livelihood option, resource-poor and subsistence farming, small landholdings and

seasonal migration were the major issues.

Outcome

Total 83 farm families benefited under the goat farming, and they generated ₹ 31,900/family in three years. Farmers improved their livelihood, standard of living and got alternate livelihood options at the village level. Overall, it helped to reduce seasonal migration of farmers. In addition, breed improvement programme also initiated.

Kadaknath farming cum hatchery unit

Farmers from the project site were rearing desi breed as backyard poultry farming for their home consumption only and more than 40% households migrated seasonally to other states due to lack of alternative livelihood options. Introduced and distributed Kadaknath chicks, created Kadaknath farming groups (KFGs), established five village level hatchery units, capacity building programmes conducted and created marketing linkage with local vendors. Kadaknath is a famous Indian chicken breed due to its unique nutritive value.

Outcome: Created alternative livelihood option, achieved average B:C 2.37, increased family's additional income, helped to reduce seasonal migration, enhanced nutritional security, covered more than 30 farm families, received average income of ₹ 48,613/family. Farmers gained confidence to start remunerative enterprise at village level. Further integration of hatchery unit helped to create self-sustainable model for the Kadaknath farming at remote tribal village, eliminated dependency on chicks from outside hatcheries.

Protected cultivation through low-cost poly house and shade net house

Introduced and installed one low-cost poly house and three shade net house (120 m^2 each) which were equipped with low cost fogging system, poly mulching and drip irrigation system, provided high quality seeds from IIHR, TNAU and NSC and training provided on production technologies. In the traditional way of vegetable farming, low production and high biotic and abiotic stress was the major problem for vegetable growers. Poly house technology helped farmers to raise healthy nursery in scientific manner that makes healthy crops with high yield. This technology breaks the seasonal barrier for the crops and gives quality produce. For the efficient use of water and nutrient, and to save input cost, low-cost drip system and poly mulching was introduced. In the protected horticulture, there are less chances of crop loss or damage, can grow crops throughout the year and will not have to wait for any particular season, less pests and insects in a poly house, climate will not have any impact on the growth of crops and the quality of produce will be obviously higher in poly house. It gives 4-8 times more yield as compared to farming done in open field.

Outcome

Farmers had grown various high value crops such as cauliflower, capsicum, chili, yard long bean, cucumber, watermelon and strawberry, and received very good yield, generated income of ₹ 12,890/ farm family in the 120m^2 area. This technology reduced cost of production, low biotic and abiotic stress, received good quality produce and drip system with poly mulching saved the cost of weed management, water, time and labour for the irrigation.

Nutritional kitchen gardening

Provided high quality and improved vegetable seeds from IIHR, TNAU and NSC, training provided on the package of practices and management of vegetable crops, and introduced and installed low-cost modern nutritional terrace gardening with grow bags and low-cost drip irrigation system. Nutritional security is one of the important issues in rural areas, people were totally dependent on the market to procure vegetables and fruit; this dependency affects their economy and family budget. To provide options for the nutritional security, we had promoted households for nutritional home gardening and introduced and established modern nutritional terrace gardening units, with grow bags and drip system, and for this not much technology and modern briefings are required for the establishment and management of a terrace garden. Production of fruits and vegetables at home provides direct access to important nutrients and it saves money, nutritional garden provides fresh and healthy vegetables for the day-to-day use.

Outcome

Farmers of the tribal areas were highly benefitted by the nutritional gardening. Average production 245 kg/year vegetables per unit per family was recorded and saved ₹ 6,500 in the family budget. Modern terrace gardening is very easy and convenient to manage the crop, nearby farmers showed their interest to establish this unit.

Scientific vegetable cultivation

Introduced improved vegetable seeds and planting materials from IIHR, TNAU, NSC and IGKV, established low-cost drip system and poly mulching, demonstrated plant protection measures and organized capacity building programmes on scientific technologies. Vegetable farming is the major income source of Indian farmers and it is a very profitable business. Most of the farmers have adopted the traditional ways of farming which give very less or marginal profit. Scientific vegetable cultivation practice helped farmers to fetch more income and productivity. Vegetable growers were facing problems like - low productivity, lack of good planting materials, high biotic and abiotic stress, higher input cost, lack of suitable varieties and low technical know-how knowledge. To overcome this problem and improve the livelihood of tribal farmers, we had intervened the scientific vegetable cultivation technology to the tribal vegetable growers.

Outcome

- More than 110 farmers covered under the scientific vegetable cultivation.
- Farmers received very good yield from the improved varieties.
- Drip system with poly mulching helped a lot, it saved water, time, labour for the irrigation and the cost for weed management.
- Generated average income of ₹ 7,500/farm family with 2.31 average B:C ratio from the small area.

Agro-processing centres and value addition of agro-products

- Established four agro-processing centres (APCs) with mini rice mill, pulveriser, mini flour mill, PKV dal mill, mini oil expeller machine and spice grinding machine.
- Provided training on the operation and management of processing units.

The concept of the agro-processing centre (APC) is to process the grains and spices at the village level to substantially enhance the income of the farmers. These agro-processing complexes were technically feasible, economically viable and socially acceptable models. FFP site is located at a remote location and there were no proper facilities available for the processing of agro-products, hence the APCs helped the farmers to generate income at the village level. This initiative highly helped the landless and small farmers, as easily operated by farm women and generated employment at tribal villages.

Outcome

In this initiative, total 12 farm families benefited and generated income of ₹ 12,155/unit per family in a year at the village level, women empowerment and livelihood generation, farmers are getting quality products, reducing post-harvest losses, employment to rural youth and achieving diversification concept in agriculture besides improving the economic and social status of farmers.

Oyster and paddy straw mushroom production

Introduced and established four model mushroom production units and hands-on training on mushroom production was given. Mushroom is a wholesome food for all age group because of its nutritional and medicinal properties. Chhattisgarh has a great scope for commercial mushroom cultivation by recycling paddy waste for higher income generation. It can cater to the growing food demand; solve unemployment issues and environmental pollution to a significant extent. The cultivation practice of oyster and paddy straw mushroom is very simple and economical in rural areas where raw materials and facilities required are easily available. In the FFP villages, paddy straw burning, lack of alternative livelihood options and employments for the farm women and rural youth were the major challenges. Mushroom production helped them for employment and nutritional security.

Outcome

- Best utilization and income generation from the waste paddy

straw.
- Employment generation for farm women and rural youth.
- Highly nutritive and high value produce.
- Farmers received income of ₹ 12,500 with the 3.66 B:C ratio from each unit in the three months.

Low-cost azolla production

Azolla is an excellent alternative to concentrates/ fodder/feed, thereby providing a sustainable feed for livestock. It contains most of the nutrients which are required for all classes of livestock, including poultry and fish. Low-cost azolla production units with polythene sheet were demonstrated and training organized. Azolla improved the weight of chicken and increased the egg production in layers. In the FFP villages after the introduction of goat and Kadaknath poultry, availability of feed was the major challenge among the stakeholders and most of the farmers were economically weak and were unable to purchase quality poultry and goat feed. To ensure feed availability in a less investment, we had introduced and demonstrated azolla with low-cost technology.

Outcome

In a short period of time, it became popular among the farmers and they established more than 47 azolla production units. This technology requires less investment and management, easy to establish and does not require any special expertise. Now farmers are producing sufficient quantity of azolla and feeding to their cattle, goat and poultry. Most of the farmers were economically weak and were unable to purchase quality poultry and goat feed. They found azolla as an excellent alternative feed and thereby saved 20% cost on poultry feed. Integration of the azolla tank with poultry shade is a very good and successful model at the tribal villages. A single azolla unit received 3.65 quintal azolla/year and generated income of ₹ 3,030/farmer.

Agricultural film shows (AFSs)

Agricultural film shows were organized on various agricultural technologies like rice production, poultry farming, azolla production, pest and disease management, mushroom production, goat farming, poultry farming and high-tech horticulture at the FFP villages. Tribal farmers have low knowledge level, lack technical know-how and motivation and they were practicing the traditional way of farming. Agricultural film shows (AFSs) is a very effective way to improve farmers' knowledge, multimedia creates interest among the farmers, and they can easily understand and implement the technology. To improve the knowledge of tribal farmers, we had initiated the AFSs and found improvement in the farmer's knowledge and innovativeness.

Outcome

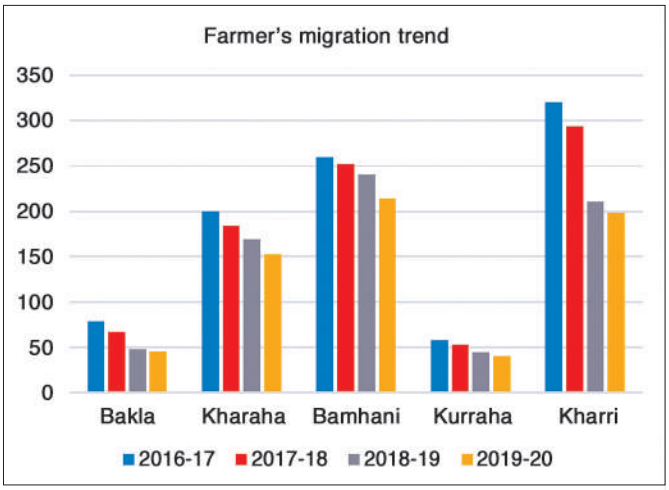
Total 19 agricultural film shows organized and more than 1125 farmers actively participated, and gained knowledge about the latest and modern agricultural technologies, awareness created and popularize many agricultural interventions. We conducted a knowledge test and found that farmers gained more than 35% additional knowledge on agricultural technologies.

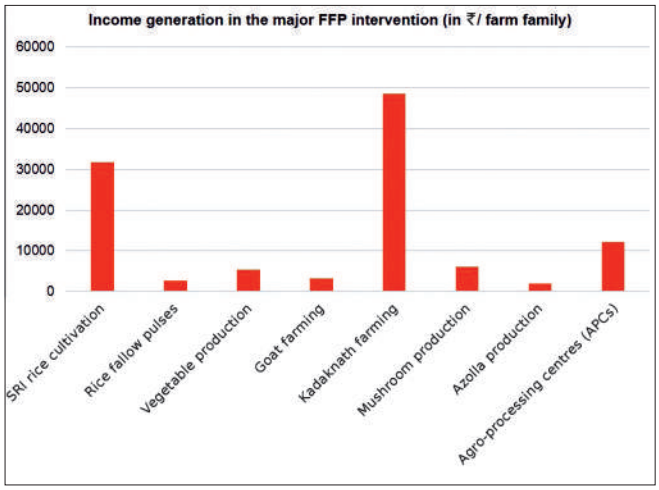
Farmer communication centres (FCCs)

- Two farmers communication centres (FCCs) established at the FFP villages, which covers all nearby villages.
- We have trained rural youths to operate these communication centres.
- Established a computer system with internet connectivity, printer, projector, video CDs and kept agricultural literature and displays. Online video-conferencing facility

Impact of FFP

Significant achievement of project	Successful interventions of FFP
• 2 Farmer communication centre (FCCs) established	• SRI rice cultivation (B:C - 3.619)
• 5 Custom hiring centre (CHCs) established	• Rice fallow pulses (B:C - 1.031)
• 52 technological interventions introduced and sustained	• Vegetable production (B:C - 3.226)
• 7 Agricultural enterprises units established	• Goat farming (B:C - 1.130)
• 86 Capacity building programme organized	• Kadaknath farming (B:C - 2.370)
• 92 hectare of rice fallow covered with pulses	• Mushroom production (B:C - 3.735)
• 26% of farmer's seasonal migration reduced	• Azolla production (B:C - 5.280)
• Cropping intensity increased by 120% (20% additional)	• Agro-processing centres (APCs) (B:C - 2.670)
• ₹ 97.74 lakhs of additional income generated	
• 6 structures (Polyhouse and poultry shed) established	
• 4 agro-processing centres established	
• Women farmers empowered: 232 (38%)	
• Youth farmers attracted towards agriculture: 74 (12%)	
• 2 Farmer producer groups (FPGs) created	
• 10 Farmer interest groups (FIGs) formed	
• 1 Self-help group formulated	





established for the conversation with the expert scientists. The public extension system requires a paradigm shift from top-down, blanket dissemination of technological packages, towards providing producers with the knowledge and understanding with which they solve their own location-specific problems. In this way, we established two FCCs to solve the issues raised by farmers instantly and provide need-based information on various agricultural technologies on a continuous basis. Farmers facing problems such as lack of advisory services and information sources at the village level, low knowledge level, lack of technical know-how and motivation, FCCs helped them to provide need-based information at village level.

Outcome

- More than 625 farmers visited and got solution to their problems and became aware about latest agricultural technologies.
- Total 8 farmers-scientist interface organized and 112 farmers benefitted.
- Farmers got confident to access latest and useful information related to the day-by-day agricultural practices at village level.

TRAINING

Trainings were conducted in the field of low-cost azolla production technology (9), hatching of kadaknath eggs and management of new chicks (4), plant propagation technologies (2), multiplication and application of waste decomposer (2), processing and value addition of agro produce (3), scientific kadaknath farming (4), scientific nursery raining technology (3), paddy straw mushroom production (2), oyster mushroom production (5), nutritional kitchen gardening (4), eco-friendly pest management technologies (6), scientific goat farming (2) and scientific vegetable production (6).

Drawback	Solutions/strategies to overcome
Limited funding per farm family	• Used group approach • Convergence with TSP/SCSP
Year wise extension of project duration	• Introduced short time intervention which can produce additional income within a year
Limited budget under works	• Used local resources to establish physical/civil structures to support interventions
Limited project manpower	• Involved and encouraged youth farmers to support the project activities

LESSONS LEARNT

- Group approach is highly suitable under resource poor condition.
- Small scale technologies are more suitable to generate additional income of tribal farmers.
- Involvement of local/farmer's resources creates more involvement of farmers in the project activities.
- Low-cost technologies are having more acceptance and adoption.
- Farmer communication centres helps the farming community to get updated farm information at their doorstep.
- Small scale agro processing centres has contributed farmer's additional income throughout the year.
- Kadaknath hatchery units helped the farmers to sustain their production cycle to get more profit.

WAY FORWARD

- Promoting rural entrepreneurship to sustain the farm income.
- Scale-up of small scale agro-processing unit will help to reduce the seasonal migration of the farmers.
- Increased capital accumulation with low-cost innovations to empower the small and marginal farmers in the resource poor rural settings.
- The rural development projects should combine with infrastructure development, education, investment in agriculture and the promotion of rural non-farm activities where rural women and youths can engage themselves.
- Combine efforts on rural development and rural entrepreneurship is the way of converting developing country into developed nation.
- Farmer producer group approach will create the employment opportunity in the rural areas which will reduce the disparities between the rural and urban agriculture.

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