



Technological interventions

for doubling farm income: An analysis of Farmer FIRST approach

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Farmer FIRST is a new ICAR programme aimed to move beyond the production and productivity, to privilege the small holder agriculture and complex, diverse and risk prone realities of the majority of the farmers through enhancing farmers-scientists contact. NIANP started a FFP project from November, 2016 in a cluster of 3 villages of Doddaballapura taluk, Bengaluru rural, Karnataka, which consists of 500 households. In this study, assessment has been recorded between farmer practices before the technological interventions and after the interventions. The average annual net income of the farmers increased due to the combination effect of mineral nutrition, mastitis kit, vegetables, fodder, fertility management, ragi and pigeon pea crops and cow mats for lameness management.

Keywords: Farm income, Fertility management, Mastitis, Technology impact assessment

AGRICULTURE sector remains the largest sector, providing means of livelihood. Karnataka is one of the leading states in plantation and garden crops in the country. Average land holding size in the Karnataka state is 1.55 hectares which accounts for about 6% of the total area and 5% in the production of food grains in the country. Food grain area under irrigation is 28%. Karnataka state has a total bovine population of 11.45 million (Cattle-8 million and Buffalo-3.45 million), sheep populace is around 11.1 million, while goat is about 6.17 million, pig about 0.32 million and poultry is about 74.3 million.

The agriculture and dairying have witnessed a quantum jump in production through various extension approaches. The Farmer FIRST (Farm, Innovations, Resources, Science and Technology) programme aims at enriching farmers-scientist interface, technology assemblage, application and feedback, partnership and institutional building and content mobilization which has been initiated since October, 2016. It seeks to provide a platform to farmers and scientists for creating linkages, capacity development, technology adaptation and application, on-site input management, feedback and institution building.

Under the farmer FIRST programme (FFP) of ICAR, NIANP had undertaken the project entitled "Improving livelihood security of farmers through technological interventions for sustainable livestock farming".

Combination of different technological interventions were used to see the enhancement of income of farmers under FFP.

Impact assessment of technological interventions

The NIANP institute is working in the adopted villages through Farmer FIRST Project (FFP) with focus on livestock technologies like mineral nutrition, reproduction management and quality milk production so as to enhance income of farmers. Under the Project, 500 households in a cluster of 3 villages in Doddaballapur taluk, Bengaluru rural district, Karnataka have been adopted. The technology interventions were arrived at after thorough interaction and need assessment from among the farmers. Apart from livestock technologies, crop, horticulture and NRM technologies are implemented as diversification for income enhancement. Farmer's practices (traditional farming methods) prior to technological interventions under the project are listed below:

- 40% of farmers fed mineral mixture, only for milking animals. Heifers were not fed with mineral mixture.
- Only 19 out of 500 farmers produced the green fodder. Others purchased fodder from nearby villages and fed only the available quantity at available times. Most farmers fed dry straw of finger millet every day.
- Affected animals were subjected to curative

treatment of mastitis, usually at a cost of ₹1250/month. Each time the loss of milk was to the tune of 40–50 litres/month (₹1000–1250 /month).

- Cement floor/stone slabs/mud floor without good drainage led to the issue of laminitis in animals. Only 74 households used cow mats.
- Services of veterinary doctors were used for AI and repeat breeding was a major challenge.
- Low yielding varieties of ragi and pigeon pea were commonly cultivated. Pigeon pea grown had a yield of 10 q/ha and ragi varieties yielded 25 q/ha.
- Varieties of vegetables from private companies were being cultivated at higher seed cost. Pest/disease tolerance was not a criteria for selection of varieties and seeds.
- Hand milking was the most common practice. Unhygienic milking hands and utensils were the source of infection for mastitis. Milking machine was used by none.

Project interventions

Major interventions, extent of coverage and cost of intervention under the Farmer FIRST programme are listed in Table 1. The following project interventions were introduced in various areas such as:

- Mineral mixture: NIANP developed area specific mineral mixture was fed to milch animals @50 g/cow/day for 6 months for 120 animals. Later farmers continued the same at their own cost.
- Fodder: Seeds of CoFS 31, Sesbania and Agathi were distributed to farmers having irrigation facilities. Three fodder nurseries were developed in the field.
- Mastitis kit: California Mastitis Test kit along with SOP and required training was provided to all farmers.
- Lameness management: Protocol with cattle shed flooring using cow mats along with supplementation of trisodium citrate @10 g/day for a month was provided to the farmers.
- Fertility management: Heifers were unfed, for which supplemental feed along with fertility management protocol of injection AD3E 10 ml I/M, Tonophosphan 10ml I/m, were administered for anestrus and for repeat breeding issue Tonophosphan 10 ml I/M, Inj: AD3E 10 ml, Inj: Receptal 1 ml I/M and advised for Oxytetracycline intra-uterine wash. Special supplemental feed along with a vitamin treatment was given to heifers for bringing them to early puberty.
- Finger millet and pigeon pea: Improved varieties of ragi ML 365 and pigeon pea BRG 5 were introduced. BRG 5 has a yield of 15–16 q/ha and is wilt resistant. ML 365 has a yield of 35–36 q/ha and has a better straw yield.

I. Income change from Intervention group I (mineral nutrition, mastitis kit and cow mats) during FY 2017–21

The average annual net income of the 151 farmers increased from ₹72689 in March 2017 to ₹143789 in March 2021 due to the combined effect of mineral

Table 1. Major interventions, extent of coverage and cost of intervention

Intervention	No. of house-holds covered	No. of animals or area	Additional critical input cost (₹)/Year
Mineral nutrition	353	455 animals	840 / animal
Mastitis kit	500	666 animals	1260 / animal
Cow mats	434	589 animals	1860 / animal
Fodder COFS-31/ Hydroponic fodder/ Azolla	224	261 acres	300 /acre
Fertility Management (Special Feed/Vitamin supplementation/ Hormonal injection)	55	79 cows	3300 / animal
Ragi ML-365/Pigeon pea BRG-5	77	114 acres	400 /acre
Vegetables (IIHR Varieties)	125	203.5 acres	-
Milking machine	5 (82 animals)		

nutrition, mastitis kit and cow mats (Table 2). Following are the contributing factors:

- Mineral mixture feeding led to increase in milk yield, milk fat content and reproductive performance of the animal.
- Use of mastitis detection and treatment kit reduced the incidence of sub-clinical mastitis by 37% (71 out of 192 cows got benefitted). The overall milk quality (reduction in somatic cell count in milk) improved by 50% over 3 years period.
- Additional income through milk yield increase- @1.0 litre/day/animal- ₹9000 by feeding mineral mixture.
- Cow mats resulted in correction of infertility issues in 55 animals, who got conceived, leading to an additional gain of average 300 milch days.
- Gain due to mastitis, ₹15000/animal/yr, 5 days milk days and reduction in veterinary expenses ₹9000/ animal/yr. Total income by the introduction of mastitis kit is ₹24000/yr.
- Net income by introduction of cow mats, ₹34800/yr due to reduction in veterinary expenses, correction of reproductive issues, time and drudgery reduction in cleaning.

II. Income change from Intervention group II (fodder, mastitis kit and cow mats) during FY 2017–21

The average annual net income of 147 farmers, increased from ₹118147 in March 2017 to ₹214356 in March 2021 due to the combined effect of fodder, mastitis kit and cow mats. Usage of cow mats by farmers increased from 93–247, few of them procuring the cow mats on their own after seeing the positive results of the intervention. Following are the contributing factors:

- Reduction in fodder procurement cost ₹25200/yr/ animal and added return to household by selling

Table 2. Summary of changes in gross income due to technology interventions

Intervention group	No. of households	Gross average income ₹ (2016)	Gross average income ₹ (2021)	Gross additional income over the period ₹	Per cent (%) increase in gross income
Mineral nutrition + mastitis kit + cow mats	151	72689	143789	71100	98
Fodder + mastitis kit + cow mats	147	118147	214356	96209	81
Ragi/pigeon pea + fodder + mineral nutrition + mastitis kit + cow mats	77	171398	312678	141280	82
Vegetables + mineral nutrition + mastitis kit	66	197892	323459	125567	63
Vegetables + mineral nutrition + mastitis kit + cow mats + fertility management	55	260083	543670	283587	109
Average		164042	307590	143549	88

fodder ₹27900/yr/animal by spending ₹5700/yr/animal on cultivation, transportation, etc.

- 3 fodder and 4 tree fodder nurseries were developed at the village for onsite production of quality fodder slips and saplings. In total hydroponic fodder and Azolla unit reduced the cost of feeding giving net returns of ₹3,000 (market value of extra green fodder produced).

III. Income change from Intervention group III (ragi/pigeon pea, fodder, mineral nutrition, mastitis kit and cow mats) during FY 2017–21

The average annual net income of the 77 farmers increased from ₹171398 in March 2017 to ₹312678 in March 2021 due to the combined effect of ragi/pigeon pea, fodder, mineral nutrition, mastitis kit and cow mats. Average net return of ragi variety (ML-365, ₹30,000/ha) was greatly increased as compared to local variety (₹14,000/ha). Pigeon pea variety (BRG 5) increases crop and stover yield compared to local variety.

IV. Income change from Intervention group IV (vegetables, mineral nutrition and mastitis kit) during FY 2017–21

The average annual net income of the 66 farmers increased from ₹197892 in March 2017 to ₹323459 in March 2021 due to the combined effect of mastitis kit, mineral nutrition and vegetables. Following are the contributing factors:

- Change of farm income from ₹37,000 of ragi crop/ha/season to ₹92000 of onion, ₹81000 of ridge gourd, ₹96000 of tomato and ₹1.2 lakhs from drumstick crop.
- On site nursery for seedling production of vegetables was established and 3 rural youths were attracted towards seedling production in the village.
- Increase in area under vegetables from 2.5 acres to 12.5 acres in onion, tomato and drumstick.

V. Income change from Intervention group V (fertility management, vegetables, mineral nutrition, mastitis kit and cow mats) during FY 2017–21

The average annual net income of the 55 farmers

increased from ₹260083 in March 2017 to ₹543670 in March 2021 due to the combined effect of cow mats, mastitis kit, mineral nutrition, fertility management and vegetables. Out of 114 animals diagnosed with reproductive disorders, 106 cases were resolved in one time treatment i.e. 90% of the repeat breeding and anoestrus disorders solved in single intervention. As one missed cycle is equals to 21 milk days of an animal and causes calf loss of ₹6,000. One early calving led to additional gain of average 300 milch days.

There was an average 124% income change in small farmer category and 34% income change in medium farmer category and 75% income change in large farmer category with the help of technical interventions over the period of 2016–2021. Apart from that, income of women farmers increased by 155%, women had better access to technology and their adoption level of technologies and social participation also increased over the period. The overall milk production in the area increased by 61% over 2016–2021 as a result of technology interventions.

SUMMARY

The total area of 869 ha was under the FFP, directly and indirectly through livestock, poultry, procurement of farm products, outreach programmes through linkages and convergence with FFP team. Adoption of FFP led to an average 4 times increase in area under fodder crops. About 59% of farmers adopted mastitis management protocols, which led to a reduction in mastitis incidence by 56%. It was observed that there was 69% of technology adoption across interventions. The area under vegetables increased by 3 times and a 1.5 times increase in farm income was observed by changing crops. During the period, an average 61% increase in milk production was reported in the study villages and an average 88% gross income increase across different technology interventions.

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