



# Enhancing productivity and income

## of small farmer through new varieties and precision farming

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*Farmer FIRST Programme (FFP) which aims at enhancing the production, productivity and income of farmers through farm family approach was implemented in a cluster of 6 villages, where seeds of high yielding, disease resistant varieties and improved production technology were introduced in field crops - ragi, redgram and field beans. In vegetable crops, multiple disease resistant and high yielding hybrids along with precision farming were introduced, e.g. in tomato and chilli crops. All these interventions led to good socio-economic and technological impact among all the adopted farmers. Mr. Krishna Naik, a progressive farmer from Vasappanadoddi FFP village, used to get annual net-income of ₹1,86,580 from ragi, redgram, tomato, chilli and other crops, before the FFP was started. With doubling farmers' income (DFI) interventions, the farmer is getting an annual family net-income of ₹6,68,420 and saving ₹2,21,840 per annum. Along with the synergy programmes, these technological interventions spread extensively to enhance productivity and income of farmers.*

**Keywords:** Income, Precision farming, Productivity, Vegetable crops

**A**GRICULTURE has been the primary occupation of a large population of many villages in the country. More than two-third of Indian population directly or indirectly depends on Agriculture and allied sectors of agriculture like animal husbandry, horticulture, agro-based industries etc for their livelihood. Share of agriculture and allied sectors in gross value added (GVA) of India at current prices stood at 17.8% in FY20. The Economic Survey of India 2020–21 report stated that in Financial Year (FY) 2020, the total food grain production in the country was recorded at 296.65 million tonnes (up by 11.44 million tonnes) compared with 285.21 million tonnes in FY19. However, as per the estimates of Indian Council for Agricultural Research (ICAR), demand for food grain would increase to 345 million tonnes by 2030.

Agricultural development has received the highest priority in the programmes of planned changes and generating higher income with adequate employment opportunities for the rural mass by maximizing the productivity, not only in the field of agriculture but also in the allied and off-farm enterprises with the special emphasis on animal husbandry, small scale agro-based industries and rural handicrafts through proper identification and development of indigenous knowledge and traditional skills.

Farmer FIRST Programme (FFP) aims at enhancing the production, productivity and income of farmers through farm family approach in addition to integrating various enterprises in the farm and ensures recycling of farm wastes utilizing all the available resources. It also aims at working out appropriate combinations of farm enterprises, resources, practices and methods to achieve higher productivity and net-income of the far families. Various subsidiary enterprises like horticulture, crop husbandry, dairying, poultry, apiculture, sericulture, fisheries etc have to be combined by involving farmers in planning, implementation and evaluation of production plans to register a significant impact in terms of improving the standard of living in addition to higher and sustained income to the rural poor. In this direction ICAR-IIHR, Bengaluru implemented the Farmer FIRST Programme in a cluster of six villages of Kanakapura taluk, Ramanagara district, Karnataka for holistic development of the farm families in these villages through integration of technologies in multiple enterprises and various institutions.

The project was implemented in a cluster of 6 villages, viz. Vasappanadoddi, Yerumgere, Balepura, Kebbedoddi, Chikalegowdanadoddi and Hosadurga. The project villages were located in Ramanagara district

of Karnataka state which has an average rainfall of 1324 mm. Complete land and soil inventory was made through soil survey work by NBSS and LUP, Bengaluru in all the selected villages to understand various geo-physical and bio-chemical properties of the soil, which showed that major soil type found in all the villages is sandy loam. Soil survey also helped us in planning INM strategy in different crops and in land use in terms of crop suitability in different FFP villages, which were largely practicing dry land farming in resource poor condition, having less knowledge of improved varieties and technologies in agriculture.

Through Participatory Rural Appraisal (PRA), identification and prioritization of problems in different agriculture and horticulture based entrepreneurs was undertaken for planning and implementation of different technological modules. To provide effective solutions to these problems, in all the selected cluster of six villages, many field based extension programmes were undertaken, including demonstration in farmers' field, during which all the essential critical inputs were supplied along with complete technical guidance. Farmers were also equipped with the essential knowledge and skills for adoption of these innovations.

### Intervention

Many technological interventions were planned in the FFP villages, with an objective of enhancing the yield, quality, productivity and income of farmers. Based on the situational analysis, it was felt by the farmers that there was a need for introduction of suitable varieties and production techniques in field crops. To cater the felt needs of farmers, large scale technological interventions were implemented in all the FFP villages, through 1) supply of seeds of improved varieties/hybrids in field, horticultural, and fodder crops, 2) supply of essential and critical inputs required for adoption of innovations, 3) organizing capacity building programmes for different clientele groups and 4) institutional support programme from different developmental departments (agriculture, horticulture, animal husbandry and veterinary services, watershed development etc) at village level.

As a part of introduction of holistic package of technological interventions which includes improved varieties of seeds of major field crops such as blast

resistant, high tillering, high yielding varieties, viz. KMR-301, ML-365, GPU-67, MR-1 and MR-6 in ragi crop; redgram varieties which are wilt and drought resistant and suitable for dryland farming like BRG-1, BRG-2, BRG-3, BRG-5; viral disease resistant varieties of field bean, viz. HA-3, HA-4, round the year suitable, dual purpose (seed and vegetable purpose) also, were introduced. Further, micronutrients, bio-fertilizer and bio-pesticides and few plant protection chemicals were also provided to the farmers at different stages of crops to facilitate complete adoption of holistic production package, which in turn resulted in increased yield, productivity, quality and income in all three field crops. Range of yield in ragi increased from 27 q/ha (before FFP) to 57.50 q/ha, in redgram it was 3.25 q/ha (as intercrop only, before FFP) to 7.00 q/ha, in field beans it was 4.0 q/ha (as intercrop only, before FFP) to 5.0 q/ha after FFP programme.

Introduction of tomato hybrids of Arka Rakshak and Arka Samrat of ICAR-IIHR, Bengaluru lead to average yield of 77.55 tonnes/ha compared to 45.0 tonnes/ha yield of local varieties/other private company hybrids like Shivam and Abhinav. Introduction of disease resistant hybrids like Arka Haritha and Arka Meghana in chilli led to higher yield i.e. 36.325 tonnes/ha compared to 21.0 tonnes/ha yield with farmer varieties like Kadaroli and Sankeshwara, in addition to other private company hybrids. Precision farming package was introduced under FFP in tomato and chilli crop, which included use of mulch sheet, drip irrigation, fertigation, micro nutrient application, integrated management of pests, diseases, nutrients, and was completely adopted by the farmers along with new hybrids. This holistic production package with disease resistant hybrids and precision farming helped all the farmers to discontinue practice like flood irrigation, use of local varieties/disease susceptible hybrids in vegetables and they were able to maintain the optimum soil moisture condition throughout the crop period.

Arka Rakshak and Arka Samrat hybrids are very high yielding, have very good shelf life of >10 days and resistant to three diseases such as Bacterial wilt (BW), Tomato leaf curl virus (TLCV) and Early blight (EB). Increase in crop yield by 2.3–3 times, was mainly due to these multiple reasons (triple disease resistance) ; good



Mr. Krishna Naik in ragi field (variety ML-365)



Field view of triple disease (TLCV, EB and BW) resistant hybrid-Arka Rakshak of tomato

**Table 1.** Summary of performance of all these crops

| Particular                                   | Description                                                                                                                                                                                                                                                                   |                              |                           |                                          |                    |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------|------------------------------------------|--------------------|
| Farmer's name                                | Mr. Krishna Naik (57)                                                                                                                                                                                                                                                         |                              |                           |                                          |                    |
| Agri enterprises                             | Field crops, Horticultural crops, Dairying                                                                                                                                                                                                                                    |                              |                           |                                          |                    |
| Size of landholding                          | 3.5 acres                                                                                                                                                                                                                                                                     |                              |                           |                                          |                    |
| Technologies of ICAR-IIHR, Bengaluru adopted | Year of adoption: 2016–17<br>Field crops: New varieties in Ragi, Redgram, Field beans<br>Horticultural Crops: Tomato, Chilli, French beans, etc<br>Other technologies: Precision farming in vegetable crops (Mulching, Drip irrigation, Fertigation, IPM, IDM, INM, good PHM) |                              |                           |                                          |                    |
|                                              | Crop                                                                                                                                                                                                                                                                          | Varieties/<br>Technology     | Area<br>covered<br>(acre) | Yield                                    | Income<br>(₹/acre) |
| <i>Horticultural crops</i>                   |                                                                                                                                                                                                                                                                               |                              |                           |                                          |                    |
|                                              | Precision farming<br>in Tomato                                                                                                                                                                                                                                                | Arka Rakshak,<br>Arka Samrat | 2<br>2                    | 45 tonnes/<br>acre<br>48 tonnes/<br>acre | > 3.60<br>lakhs    |
|                                              | Precision farming<br>in Chilli                                                                                                                                                                                                                                                | Arka Meghana,<br>Arka Harita | 0.5                       | 16.50 tonnes/<br>acre                    | 2.40<br>lakhs      |
|                                              | French beans                                                                                                                                                                                                                                                                  | Arka Sharath                 | 0.5                       | 6.0 tonnes/<br>acre                      | 1.35<br>lakhs      |
| <i>Field crops</i>                           |                                                                                                                                                                                                                                                                               |                              |                           |                                          |                    |
|                                              | Ragi                                                                                                                                                                                                                                                                          | MR-6, ML-365,<br>GPU-67      | 2                         | 26 quintal/<br>acre                      | 0.78               |
|                                              | Red gram                                                                                                                                                                                                                                                                      | BRG-3 and<br>BRG-5           | 1                         | 4.6 quintal/<br>acre                     | 1.60               |
|                                              | Field beans                                                                                                                                                                                                                                                                   | HA-3, HA-4                   | 0.5                       | 4.6 quintal/<br>acre                     |                    |
|                                              | Mango                                                                                                                                                                                                                                                                         | IPM, IDM, INM                | 1                         |                                          |                    |

fruit weight of 72–78 g per fruit, with good keeping quality of 10–12 days from harvest; and adoption of holistic precision farming package. On-site production of seedling or regular supply of good quality vegetable seedlings was established to ensure disease free and healthy good quality seedling in the village. Good packaging and other post-harvest management practices for quality management and easy marketing of fruits even for long distance market were introduced under FFP.

From ICAR-IIHR package, farmers were able to maintain the optimum soil moisture condition throughout the crop period. Since, Arka varieties of chilli such as Arka Meghana, Arka Harita are resistant to powdery mildew disease and tolerant to sucking pests (thrips) with good keeping quality upto 5–7 days after harvesting, led to increase in yield, quality, market demand and higher price, leading to increased additional net income from ₹1,92,238/acre with old package to ₹4,50,472 per hectare per crop with new Arka chilli hybrids and precision package in chilli. Same was the case of adoption of French beans varieties (Table 1).

**Impact:** Mr. Krishna Naik was the first farmer under FFP to adopt tomato hybrids of the institute and got yield of >45 tonnes/acre and became a motivator for the neighboring farmers to use our hybrids, which led to horizontal spread of these varieties and hybrids.

His family income was doubled in a span of 2 years, since then he started adopting ICAR-IIHR technologies regularly. He has obtained district level award for the highest ragi yield (26.5 quintal/acre) from transplanted crop during 2020–22.

### SUMMARY

Mr. Krishna Naik of Vasappanadoddi FFP village, used to get an annual net-income of ₹1,86,580 from growing ragi, red gram, tomato, etc before FFP implementation with low yield due to use of local varieties, higher infestation of pest and diseases, increased labour cost, micronutrient deficiency etc in field crops and additionally multiple diseases in tomato and chilli. With DFI interventions like introduction of high yielding and disease resistant varieties in field and vegetable crops along with adoption of precision farming in tomato and chilli, he is getting an annual net-income of ₹6,68,420 in 2021–22, when compared to ₹94,000 during 2016–17. Additionally, there is cost saving of ₹2,21,840 in the production of tomato and chilli, due to savings in input and labour cost. He has been an inspiring link farmer for many technologies in FFP village.

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