Good Practices 9: May 2015

PROMOTING ECO-FRIENDLY TECHNOLOGIES IN RICE PRODUCTION IN KUTTANAD, KERALA

While large scale demonstrations are important to promote eco-friendly and climate resilient technologies, their up-scaling requires support from a wide range of partners. Dr. P. Muralidharan shares the experience of promoting and upscaling new technologies among farmers in Kuttanad here.

CONTEXT

Kuttanad, the major rice granary of Kerala, is one of the few regions of the world that produces rice at below mean sea level. It forms a unique ecologically fragile bio-geographical unit that is located mostly in Alappuzha district. The vulnerability of the system is attributed to the problems of water logging and soil acidity along with climatic variations. Crop damage due to summer rains and floods during monsoon in the low-lying paddy fields called *padashekharams*are quite common. This uniqueness in bio-geography and associated social factors and institutions has earned it the status of a Globally Important Agricultural Heritage System (GIAHS) by FAO in 2013.

The heritage status also necessitates ecological restoration and sustainable development of the water-logged system which has come under increased stress due to the environmental pollution caused by indiscriminate use of high quantity of chemical fertilizers and plant protection chemicals. Moreover, the use of high quantity of seeds and high labour charges has resulted in higher cost of cultivation leaving only marginal profit to paddy farmers.

To address these problems, technology demonstrations were organised by the KrishiVigyan Kendra (KVK) Alappuzha in Muttur Village of Veliyanad Block of Kerala. These demonstrations continued for foursuccessive crop seasons (only one crop season possible in a year) under the National Innovations in Climate Resilient Agriculture (NICRA) project of the Indian Council of Agricultural Research.

WHAT WE DID

Identifying the Technology package

Based on the problems identified through focus group discussions (FGD) with farmers and also inputs from expert consultants, components of the technology package for demonstrations were identified. The emphasis was on identifying technologies that promote agro-ecosystem resilience against climate variations. The package of technologies demonstrated includes the following:

I. *Optimization of seed rate and plant population through the use of drum seeder*:
Drum seeder is a simple device used for wet sowing of pre-germinated paddy seeds directly on well puddled and levelled fields. The seeder consists of four seed drums fixed on a central shaft with wheels on both the sides. Each drum has holes of 9 mm diameter at both ends for dropping seeds at a spacing of 20 x 10 cm. Water soaked pre sprouted seeds of paddy are filled upto half the drums. On pulling the seeder, 3-4 paddy seeds are placed at 10cm intervals at a row spacing of 20 cmseeder @ 30 kg/ha.

II. *Site specific acidity-nutrient management (SSNM) based on soil testing:*
Soils of the Kuttanad region are inherently highly acidic and hence acidity management forms the key for higher crop production through improved nutrient efficiency. Based on soil testing, dolomite was applied as the liming material to have the added advantage of magnesium in this liming material. The quantity of fertilisers recommended for application were modified based on the soil test results, which in many cases were less than the quantity traditionally applied by the farmers;

III. *Eco-friendly pest and disease management:*
Pests and diseases were managed by use of *Pseudomonas* for seed treatment, soil, and foliar applications; placement of trichocards for the control of major pests (stem borer and leaf roller) and light traps for pest monitoring; and use of fish amino acid against rice bugs.

Facilitation

Identifying partner farmers for demonstration

Partner farmers were selected based on consultations with farmers in the area.In the first year, citing the requirements and responsibilities to be a partner farmer, consent was obtainedfrom the farmers who had participated in the initial discussions for finalising the technology package.An application format was developed and the farmers applied in that form with an undertaking to implement the activities as agreed upon.From the second year onwards, a single *padasekharam* was selected based on willingness from the office bearers who had prior consent from the farmers of that *padasekharam.*These farmers individually submitted their application. Thus a total of 114 farmers partnered in these demonstrations which covered an area of 74.2 ha in four years.

Training

Each year,the selected farmers were trained on the package of technologies and a calendar of activities was prepared with day zero being the day of sowing. The schedule had technology protocols that included pre zero day activities such as seed treatments. From the second year onwards, these preparations took only very less time mainly due to farmer-to-farmer interactions.The critical inputs viz., dolomite, *Pseudomonas* for seed treatment and trichocards were provided to the partner farmers up to the third year. In the fourth year, they were linked to the schemes of the state Department of Agriculture for lime and Pseudomonas and only trichocards were provided.

Recording Data

Each farmer was provided with a field book to record every operation taken up from land preparation to harvest along with quantity and expenditure towards inputs and labour.

Farmer Field Schools

During the first year of demonstration, a Farmer Field School was conducted involving all the partner farmers in which they were facilitated to undertake agro-ecosystem analysisand identification of pests and natural enemies. They were also educated on the economic threshold levels for each pest, disease and nutrition statusof the plants.

From the second year onwards, field visits were undertaken by the KVK teamto individual fields(on rotation basis)at regular intervals till the crop is harvested. This allowed detailed discussions on the adopted technologies and also promoted learning on the impact of adopted technologies among the partner farmers and also among other farmers who came to these meetings.

MAJOR OUTCOMES

The overall achievements of the demonstrations for four years could be summarized as

- By using paddy seeder (Drum seeder) the seed requirement could be reduced to 30 kg/ha from of 100-120 kg/ha used by farmers for broadcasting, thus reducing the cost of seed to almost 25%. Since the seeds were sown in lines, keeping a spacing of 20x10cm, the plant population was optimum, the number of productive tillers was high and there was enough aeration in the crop stand which resulted in reduced susceptibility to pests and diseases. Further, the plants had strong anchorage in the soil which helped them survive lodging in the harvesting stage due to summer showers and wind, while about 20% crop loss was recorded due to lodging in the traditional broadcasted crop. Thus this technology offered climate resilience to the crop.

In addition, the time taken for harvest by the combined harvester was reduced (due to the uniform population and non-lodging feature achieved by drum seeding) and this helped farmers to reduce the cost of harvesting by 40-50%. (An acre of broadcasted field when lodged takes one and a half hour for harvesting by the combined harvester whereas the same area requires only 45 minutes if drum seeded). All these factors put together reduced the cost of cultivation by about 10-20%.

- Application of dolomite as liming material based on soil tests not only reduced the soil acidity for improved nutrient availability to crop, but supplied magnesium also.The cost of fertilizers could be reduced by 30% based on soil tests. This could make up the additional cost of dolomite. This site specific nutrient management (SSNM) resulted in a healthy crop which finally reflected in the yield. Moreover, optimum and efficient use of fertilizers could reduce the pollution of the surrounding water bodies.

- Many farmers could harvest the crop without using any plant protection chemicals. There were no pest and disease incidence in these plots and the farmers were satisfied with the effect of *Pseudomonas* and trichocards. In other cases the use of chemical pesticides and fungicides reduced by 90%. For the farmers who regularly used plant protection chemicals, the amount spent for pesticides and fungicides reduced to 50 % compared to the previous crop. These practices also reduced the cost of cultivation and environmental pollution.

- Overall, the package of technologies resulted in an average yield increase of 15-20%. While the traditional broadcasted crop yielded an average 5-6 tonnes/ha, by adopting this package of technologies, farmers could harvest 6-7 tonnes/ha with reduced input use. The demonstration plots had higher number of productive tillers per m^2, and grains per panicle and heavier grains in all the four years. The higher yield obtained and the reduced cost of cultivation led to an overall higher net profit of minimum Rs.12,500 per ha.

FROM DEMONSTRATIONS TO WIDER IMPACTS

The demonstrations organised by the KVK could impact large number of farmers due to the support received from the following individuals and organisations.

- *Effective KVK-ATMA Coordination*:
  The KVK shared these experiences in the technology advisory meetings organised by ATMA every month. Learning from this experience, ATMA took up large number of demonstrations on the use of drum seeder, application of dolomite and use of bio-agents for pest and disease management, in different blocks of Alappuzha district.

- *Role of Partner Farmers*: The partner farmers were happy and many of them acted as master farmers voluntarily to spread this package of technologies to progressive farmers residing in the adjoining villages.

- *Role of DoA and Local self Government*: During the cropping season 2014-15, the 50% subsidy support provided by the Department of Agriculture facilitated application of dolomite and use of *Pseudomonas* treated seeds in about 400 ha paddy fields in the project village and adjoining villages. The Local self Government (Muttar Panchayath) also supported in up-scaling the interventions to larger areas by encouraging farmers to take up the same.

CONCLUSIONS

While the KVK demonstrations could convince several farmers to use a package of scientific practices and learn from their impacts (reduced use of inputs, less pollution,higher profits and enhanced climate resilience), the upscaling of the technology package was possible only through the concerted efforts of the Department of Agriculture, ATMA, Local Self Governments and input agencies.

Apart from creating awareness on the merits of new technologies, farmers do need hand holding support while implementing the same and also need access to the recommended inputs (free initially but made available to buy later) at the right time. Our experience clearly shows the importance of engaging with other stakeholders such as ATMA, the State Department of Agriculture and the Local Self Government Institutions if the technology demonstrations have to result in wider impacts.

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