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Technology transfer in rice

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Training on integrated nutrient management (INM) in rice was given to the 45 farmers of Kanyakumari district of Tamil Nadu. Among the trainees, 46.6 per cent of the beneficiaries adopted the INM practices. The impact analysis revealed that, Integrated nutrient management gave an increase in yield of rice to the tune of 28.6 % over non-INM practices. Under INM, the problem of pest incidence reduced upto 28% and 25% in the case of disease incidence. The INM practices saved the chemical fertilizers bill upto 19% compared with existing practices of nutrient management and this way the INM practices generated considerable amount of additional revenue over non INM with BC ratio 2.23. Integrated nutrient management in rice increased the total system productivity and B:C ratio, besides INM helped to reduced cost of cultivation by minimum chemical fertilizers use and less plant protection cost by minimizing the pest and diseases population.

An integrated nutrient management (INM) system may play a vital role in sustaining both soil health and crop production. The basic principles of INM is the maintenance and possibly improvement of soil fertility for sustaining crop productivity which may be achieved through combined use of all possible sources of nutrition and their scientific management for optimum growth, yield and quality of different crops and cropping systems in an integrated manner in specific agro – ecological situations.

Farmers practices in nutrient management :

The prevailing farmers practices in this zone were assessed by conducting group discussions, individual contact, PRA, village meeting etc. Some of the constraints of the farmers practices observed during the survey were discussed also. In this area, rice growing farmers are not applying FYM or compost due to non availability of required quantity of organic manures/ green manures (Anonymous, 2003). Farmers are not raising the green manure crops as pure or inter crops in paddy fields. They are applying chemical fertilizers *viz.*, urea, super phosphate, potash or DAP in two times, once at basal and the remaining quantity at tillering stage. Normally the farmers in this area are also not adopting seed treatment with bio-fertilizer as well as balanced fertilizer application (Anonymous, 2005).

Integrated nutrient management :

Plant nutrients can be supplied through different sources like organic manures, crop residues, bio fertilizers and chemical fertilizers for better utilization of resources and to produce crop with less expenditure. INM is the integrated nutrient sources and method of application to maintain soil fertility and productivity. It also involves utilization of both organic and inorganic sources to greater extent in increasing added inputs use efficiency.

Objectives :

The INM system mainly concentrates on the following objectives, to achieve the potential yield of crops, to optimize and to sustain the resource base, to minimize the cost of production, to demonstrate the need for soil health management and to inculcate the principle of INM.

Balanced fertilizer application is prime important for getting higher yield in any crop. Fertilizer requirement for the cropping system is more important in the present farming situation as the cost of input is high. The INM practices adopted in rice were as follows.

Basal application of organic manure:

FYM 12.5 t ha^{-1} or 15.0 t ha^{-1} compost or 6.25 t ha^{-1} green manure

Bio fertilizer application:

- *Azospirillum*: Seed treatment: 600 g ha^{-1}
  Soil application: 2000 g ha^{-1}
- Azolla: 250 kg ha^{-1} - dual cropping
- Blue Green Algae: 10 kg ha^{-1} soil based BGA flakes

Balanced fertilization (Inorganic):

Short duration : 120:38:38 kg NPK ha^{-1}
Medium and long duration : 150:50:50 kg NPK ha^{-1}
Zing Sulphate : 25 kg

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Fertilizer schedule:

Fertilizer / stage	N	P	K	$ZnSO_4$
Basal	25%	100%	25%	100%
Active trilling	25%	-	25%	-
Panicle initiation	25%	-	25%	-
Heading	25%	-	25%	-

Neem treated urea:

Blend the urea with crushed neem seed or neem cake 20% by weight (or) urea can be mixed with gypsum and neem cake at 5:4:1 ratio.

Coal tar urea:

100 kg urea + one kg coal tar.

Gap in technology adoption :

There is a wide gap between technologies available and technologies adopted by the farmers. The rate of adoption of technologies has been very low. The common reason for poor adoption of technologies are inadequate input supplies and inadequate marketing infrastructure. Other important reasons for low acceptance of farm technologies are economically not viable, not feasible and not compatible with overall farming system of farmers. A survey was conducted by adopting group discussion, village meetings, PRA and individual contact to assess the gap in INM technology adoption in rice.

Sr. No	Technology	Gap in adoption (%)
1.	Variety	23
2.	Preparatory cultivation	40
3.	Seeds and seed treatment	75
4.	Planting techniques	30
5.	INM	100
6.	Intercultural practice	40
7.	Pest and disease management (IPM)	75

It is obvious from the observations that maximum gap was observed in seeds and seed treatment, INM and IPM. A wide gap was found in the practice like INM and seed treatment, which will directly influence the yield and yield attributing characters resulted in low productivity.

Number of farmers trained and adoption rate (%)				
Sr. No.	Training	No. of farmers participated	No. of farmer practicing INM technology	% Adoption
1.	INM – Rice	45	21	46.6

Skill demonstration :

As a part of the training programme the following skill demonstrations were conducted to the farmers on "neem cake coated urea, coal tar urea, seed and sett treatments with bio-fertilizer and composting techniques.

Neem cake coated urea:

Blending of the urea with crushed neem seed or neem cake 20% by weight. Neem cake was powdered to pass through 2 mm sieve before mixing with urea. Kept it over night before use. The next day neem cake coated urea was broadcast in the field.

Coal tar urea :

For treating 100 kg urea, one kg coal tar and 1.5 lit kerosene is required. First melt coal tar over a low flame and dissolved it in kerosene. Mixed the urea with the solution thoroughly in a plastic container, using a stick. Allowed it to dry in shade on a polythene sheet.

Seed treatment:

3 pockets of *Azospirillum* (600g) was mixed with sufficient water wherein the seeds were soaked over night before sowing in the nursery bed.

Root dipping:

5 pockets of *Azospirillum* was mixed with 40 l of water and the root portion of seedling was dipped for 15 - 30 minutes before transplanting.

Soil application:

10 pockets of *Azospirillum* was mixed with 25 kg FYM and 25 kg soil and applied the mixture uniformly in the main field before transplanting.

Azolla:

Fifty kg of azolla was inoculated as dual crop in farmer's field, 5-7 days after planting and then incorporated at the time of weeding.

Exhibition :

Exhibition was organized during the training programmes with charts display materials containing information on bio-fertilizer seed treatment, split application of N, importance and advantages of DAP spray, advantage of gypsum application, merits in using organic fertilizers, need for balanced fertilization and various methods of fertilizer application.

The findings of the present study as well as relevant discussion have been present under following heads:

Impact analysis :

The impact of training programme on integrated nutrient management was carried out by conducting survey *viz.*, PRA, village meetings, individual contact and field visit. The results are presented in the Table 1.

Table 1 : Impact of training programme on integrated nutrient management

Sr. No.	Impact indicators	Farmers practice	INM practice	% increase(+) /decrease(-)
1.	Yield (t / ha)	4.9	6.3	+ 28.6
2.	Gross income (Rs/ha)	23,150	31510	+ 36.0
3.	Cost of cultivation (Rs/ha)	12,200	14100	- 15.6
4.	Net income Rs/ha)	10,950	17410	+ 59.0
5.	B.C ratio	1.9	2.23	+ 17.4
6.	Increase in awareness of INM %	-	-	+ 52.0
7.	Adoption of INM %	-	-	+ 64.0
8.	Pest incidence %	-	-	- 28.0
9.	Disease incidence %	-	-	- 25.0
10.	Pesticide usage %	-	-	- 25.0
11.	Saving in Chemical fertilizer %	-		+ 19.0

It is evident from Table 1 that the integrated nutrient management gave an increase in yield of rice to the tune of 28.6 % over non-INM practices. In rice, green manure application @ 6.25 t / ha before transplanting and application of 25% of the recommended N each at basal, tillering, panicle initiation and flowering may help for continuous supply of nitrogen from establishment stage to flower initiation which will enhance the number of productive tillers, yield attributes and yield. Under INM, the problem of pest incidence reduced upto 28% and 25% in the case of disease incidences. The INM practices saved the chemical fertilizers bill upto 19 % compared with existing practices of nutrient management and this way the INM practices generated considerable amount of additional revenue over non-INM with BC ratio 2.23.

Soil :

The observations revealed that integrated nutrient management approach helps to restore and sustain soil fertility and productivity. It may also help to check the emerging deficiencies of nutrients other than N, P mad K.

Constraints :

Some of the constraints for adopting the INM practices in rice are lack of awareness about balanced fertilizer use, low profitability of coarse cereals, high cost of fertilizers, lack of enough credit facilities, low fertilizer use efficiency and low availability of organic resources.

Conclusion :

Application of organic manures and bio-fertilizers resulted in higher yields. The INM is economically viable, socially acceptable and practically feasible. Adoption of organic manures and bio-fertilizers will help in decreasing dependence on chemical fertilizers and other off farm inputs. Organic recycling is of vital importance not only in augmenting the crop productivity but will minimize the environmental pollution as well.

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