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Increased adoption of seed treatment for groundnut disease management through farmer participatory evaluation: A micro study in Kurnool District of Andhra Pradesh

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Introduction

Semi-arid tropics mainly constitute rainfed dry areas where 57% of total global dryland areas are in Asian countries of which 65% of arable land is rainfed in India. Most of the farmers living in the dry regions are resource poor and the poorest of poor live in dry tropics of Asia and Sub-Saharan Africa. Conventional agricultural practices in these areas have led to soil degradation and pest and disease problems. To top this situation rainfall is erratic with frequent dry spells that make crop production a risky proposition.

Over the years, researchers and development functionaries, who have been attempting to involve the communities in management of natural resources for sustainable rural livelihoods, have learned many lessons. One of the major learning is that unless there is some tangible benefit for the community, people's participation will not come forth. The earlier approach for natural resource management in rainfed areas is soil and water conservation by putting bunds, and harvesting runoff. However, efficient use of stored water, conserving soil moisture, building soil fertility, integrated nutrient management and integrated pest and disease management activities were not included in the Natural Resource Management (NRM) program. There was hardly any involvement of stakeholders in planning, implementation, and maintenance. Hence, such unilateral programs did not make headway in impacting the livelihoods of rural poor in the rainfed areas.

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To develop sustainable natural resource management options for increasing agricultural productivity and income of resource poor-farmers in the dry regions, an integrated farmer participatory watershed management model was developed by International Crops Research Institute for Semi-Arid Tropics (ICRISAT) along with National Agricultural Research Systems (NARS) partners. This holistic approach includes new science tools, linking on-station research to on-farm watersheds and technical backstopping through consortium of institutions with convergence of livelihood-based activities.

The broad objective of the approach is

to enhance and sustain the productivity in the rainfed eco-regions of the semi-arid tropics of Asia through integrated soil and water management, judicious utilization of land, and other natural resources, integrated pest and disease management, for increasing productivity, income growth, poverty alleviation and rural development.

ICRISAT led consortium partners developed a strategy for Integrated crop development through Integrated nutrient, pest and disease management activities to improve the livelihoods of resource-poor farmers by increasing their income.

Problem description

Groundnut is grown in large acreage and is the predominant crop grown under rainfed conditions in project villages of Nalgonda, Mahbubnagar and Kurnool district, where yields are decreasing every year due to insect pest and disease problems. The resource poor farmers who can rarely afford to adequately manage the diseases are incurring significant yield losses. The occurrence of diseases, non-availability of resistant varieties, improved technology to control the diseases, awareness and poor socio-economic conditions of farmers are the main causes for poor yields of groundnut in the project villages.

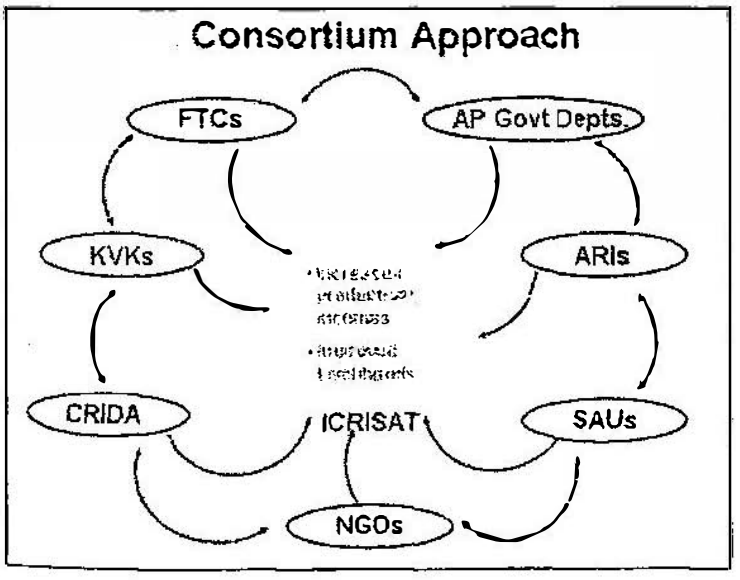
Groundnut fields were surveyed in the project villages to study and assess the yield losses due to disease during 2002. Many diseases are found to infect groundnut crop but only a few are of economical importance in rainfed crop production. The major diseases that cause economic loss to the farmer under

rainfed conditions are seedling root rot, early and late leaf spots, and virus diseases like, peanut bud necrosis (PBN), and recently identified peanut stem necrosis (PSN). Seedling root rot disease of groundnut has been identified as an economically important disease in watershed villages causing significant yield loss ranged from 15-25%, due to significant reduction in plant population. Some farmers expressed their inability to control the disease even after applying Dithane M 45 seed treatment and spray, recommended by Agri-input dealers.

Approach

A consortium led by ICRISAT technically supports Andhra Pradesh Rural Livelihood Program (APRLP). It is an innovative farmer participatory consortium model for watershed management to achieve convergence and integration of various soil, water, crop, nutrient and other livelihood opportunities and to scale-up the benefits of holistic watershed management approach through convergence for improving the livelihoods of resource-poor farmers (Dixit and Wani, 2003). Watersheds are used as entry points for improving the livelihoods of rural poor under APRLP in Kurnool, Mahbubnagar, and Nalgonda districts of Andhra Pradesh. It has adopted this approach on a large scale and attempted to put together a consortium of organizations, viz., National and State agricultural research institutions, government development departments, Non-Government organizations (NGOs), Women's self help groups (SHGs) for effective convergence at village level (Wani et *al.* 2003).

Participatory rural appraisal conducted in the *grama sabha* of the village revealed that seedling mortality is a major problem reducing the yield significantly. Due to seedling root rot disease the crop stand reduces and to maintain the optimum population farmers have to increase the seed rate by 10-15%, which is costing them heavily year after year. ICRISAT developed models



to reduce disease incidence by integrated disease management strategies like seed treatment, introducing disease tolerant varieties, and intercropping legumes with cereals along with local varieties of the region (Ravinder Reddy, 2003). In addition to development of disease tolerant varieties, ICRISAT is also developing technologies that emphasize biological, cultural, and mechanical control strategies to minimize the use of chemical pesticides. Harmonious integration of these approaches is the keystone of ICRISAT integrated disease management (IDM) research. Besides being sustainable, the IDM approach reduces production costs and makes it safe crop production. At the same time it also reduces risk of chemical pesticides that are dangerous to humans, animals and the environment.

Farmer participatory on-farm seed treatment trials, on-farm training programs on disease identification, capacity building activities were conducted in the villages to evaluate the seed treatment chemicals, methods and assess the yield loss due to groundnut seedling root rot disease.

Finding things to try

Seed and soil-borne diseases are major constraint in crop production in watershed villages. Seed treatment is an effective and economical method for the management of seed and seedling diseases. It is the first and economical step in Integrated Disease Management and is insurance for seedling protection up to 15 days after sowing. Failure to apply the proper seed treatment method and chemical can result in

- Seed and seedling diseases in the crops, resulting in poor plant stand and low yields
- Introduce and spread the diseases into new areas/fields/villages where disease has not appeared earlier.

Seed treatment methods and problem: Survey of the villages also revealed that the general practice of seed treatment in the village is usually done by hand sprinkling fungicides on seed lot spread on the floor or plastic sheet and mixing the seed. Some large farmers are practicing seed treatment of groundnut seed by using Dithane M 45 fungicide recommended by agri-input dealers which is not giving desirable results. Disadvantages of seed treatment with hands are

1. Non-uniform application and poor chemical coverage over the seed hence, disease control is not at desirable level
2. More chemical wastage
3. Hazardous to health

Farmer participatory trials were conducted to compare demonstrations using a simple equipment, a Hand operated seed treatment drum and against the usual practice of farmers hand mixing.

Table 1. Effects of different methods of seed treatment on groundnut germination and seedling root rot disease

Method of seed treatment	Seed germination (%)	Seedling root rot disease (%)
Hand mixing	82	11
Seed treatment drum	93	4
Control	80	24

Experiences

Benefits to Farmers: The experimental results revealed that seed treatment with Benlate+Captan @3g kg^{-1}, increased germination percentage, reduced disease by 20%, increased yield by 5.5% over control with a net profit of Indian Rupees (RS) 1730.00 per hectare (Table 2) for an input of just Rs.110.00. Control plot is one where seed was not treated with any chemical.

Table 2. Effect of seed treatment chemicals on germination and yield

Sl. No.	Treatments*	Percent germination (%)	Percent seedling root rot (%)	Pod yield (kg ha^{-1})	Increase in yield (kg ha^{-1})	Increase in yield (%)	Net additional income realized (IRS)**
1	Benlate + Captan	94	4	2202	115	5.5	1730 (1840–110)
2	Dithane M45	81	19	2132	45	2.15	680 (720-40)
3	Control	80	24	2087	0.00	0.00	—

* All the chemical used @ 3g kg^{-1}seed

** Increase in yield {selling price of pod at the time of harvest RS 16 kg^{-1} - cost of seed treatment}

Benefits of seed treatment as perceived by farmers:

1. Inexpensive and effective method of disease control
2. Uniform protection all over the field
3. Ease of application
4. Inexpensive crop establishment insurance up to seedling stage
5. Protects seed and seedlings from seed and soil- borne diseases
6. Increases percentage of seed germination
7. Increases pod yield
8. Avoiding chemical sprays, thus reducing further investment

Impact

This innovative participatory research and training has resulted in increased adaptation of seed treatment by 74 - 263 per cent over the previous year by the farmers in all the nucleus watershed villages across three districts (Table 3). Farmers started treating seed by using their convenient local methods

Table 3. Adoption of seed treatment in nucleus watershed villages

Watershed Villages	Number of farmers adopting seed treatment		Percent increase over year 2002
	Year-2002-03	Year-2003-04	
Kurnool District			
Karivemula	16	37	131
Devanakonda	21		
Nandavaram	36		
Mahabubnagar District			
Mentapally	23	48	108
Appaipally	-	26	-
Malleboinpally	19	69	263
Sripuram	17	39	129
Nalgonda District			
Nimical	27	4	74
Thirumalapuram	20	38	90
Kacharam	15	29	93

- Information not available

like plastic bags, fertilizer bags, pots for treating seed and learned improved method of seed treatment by using seed treatment drum. This indicates that the stakeholders enriched their cognitive capital by being involved in participatory research and training in disease management has increased the groundnut pod yield significantly.

Enhanced livelihoods through technology

This illustrates how a small intervention like seed treatment has the potential to create additional income for the farmers' as well as additional livelihoods to agricultural labor. The reduction of seed rate to the extent of 15-20 per cent will reduce the cost of cultivation obviously increasing the net income from farm. Due to proper crop stand the labor requirement for harvesting the crop and separating pods will proportionately increase creating more livelihoods. The livelihood creation will proportionately increase in marketing chain as well. The additional income and livelihoods created by this technology was estimated for 1000 hectares and presented in Table 4.

Table 4. Estimated additional income and livelihoods from seed treatment

S.No	Item	Additional benefit (IRS)	Livelihoods
1	Additional net income[1]	17,30,000.00	Income from increased yield @ IRS 1730.00 ha^{-1}
2	Harvesting[2]	30,000.00	1000 wage days @ IRS 30.00 per day for women labour
3	Decortication[3]	24,000.00	480 wage days @ IRS 50.00 per day for men labour
	Total	**17,84,000.00**	

1. Estimated base on increased yield {selling price of pod at the time of harvest @ RS 16kg^{-1} - cost of seed treatment}
2. Estimated based on the labour requirement to uproot and separate pods for the increased yield.
3. Estimated on the basis of additional man-days required for mechanical decorticating the additional yield

This clearly showed that through the intervention of seed treatment one women wage day per hectare in harvesting and 0.48 man-days in decorticating were additionally created. it is additional to the net income rise for the farmer. Total monetary worth of intervention was estimated at IRS 1784.00 per hectare. All these estimates are limited to village/farm level only, but if the marketing chain is also considered, the additional livelihoods created and income generated would be certainly more encouraging.

Lessons learnt

- Availability of seed treatment chemicals is a problem
- Purchasing little quantity of chemical is not possible
- Treatment of seed by using drum is very effective in chemical application to seed and controlling disease
- Farmers identified proper seed treatment chemical and realized seed treatment as an easy and low cost disease management technology
- Initiatives with the government to include seed treatment drum in the list of agriculture inputs subsidy scheme

Conclusion

Farmer participatory research in seed treatment and on-farm training in disease diagnosis techniques has great impact on farmers' innovative disease management approach. An innovative farmer participatory consortium model for watershed management developed by ICRISAT has been adopted to achieve success in controlling seedling root rot disease by seed treatment, a low cost integrated disease management strategy. Application of proper chemicals and recommended dosage for treating seed to control seedling root rot disease by protecting the seed from seed and soil-borne fungi has increased pod yield significantly.

The work described here is part of a growing body of experience in participatory research and farmer training. In these cases, collaboration among farmers groups, consortium partners from national and state research

organizations on management of plant diseases have provided opportunity to all concerned. Our results support the emerging conviction that participatory approaches can facilitate changes in farmers' knowledge, attitude, and practices by providing them with improved access to information and technology. The case presented here indicated that farmer participatory research (FPR) and on-farm training were successful in increasing knowledge and disease diagnosis techniques meeting farmers' needs. Partnership among researchers, farmers groups, and community development organizations providing training services can provide many of the requisites for rural development.

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