On-farm IPM of chickpea in Nepal: Dissemination, adoption and promotion, 1997-2005

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Abstract

Chickpea is an important winter grain legume grown in the rice and maize-based systems in the Terai and inner Terai regions of Nepal. In spite of several chickpea varieties and production technologies recommended to farmers in the past, farmer adoption has not been encouraging. To promote better adoption, Integrated Crop Management (ICM) technologies of chickpea were introduced in potential production pockets in the Terai/inner Terai region. On-farm ICM research was initiated jointly by NARC and ICRISAT with DFID funds in 110 farmers' fields in 1998/99. On the basis of encouraging results obtained in the first year, the project activities were extended to other districts subsequently. By 2004, ICM technologies were disseminated to 20 Terai districts. The ICM package consisted of high yielding disease-tolerant varieties, recommended dose of fertilizers, seed dressing with fungicides and need based foliar application of insecticides and fungicides. Results of the research indicate that ICM packages gave two to three-fold yield increase in chickpea, thereby reducing the unit cost of production and enhancing the incomes of poor and marginal farmers. Study on impact assessment of on-farm ICM research conducted in Banke, Bardia, Sarlahi and Mahottari districts reveals that adoption of the ICM package has substantially enhanced family income, increased dietary intake of chickpea among poor families and increased farmers' ability to spend on education, health and other household activities. A total of 12000 farmers from 20 Terai districts have been educated about ICM, and some of them are involved in seed production and seed business activities, providing more long-term sustainability. Scaling-up of ICM technology is suggested.

Keywords: *PVS, ICM/IPM, Chickpea, On-Farm Research.*

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Introduction

Grain legumes occupy approximately 10% of total cultivated land in Nepal. They are grown in 311,210 ha with the total production of 256,000 MT and average productivity of 0.823 t/ha (Anon 2003). Chickpea is an important winter grain legume grown in the Terai and inner Terai regions in rice and maize-based cropping systems. Apart from supplying cheap protein to the predominantly vegetarian population, it is a source of income to poor and marginal farmers. Research in the past has recommended six varieties of chickpea (NGLRP 2004). Suitable practices for cultivation have also been recommended.

In spite this, national average yield levels have shown rather slow increments over the period. Research results indicate that though the yield potential at the research station is about 3 t/ha, and yield obtained in farmers' field under well managed conditions is 1.5 t/ha, these have not been reflected in national productivity. The reason for this is non-adoption of recommendations due to a number of socioeconomic, biotic, abiotic and technological constraints. With these factors in mind, farmer participatory ICM in chickpea was initiated in different production pockets. This report deals with *Farmer participatory research initiatives – dissemination, adoption and promotion in chickpea* implemented in collaboration with different stakeholders with funding supports from ADB/ICRISAT, DFID/ICRISAT, IFAD/ICRISAT, and NARDF/NARC during 1997-2005.

Objective: Rehabilitation of chickpea in rice fallows through the promotion and dissemination of ICM technologies to potential production pockets in the Terai region of Nepal.

Materials and methods

Based on the availability of on-station proven varieties and technologies; and problems identified in farmers' fields through formal surveys, village level workshops, regional technical working group (RTWG) meetings, interaction with farmers/extension workers, focused group discussions and stakeholders' workshops, participatory varietal selection (PVS) was initiated in chickpea. The sites were selected on the basis of local importance of the crop and their potential.

ICM trials comprising of all the components were initiated in chickpea in 1998/99 in potential production pockets. Plot sizes were kept 333 sq m and the full package of crop production practices were compared with farmers' practices.

Orientation training, farmers' field days, joint monitoring of trials were also conducted in the research sites with the participation of farmers, local extension workers, NGOs and research scientists. Relevant data and farmers' reactions were collected through formal and informal surveys.

For the dissemination and promotion of ICM technologies, distribution of mini-kits, community level seed increase, training and distribution of leaflets/folders were carried out during the project period.

Participatory varietal selection (PVS)

In PVS, released and pre-released varieties were evaluated at Banke, Bardia, Mahottari, Sarlahi and Nawalparasi, Kapilbastu and Chitwan districts (Table1).

Table 1. IPM trials conducted in chickpea, 1998-2004.

Year	No. of districts	No of trials	Districts	Involvement/ Linkage
1998/99	4	110	Banke, Bardia, Nawalparasi, Siraha	NARC-ICRISAT/ ADB
1999/00	6	503	Banke, Bardia, Nawalparasi, Siraha, Sarlahi	NARC-ICRISAT, DFID
2000/01	8	647	Banke, Bardia, Nawalparasi, Siraha, Sarlahi, Mahottari, Sirha, Sunsari	NARC-ICRISAT, DFID
2001/02	14	843	Banke, Bardia, Nawalparasi, Siraha, Sarlahi, Mahottari, Sunsari, Saptari, Parsa, Bara, Rupandehi	NARC-ICRISAT/ DFID and ADB
2002/03	17	1100	Banke, Bardia, Nawalparasi, Kapilvastu, Sarlahi, Mahottari, Sunsari, Chitwan	NARC-ICRISAT, DFID and RWC
2003/04	20	700	Banke, Bardia, Dang, Kanchanpur, Sirha, Saptari, Nawalparasi, Rupandehi, Kapilvastu, Chitwan, Bara, Parsa, Sarlahi, Mahottari, Sunsari, Saptari, Morang, Jhapa, Rautahat, Kailali	NARC-ICRISAT/ DFID, IFAD and NARDF
2004/05	20	700	Banke, Bardia, Dang, Kanchanpur, Siraha, Saptari, Nawalparasi, Rupandehi, Kapilvastu, Chitwan, Bara, Parsa, Sarlahi, Mahottari, Sunsari, Saptari, Morang, Jhapa, Rautahat, Kailali	NARC-ICRISAT/ DFID, IFAD and NARDF

Table 2. Chickpea grain yield (t/ha) in PVS at Sarlahi, Mahottari, Banke and Bardia, 2002/03.

Variety	Sarlahi and Mahottari	Banke and Bardia	Mean
Avarodhi	2.58	1.37	2.0
Tara	1.54	1.36	1.5
Koselee	1.63	1.39	1.5
Kalika	1.70	1.42	1.6
Sita	2.07	1.46	1.8
Chandra	1.59	1.64	1.6
Dhanush	1.75	1.32	1.5
Local	1.20	1.28	1.2
Mean	1.76	1.58	1.41
F test	*	*	*
LSD (0.05)	0.30	0.25	

Results to date indicate that variety Avarodhi was favored by farmers across the Terai (Table 2), while some farmers preferred Koselee as it fetches higher price in the market. Sita was a variety of choice in the mid-western Terai. Avarodhi performed better in spite of very low yield levels for all the varieties at Kapilvastu site due to higher disease and insect damage in new test site operated by FORWARD.

Integrated Crop Management

In the initial years, single components of production technologies were evaluated in different production pockets, and compared with the local practices or farmers practice. Almost all the components were found better than the existing farmers' practices. Therefore, all the components were packaged as Integrated Crop Management (ICM) technology and evaluated in farmers' fields over a wide range of environments. IPM technology consisted of improved varieties, seed dressing with Bavistin® @ 2 g/kg, basal fertilizer application @ 20:40:0 NPK kg/ha, Rhizobium inoculation, need-based foliar application of Thiodan® @ 2 ml/L water (2-3 times) for the management of pod borer and Bavistin® @ 2 g/L water 2-3 times for the management of BGM. The plot size was 333 sq m per treatment and the produce served as a source of seeds for the subsequent years. It has also demonstrated effectively to farmers and development workers and convinced them of the superiority of the selected variety.

The ICM package gave an overall yield increment of 134% over the control (Table 3), the range being 107-195%. Higher number of pods/plant, lower

Table 3. Comparative performance of the ICM package on chickpea yield, 1998/99-2003/04.

	Seed yield (t/ha)		Percent yield increase over control	
Crop	ICM	Non-ICM	Range	Mean
Chickpea	1.97	0.84	107-195	134

Source: Neupane et al. 2002 and NGLRP 2004.

disease and insect incidence were associated with ICM. In cases where farmers also applied plant protection measures the differences were only marginal. Economic analysis of application of IPM has indicated that it is highly profitable to apply plant protection measures for the control of pod borer and BGM.

Promotion

Over the years the promotion of chickpea ICM technologies has included distribution of mini-kits, community level seed increase, on-the-spot training on chickpea ICM, farmers' field days, workshops, distribution of ICM promotional tools, TV broadcasts, training of field staff and farm visits.

Training and capacity building

Training programs on chickpea ICM were organized through collaborating stations/agencies. Experts from the Department of Agriculture, NGOs and NARC stations participated as resource persons in the training programs organized on-farm. During 1997/98-2003/04, more than 12000 farmers from 20 Terai districts have been acquainted with improved management of chickpea, through trainings, exposure visits, distribution of literature and formal and informal contacts, through different implementing/collaborating agencies.

Farmers' field days

Farmers' field days were organized at the podding stage to familiarize farmers, extension personnel and NGO and research staff with chickpea ICM technologies and create interactions among them. These activities were helpful in getting all the stakeholders at one place, interacting and sharing on different aspects of the technologies. This has helped disseminate varieties and ICM technologies.

Impact assessment

A study on impact assessment of ICM technology was conducted at selected project sites. About 400 research participants and 100 non-participant farmers from Banke, Bardia, Sarlahi and Mahottari districts were selected for the study. Results indicated that participatory chickpea ICM significantly increased household income, and offered a diversity of crop varieties and choice. Adoption of ICM has enhanced the dietary intake of chickpea, increased farmers' ability to spend on education, health and other household activities.

1. Seed transaction

Farmers' access to improved seed and its dissemination was of considerable importance. Seeds were sold to areas as far as 35-40 km from Bardibas and Lalbandi, which serve as seed villages. In the mid western region, 83% of farmer respondents sold seed to other villages, traders and NGOs/CBOs, whereas in the central region, 73% farmers sold it to other villages. In the project area, seed sold per household was 127 kg in the mid-west and 279 kg in the central region. Additional employment generation @ 50 man-days per ha for additional chickpea growing has been recorded in the project sites.

2. Reduction in cost of production

The unit cost of production with ICM was 62% lower compared to farmers practices. Net income from IPM was 1056 kg/katha as compared to 310 kg/katha from farmers practices (Pande et al. 2003). Farmers were able to save money from chickpea sales and invest in repairs, education and health services. The consumption of chickpea in the project area increased compared to the base year.

3. Community level seed production

PVS and ICM activities have supported local seed systems. In the absence of organized seed distribution systems, the project sites acted as the seed resource centers, apart from farmer-to-farmer diffusion of seeds/technologies. Lalbandi, Bardibas, and D Gaon have become known as seed centers for chickpea.

4. Change in cropping pattern

At Lalbandi, Sarlahi, area under tomato is slowly being replaced by chickpea as a result of its profitability. The traditional maize-tomato pattern is being slowly replaced by maize-chickpea. The area under chickpea has increased and the village serves as a source of chickpea seeds. In the Bardibas area, where chickpea is sown in rice fallows, its area has increased considerably as farmers found this legume the best alternative to toria. Overall, the adoption of technologies is going up around the project sites.

Constraints and opportunities

Although the results from chickpea ICM research were highly encouraging and the impact assessment showed positive benefits of the technologies, the dissemination has been rather slow. This may be ascribed to non-availability of improved seeds, risky nature of the crop, inadequate extension services, and better options available to farmers.

Chickpea is a traditional crop, and consumed daily in a variety of ways. There are ample opportunities for expansion of its area and production because the demand for chickpea is increasing and 20,000 tons of chickpea would be needed to meet the demand of increased population by 2020. ICM technologies will help double current yield levels. Current estimates of rice fallows in the country are about 400 thousand hectares, which could be brought under chickpea, through the concerted efforts of research, extension, CBOs, NGOs and other stakeholders involved in scaling-up the technologies.

Conclusion

Participatory on-farm ICM research on chickpea has provided an opportunity for farmers to select varieties and technologies best suited to their condition. Dissemination of varieties was faster and effective through farmer-to-farmer exchange, the barter system and other local means. These efforts have helped in supporting local seed systems, created newer opportunities for seed transaction/sale and maintained chickpea varietal diversity in the localities. The technologies need to be scaled up through regular extension systems throughout the Terai districts of Nepal.

Acknowledgements

The authors would like to extend sincere gratitude to the Executive Director, Director, Crops and Horticulture Research; Director, Planning and Coordination, NARC; and Director Finance, NARC, for their keen interest and support to the program.

We also gratefully acknowledge the valuable contributions of research scientists and cooperators from RARS-Nepalgunj, Tarhara, NORP-Nawalpur, farmer groups, LI-BIRD, FORWARD, SAATHI and DADOs from various districts. We acknowledge the contributions of ICRISAT, CPP-DFID and other donor agencies for funding towards implementing various on-farm activities in chickpea.

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