CROP PROTECTION PROGRAMME

Ensuring the sustainability of an integrated crop management approach to chickpea production for poor farmers through up-scaling and far-reaching adoption in Nepal

R 8427 (ZA 0656)

FINAL TECHNICAL REPORT

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Executive Summary

Chickpea is a major component of the Nepalese diet providing an important source of protein and income for rural poor. Yet the area under production in Nepal has declined owing to frequent disease and insect damage that has affected farmer confidence in a crop that often fails. Where it is grown, yields are low (<800kgHa^{-1}). An integrated crop management (ICM) strategy evaluated by 3500 farmers in Nepal over 3 years (**R7885**) demonstrated that farmers can more than double yields and, moreover, the technology virtually guarantees a harvest. The investment required for this is low and halves the unit production costs so more than doubles profits. Chickpea is also drought tolerant and suits the dry winters of Mid- and Far-Western Nepal, geographic foci of the 10th Plan (Poverty Reduction Strategy Paper). Currently, there is potential to expand production into 400,000 Ha of rice fallow.

Lessons from earlier work were synthesised at a conference in Kathmandu (November 2004) (**R8366**) but published during this project (Pande et al. 2005). This provided a foundation on which to build a strategy for the broad up-scaling of chickpea ICM and embed it into the agricultural strategy of Nepal. Based on this and discussion with farmers a policy document has been written during the current project and published as ICRISAT Info Bulletin 70 and provides a blueprint for broad up-scaling of the ICM activities within the national development strategy of DOA, Nepal. We also provided stewardship for DOA to up-scale the promotion with previous collaborators NARC providing back-stopping, additional seed and man-power for training. Without an in-depth analysis of Nepali politics, stewarding a collaborative project between DOA and NARC was in itself a substantial achievement and some evidence for this project suggests that this may benefit Nepal for several years by changing a divisive culture within MOAC.

We trained 41 DOA agricultural extension officers along with officers and progressive farmers from NGOs, CBOs and SMEs and 3 agricultural technology and seed suppliers in the ICM of chickpea technologies. 500 mini-kits containing treated seeds, components of the technologies and an improved information sheet were distributed to over 500 farmers in areas previously unreachable by us through NARC and they sowed more than 2Ha of trial plots. Most farmers were given enough material to trial 1 katha (333 m^2) although some sowed up to 2000 m^2. We also established CBOs as seed producers which will result in the production of enough seed to sow 20Ha of land next year through local distribution networks further ensuring the sustainability of far-reaching adoption of chickpea ICM for poor farmers in Nepal.

We organised formal training in *Hear* NPV biopesticide control of pod-borer focussing on morphology, mode of action, use in crop protection, lab production, quality control and bioassay techniques. An internationally refereed research article was also published, which along with the two books mentioned above has enabled international dissemination of the successes of R7885.

Background

Rural poverty remains pervasive throughout Nepal where the per capita gross domestic product is $233 (Anon, 2003a). A predominantly agrarian nation, with 40% of the GNP derived from agriculture and between 70 and 80% of the population or about 3.3 million families engaged in agriculture (Anon, 2003a & Devkota, 2005), the country is the poorest in South Asia. The principal foods are cereals (rice, maize and wheat) with grain legumes grown as secondary crops during the dry and cool winter (*Rabi*), mostly in paddy fields using their residual moisture for plant establishment.

As the staple crop in Nepal, rice is grown in 1.45 million hectares across the country but approximately 400,000 Ha of the paddy fields remain fallow in winter (Subba Rao *et al*., 2001). Of this, approximately 138,000Ha rice fallow is found in the western regions of Nepal (Pande et al., 2003c). The Mid and Far western regions are principal geographic locations singled-out for attention under the National Planning Commission's (HMGN) 10th Plan (Poverty Reduction Strategy Paper). Accelerating income and employment growth in the rural economy of Nepal where the majority of the poor live was identified by The 10th Plan (Anon, 2003b) as the primary target for in-country development up to 2007, seeking strategies and approaches that can impact rapid changes on the wealth of the rural poor. The plan also sought to identify a core set of highly selective and well focussed activities of which the outputs from R7885 fit well. The rice fallows in western Nepal could be exploited using chickpea production along with other pulses to provide high yielding and high value crop options for poor farmers and so impact positively on their livelihoods.

The west is very dry in the winter but chickpea is a highly suitable option for exploiting rice fallows here because it has a deep root system, is drought tolerant and requires no irrigation. Yet despite its importance as a food and agricultural suitability the area sown to chickpea in Nepal has declined from more than 50,000 Ha in 1980 to 10,000 Ha in 2004 (Pande et al., 2005). This is largely due to the reluctance of farmers to invest time and money in a crop for which yields are low and usually less than 800Kg Ha^{-1} and which increasingly fails due to the severe pressure of disease and insect pests. Reduction in the production of leguminous crops has also had a negative impact on the sustainability of the cereals-based systems because legumes enhance soil fertility through nitrogen fixation and as organic matter and is also associated with a decline in grain legume consumption to about 25% of the level recommended by FAO; < 10Kg capita^{-1} annum^{-1} (Pandey et al., 2000).

A robust, cost-effective and efficient Integrated Crop Management (ICM) strategy for increased chickpea production based on environmentally benign pest management technologies was successfully validated and promoted on 3500 small-holder farms in Nepal under the forerunner DFID project (R7885) (Stevenson, 2004, Pande et al., 2003b & c). The strategy was based on improved cultivars (good yield & Fusarium wilt tolerance), seed priming, fungal and insect control using judicial pesticides or biological pesticides application, Rhizobium treatment in deficient areas and management of sowing density, fertilizer inputs and water to prevent dense canopies (Pande et al., 2001). The strategy was shown to be profitable, sustainable and acceptable to farmers in Nepal and had a significant positive impact on their livelihoods. One sample showed that the participants increased their wealth by more than US$200 per annum simply by adopting chickpea as a crop for rice fallow and the number of additional employment days this generated reached almost 1000 in the study area (Pande et al., 2003c). Potentially the technology could also be adapted for Bangladesh, India, Pakistan and Afghanistan and also to East Africa where there is increasing interest in the potential of pulse legumes. DFID's millennium goals aim to reduce the proportion of individuals below the poverty threshold of US$1 day^{-1} poverty. Implementing the outputs of R7885 will impact significantly on poverty in rural areas of Nepal addressing both the ambitions of the 10th Plan and DFID.

A project extension (R8336/ZA0616) identified and synthesised lessons from R7885 and developed a strategy for broadening the adoption of ICM. It also raised awareness of NGOs, the private sector and Government Organisations (GO's) to the benefits of chickpea ICM and sought to influence similar institutions in Bangladesh and India. We also made key policy setters in MoAC/DoA/NARC (Nepal) aware of the success of R7885 via a series of meetings in April 2004 and through an international workshop in Kathmandu. This brought together policy makers (politicians and administrators) with stakeholders (private sector, farmers, women's groups and NGOs) and through discussion enabled stakeholders to recognize obstacles to successful uptake of the outputs of R7885. The proceedings (Pande et al., 2005) were published as a 252 page volume and provide a valuable resource of information and a foundation on which to build a strategy for country wide adoption. This took form of a policy paper that was written and published during the present project as an information bulletin for individuals who are able to set and implement the policy changes necessary at the highest level to achieve the overall goal of the rehabilitation of chickpea production in Nepal, and elsewhere in Asia.

The workshop determined ways to overcome obstacles and ensure sustainability of the chickpea ICM adoption strategy and implement the adoption of ICM for chickpea production across the country. One of the key activities flagged at the meetings was the need for the stewardship of uptake by DOA (the major extension vehicle for Nepal agriculture) and the necessary training and back-stopping. This would enable a greater number of farmers to be reached than could have been achieved by NARC our former main research partner in country.

Project Purpose

The evidence from R7885/Z0440 is that the adoption of high yielding chickpea with its concomitant ICM increases income of poor farmers and increases food security. While this was validated by 3500 farmers in 14 of the 20 districts in the Nepal Terai, the principal chickpea-growing region, it has been estimated by our principal project partner NARC that the ICM approach could be extended to more than 100,000 farming households in Nepal but would require that the strategy could be adopted by DoA as part of their national program of activities since NARC primarily has a research agenda and are not in a position to reach this number of people. Department of Agriculture are the principal extension vehicle are thus through the various Development offices might ultimately be able to do so.

Ultimately, the key purpose of the present project was to obtain government adoption of chickpea ICM to its agricultural program to ensure sustainable impact. The key output for this phase of the project was to provide stewardship, training, germplasm and mini-kits for country-wide adoption of the strategies developed in earlier work and enable the up-scaling of outputs of R7885 countrywide via government (DOA replacing NARC as extension vehicle), non-government, community based and private sector organisations. DOA, the principal agricultural extension facility in Nepal, agreed to adopt this strategy as part of their self-funded staff activities for the past year but as mentioned above requested guidance.

Despite NARC and DOA being departments under the same Ministry (Ministry of Agriculture and Cooperatives) they have developed their own agenda and do not work in partnership a great deal. However the success of the ICM adoption required them to do so. Thus we sought to encourage a greater cooperation between NARC and DOA to ensure the adoption of the strategy was a success and was sustainable.

In addition by establishing networks for community based and private sector initiatives this project will help to ensure sustainability and develop wealth creating environments for

stakeholders. In doing so and through careful targeting of efforts, ICM of chickpea could be established as normal farmer practice throughout the Mid-West and Far West Nepal, the poorest areas where aid has had little impact and which are key targets for DFID directed development policy (DFID 2003).

A bio-rationals programme (NPV focus) in collaboration between government and an NGO (FORWARD) at Chitwan is currently in development. The potential for Nepal to develop better biologically based pest management will be greatly enhanced through training for NARC and NGO staff by NRI experts. The quality of commercially produced bio-pesticides was shown on R7885 to vary greatly. The capacity to evaluate bio-pesticide quality must be built into this emerging facility.

Access to quality seed is also a constraint to wider adoption and sustainability. The present project proposes to improve this through the development of community based seed production and distribution facilities and also bring in SMEs to enhance the distribution to areas beyond the geographic reach of current government and non-government partners

No major changes in the project purpose were made.

Research Activities & Outputs

Owing to the nature of the outputs of the project there are few activities that could be considered as research, as such. The principal activities described in the PMF were based around training, discussions, consultations and meetings that focussed on the stewardship of broad up-scaling of the ICM technologies in Nepal via the Department of Agriculture (DOA).

1. Policy for improved crop management of chickpea adopted by Nepal MoAC & strategy implemented through national extension programmes for increasing income & food security for poor farmers in Nepal.

1.1 Meet with Joint secretary (MoAC), and senior management teams (DoA) to steer the process by which policy is adopted and implemented for embedding ICM of chickpea into the national programmes (DoA activities) from April 2005 in advance of national agricultural strategy meetings (late April). Ensure that up-scaling costs are provided directly from government as indicated at meetings in April 2004.
1.2 Engage the various mechanisms identified for sustainable crop rehabilitation support through non-government projects such as the ADB funded Crop Diversification Project, NGOs, community groups and private sector initiatives such as the provision of sample mini-kits for distribution within the framework of strategies established under the present policy phase.
1.3 Identify suitable organisations for each region in Nepal and engage them in adoption strategies through training workshops & meetings. Specific NGOs and private organisations will be identified through present contacts and via a call in the national press.

WORKPLAN MEETING 1: Scaling Up Chickpea ICM Technologies for Enhancing the Income of Resource Poor Farmers of the Terai/Inner Terai - May 2005.

A meeting of Nepal Agricultural Research Council (NARC), Department of Agriculture (DOA) and Natural Resources Institute (NRI-UK) staff was held at NARC conference hall, Singh Durbar Plaza, Kathmandu on 24/25 May 2005 to discuss and prepare a frame work for implementing the scaling-up of chickpea ICM technologies for the year 2005/06 through DoA. The meeting was co-ordinated by Director, Planning and Co-ordination, NARC. Both the Executive Director NARC (Mr D. S Pathik), and Director General, DOA (Mr S. S.

Shrestha) were participants. There were 20 other participants including director planning, program directors and regional director (CDR) DOA, NARC directors, and other personnel from NARC, DOA and NRI (Appendix 1).

The main purpose of the meeting was to engage DOA and NARC to develop a workable program of collaborative activities that would ensure as wide an uptake for ICM through DOA as possible. And the principal achievement was to ensure a commitment from both DOA and NARC to work together on up-scaling in areas where NARC can not reach.

It important to stress that engineering a meeting between the most senior staff of the two respective agriculture departments of the Ministry of Agriculture and Cooperatives (DOA and NARC), and furthermore, to steer a collaborative project agreement between them was in itself a significant achievement.

The meeting was also concerned with developing the basis of activities for the scaling up of chickpea ICM technology and agreed on an approach for implementing the scaling up activities jointly by DOA and NARC. Unfortunately, owing to last minute absence of several key NARC, DOA personnel it was not possible to get absolute confirmation of all activities agreed in all districts so a second meeting was planned to achieve this.

The findings and successes of phase 1 and II ICRISAT/DFID-CPP Chickpea IPM project conducted in Nepal were presented by Dr P. Stevenson in which the emphasis for impressing DOA was on doubling yields levels, reduced cost of production, enhanced employment generation, access to cheap sources of dietary protein and improvement in soil health. Stevenson also stressed that the scaling up of ICM technology would result in export promotion and import substitution, as chickpeas are currently imported to meet the domestic demand. A draft strategy for the proposed scaling up of chickpea ICM technology via DoA was also presented for comment and discussion with emphasis on an enabling policy environment for ICM, enhancement of seed access, implementation of crop insurance as envisaged in the 10^{th} plan, technology support and enhancement through provision of subsidies for chemicals and equipment. The possibility of utilizing multiple sources of funds eg., DADF (district agriculture development fund, LIF (local initiative fund), DEF (district extension fund), NARDF and others was also raised**.** Under the present project ultimately only NARDF was successfully canvassed for additional funds by DOA/NARC but this is a good start.

Mr SS Shrestha, Director General, DOA emphasised how important this meeting had been in bringing together NARC and DOA and in up-scaling chickpea ICM technology but suggested this would have been achieved more quickly with earlier cooperation. He also said DOA would welcome and would like to be involved in the dissemination of any legume crop production technology for three reasons: Nutritional security of the people, soil improvement, and income generation. He noted that creation of awareness among farmers in chickpea ICM technology and strengthening linkage and marketing are important aspects for the scaling up to be successful. Though, chickpea market is not a problem at present, but as the technology gets disseminated through the program, production would increase and farmers may have to face more challenging situations, hence this aspect should be evaluated when farmers harvest (May, 2006) He also emphasised that DOA would be happy to distribute and test any amount of chickpea seeds as mini-kits. Realizing the average yield of chickpea to 2 t/ha at the national level is a good target for DOA, through the dissemination of ICM technology. He also said that the joint efforts of DOA and NARC would be successful in the scaling up through the formation of farmer groups and their orientation to improved seed and production technology. Packaging of technology is needed for Outreach and /or extension. Pilot testing in selected sites and further expansion would be the logical steps in scaling up. Networking should be very simple for the technology to spread faster

Overall, the message from district officers was that while BGM and Pod borer were the main problems and thus our ICM strategy would be a welcome addition to their arsenal of development strategies, that seed availability was identified as a problem and that any DOA involvement would require provision of germplasm. Mr K. C. Sharma , Program Director of Extension suggested that pilot testing in a limited number of districts in the first year would help to bring on board the strategy because with close focus it would be easier to ensure positive outcomes for farmers by providing stronger backstopping. This would enable field sites to be selected for visits by senior ministerial staff to impress upon them that DOA were able to achieve the same successes in extension of the ICM strategy as NARC. It was agreed that the farmers field schools (FFS) was the best approach – as the management of ICM is knowledge intensive. Dr D B Swar, the Deputy Director General DOA supported the emphasis on joint action by NARC and DOA for successful up-scaling. He also said that the generation or work was an attractive feature of the ICM technology that would appeal to ministers to continue backing the strategy if we could show that DOA had the capacity to run with it.

Altogether 15 activities were identified for implementation in four districts: Banke, Bardia, Dhang and Sarlahi, jointly by DOA and NARC with the support and backstopping of NRI and ICRISAT (Appendix 1) and staff to take an active role were identified (Appendix 4).

The meeting was successful in bringing DOA and NARC personnel to the same table and to agree on a general strategy to expand chickpea ICM up-scaling in the rice based systems but to do this together. The participants were convinced of the need for the wider dissemination / scaling up of the technology through joint action by DOA and NARC, in collaboration with other stakeholders. DOA agreed to go for scaling-up in selected pilot districts and expressed its willingness to distribute and test chickpea mini-kits in farmer's field trials and conduct farmer field schools but that this would require DOA extension workers be trained by our NARC/ICRISAT/NRI team.

The following were the main conclusions and action points of the working group:

- The technology should be pilot tested in selected districts jointly by DOA and NARC (Appendix 1). ,
- NARC/ICRISAT/NRI expertise on ICM/IPM technology should be utilized in training/capacity building of DOA Technicians/personnel.
- Farmer preferred varieties like Avarodhi & Tara etc. should be released officially. The national program should take steps for it.
- Seed production and its availability should be taken into consideration while implementing ICM scaling up activities via community based groups (CBOs).
- The proposed activities along with the responsibilities were agreed at large by DADO/DOA to be implemented in collaboration with NARC in the coming season
- It was agreed that a further meeting will workout the details of action plan based on the proposed outline.
- Incentive packages like training etc. for the R & D workers should be provided in the projects.

ICM Technologies for scaling up as mini-kits are shown in Appendix 3.

WORKPLAN MEETING 2: Scaling Up Chickpea ICM Technologies for Enhancing the Income of Resource Poor Farmers of the Terai/Inner Terai 03 Aug 2005

A meeting of NARC, DOA, NRI, ICRISAT and District Agricultural Development Officers was held at NARC conference hall, Singh Durbar Plaza, Kathmandu on 03 August 2005 to plan the specific site activities for implementing the scaling up of chickpea ICM technologies for the year 2005/06 through DOA with NARC providing a backstopping role. This was a follow up of the earlier meeting discussed above on May 24 2005. The site plan meeting was co-ordinated by Dr D B Swar, Deputy Director General, Department of Agriculture (DOA) and Dr SL Maskey Director Crops and Horticulture Director planning and coordination, NARC. There were 16 participants including director planning, program directors DOA, NARC directors, and other personnel from NARC and DOA. The meeting was successful in finalizing the specific site activities and implementation procedures for the year 2005/06.

Travelling workshops and joint monitoring tours during the crop season for exposing the concerned DOA and NARC personnel to the field problems and technologies were planned and this was built in to the program of activities. Seed back systems were also planned as to ensure that participant farmers would return the seed to the project, so that it would be available for distribution to other farmers in the following season by DOA.

The need for environmentally benign options like NPV, botanicals etc., for the control of chickpea pod borer, instead of strong dependence on chemicals were emphasised, especially in the West, and an announcement made of the NPV training program to be carried out in early March 2006 to coincide with Pod borer emergence was welcomed (See below). Proceedings of the site plant meeting are attached in Appendix 2.

2. *Capacity built to support and scale-up the adoption and implementation of integrated crop management strategies for chickpea production*.

2.1 Extension staff of the DOA/NGOs trained in the technologies promoted to farmers by project staff who have already been directly involved in the training of farmers under R7885 and mini-kits developed.
2.2 Train the NGO/NARC bio-rational initiative in Chitwan (now Nepalgunj] in quality control of biopesticides to ensure that the emerging capacity in application of biological control strategies (NPV) as a control measure for pod borer is sustainable and of high quality.
2.3 Dissemination material in the form of technology information sheets produced for the various players as learning and extension tools (for seed producers, retailers – see output 3, trainers, extension staff, farmers). This will include broader information on market information, inputs (cost, access), risk information and benefits as well as technical information.

Distribution of seed mini-kits, demonstrations and community level seed production.

A total of 500 seed kits were distributed to 363 farmers and details of their distribution are presented in Appendix 5. In summary, they were distributed to villages in Dhang, Bardia, Banke and Sarlahi districts. These districts occur in the mid west and central region and present important foci for poverty reduction. Most farmers were given enough material to trial 1 katha (333 m^2) although some sowed up to 2000 m^2.

A number of progressive farmers selected by DOA/NARC in each district were provided enough material to develop a community based seed production systems. Lessons learned for the previous project and from Nepal's 10^{th} plan identified small enterprises as a key group to benefit from and thus ensure sustainability of the development of a national strategy for ICM production of chickpea. The individual groups are detailed in Appendix 5 but in brief consisted of 2 in Bardia, 3 in Banke, 4 in Dang and 1 in Sarlahi (already many

CBOs in this district that have emerged from R7885). The groups sowed a total of 50,000 m^2 which is enough to produce up to 2.0 t of seed for distribution for the following seasons. With 50 kg of seed required to sow 1 Ha this is sufficient to sow 20Ha in November 2006 in addition to the seed being returned to the project from recipient framers on this project.

Demonstration plots were set up with a further 10 farmers in Bardia, Dang (Tulsipur), Banke and Sarlahi as detailed in Appendix 5. These consisted of 333 m^2 plots and provided an especially well managed plot to use to demonstrate various components of the ICM at different times of the season to participating farmers and also to non-participating farmers who were interested to know about the new technologies but were beyond the reach of this DOA min-kit pilot phase.

Training for extension workers. 18-23rd September 2005.

Outreach Research Division/NARC/NRI/ICRISAT held a training program with agriculture development Officers (ADOs) of Banke, Bardia, Dhang, Kanchanpur and Sarlahi during Sept 18-23, 2005 to enable them to learn about all aspects of the technology being promoted sufficiently to then impart this knowledge to the farmers described above and participants are detailed in Appendix 6. This was an essential component of the project to ensure that DOA was then able to provide the extension of chickpea ICM for farmers.

In total, 41 field technicians (Junior Technicians and Junior Technical Assistants) who are involved in agricultural extension in Banke, Bardia, Dhang, Kanchanpur districts, as part of DOA (RARS, Nepalgunj and NGLRP, Rampur) and from the NGO FORWARD (Forum for Welfare, Agricultural Research and Development), were invited to the week of training in ICM of chickpea. Chickpea promotional materials were distributed to the technicians. The training on chickpea was combined with activities on lentil and pigeonpea under Nepal Agricultural Research and Development Fund (NARDF) project in Banke, Bardia and Dang districts, illustrating how we have enabled the sourcing of additional funds for the up-scaling and sustainability of ICM of chickpea as a strategy for poverty alleviation in Nepal. Indeed, in addition to the 360+ farmers trained directly under this project, a further 150 farmers have been trained using funds from NARDF projects run jointly by NARC and DoA suggesting that the new found cooperation between the two departments now has a momentum of its own and may continue beyond the life of this project.

NPV Training 4-9 March 2006

A formal training course in NPV has been scheduled for 4-9 March 2006 to coincide with field populations of pod borer (*Helicoverpa armigera*). The provisional timetable and activities are presented in Appendix 7 but largely consist of the following activities.

The course will begin with an introduction to Morphology and Mode of action followed by the Use of NPV in Crop protection, NPV Production (Theoretical background to Infection followed by Harvesting and Processing), Quality control (purpose and variety), and counting and bioassay techniques.

A practical in virus identification will enable participants to learn to use a phase contrast microscope, how to prepare microscope slides and how to use a haemocytometer. These practical lessons will continue with an introduction to equipment, learning how to make a dilution series, how to set up a leaf dip bioassay, how to assess a assay and how to calculate results and interpret results. Visits to farmer field trials of NPV as run under the course and described below will allow participants to gain experience in application and monitoring and will allow them to learn to demonstrate the use of NPV to farmers and discuss issues with farmers.

Training in the use and application of field reared *Hear* NPV has already been undertaken for 15 farmers through Dr GV Ranga Rao at ICRISAT. Farmers from D Gaon, Bankatti and Puraina from Banke district and Mainapokhar and Sanoshree villages from Bardia district participated in the orientation course. *Hear*NPV production equipment (refrigerators, centrifuges, grinder and other accessories) were provided to the 5 groups small enterprises (CBOs), on the condition that these would be used for the production and promotion of the use *Hear*NPV for the management of chickpea pod borers. It is expected that these efforts would complement the current scaling-up program and would help further spread the technologies to a wider area. The details of participants are detailed in Appendix 8.

3. Private sector initiatives established for small & medium enterprises & community based seed production networks developed.

3.1 Farmer groups identified in consultation with government and non-government organisations and seed production networks established through training so that local farmers have a secure and sustainable source of the improved varieties crucial to the sustainability of the technology. Seed quality will be controlled via DOA seed certification guidelines and through a farmer certification scheme.

3.2 SMEs (identified in key districts in 1.3 above) trained in the ICM technologies for chickpea production ensuring they are well informed and better able to provide the technological back-stopping in the distribution technologies that accompanies seed to farmers.

3.3 Actual and potential market chains for chickpea and chickpea products identified. Bottlenecks and inefficiencies identified and resolved by drawing on experiences and knowledge from the Uganda Linking project (R8281). (We were not able to achieve this since DOA and NARC wanted to wait till the harvest before determining precise information about chickpea).

3.4 Develop a process to measure impact of up-scaling so these stakeholders are able to evaluate risks and benefits associated with changes in farmers practise associated with chickpea ICM after the lifetime of the present project. The first season will end in May 2006 but the present project will only allow activities up to Jan 2006

Role of NGO/CBO/SMEs

One of the main objectives of this project was to steward the up-scaling of the production of chickpea using the ICM validated in R7885 and develop in R8366 via the DOA extension system in 4 key districts to promote. However, as identified in the lessons learned component of the forerunner project R8366, SMEs and CBOs represent an equally important vehicle with which the up-scaling of the technology can be achieved. With this in mind a particular effort was made to ensure that these private sector groups were enabled, particularly in the area of seed prosecution and distribution but also in training.

The participants included Dahal Agrovet (Lalbandi), National Agrovet, Nepalgunj and Santosh Agrovet Mainapokhar, Bardia who are distributors and sellers of agricultural products and seeds. Along with staff from the progressive NGO, FORWARD, these SMEs participated in training in ICM production of chickpea to build their capacity to better di8sseminate ICM technologies to their clients as well as in setting up seed procurement agreements to ensure a market for farmers and provide a vehicle for wider dissemination.

Farmer groups, notably Shiva Shakti mixed farmers group in Sanoshree, Bardi district, Meghnarayan Mahato group, Satbaria and similar groups in Sarlahi also participated in training in various field operations key to successful practise of the ICM technology including sowing, weeding and application of anti-insect and anti-fungal technologies. They kept records of seed production and production costs and provided demonstration plots to

help visitors to their farms. They will be securing seed for storage to ensure an excess of seed for November 2006 to distribute among neighbouring farmers.

Policy document and other publications.

Outputs of the forerunner project extension, R8366, have led to the production of a policy document in which a strategy for country-wide adoption was documented. During the course of this project this was finished and published as ICRISAT information bulletin 70. Furthermore, a research paper was published in the international plant pathology journal Plant Disease, and the proceedings of the workshop held as part of R8366 were also published.

Stevenson, P.C., Pande, S., Pound, B. and Neupane RK. **2005**. A strategy for wealth generation through chickpea production. Information Bulletin No. 70. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 24 pp. ISBN 92-9066-482-7.

Pande, S., Stevenson, P.C., Narayana Rao, J., Neupane R. K., Chaudhary, R. N., Grzywacz, D., Bourai, V. A., Krishna Kishore, G. **2005.** Reviving Chickpea Production in Nepal Through Integrated Crop Management, with Emphasis on Botrytis Gray Mold. *Plant Disease*, Vol. 89, No. 12, 1252-1262.

Pande, S., Stevenson, P.C., Neupane R.K. and Grzywacz, D. (eds.) **2005**. Policy and Strategy for Increasing Income and Food Security through Improved Crop Management of Chickpea in Rice Fallows in Asia. Summary of a NARC-ICRISAT-NRI Workshop, 17-18 Nov 2004, Kathmandu, Nepal. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics; and Chatham, Maritime, Kent ME4 4TB, UK: Natural Resources Institute. 252 pp. ISBN 92-9066-479-7.

Contribution of outputs to development impact.

How has the knowledge promoted benefited the poor? What coverage has been achieved (numbers of farmers, institutions and production areas adopting the technology). What is the potential for wider scale impact?

Chickpea is a winter grown crop that relies on the moisture remaining after rice harvests. Consequently the crop is planted in November and is harvested in May and it will therefore not possible within the time constraints of this project to determine precisely how the project outputs have benefited the poor. However, the forerunner project R7885 studied the impact on livelihoods of the technology and showed that this strategy leads to important improvements in the nutrition and income of poor farmers in the Nepal *Terai* and furthermore is broadly applicable to South Asia. The technology has been shown (under farmer-management) to double the yields of chickpea, and double the profits made from it as a cash crop. Furthermore, it removes most of the risks of crop failure that have reduced farmer confidence in the crop in recent years. The application of the technology to winter rice fallows increases their net income by up to $US500 per hectare per year and reduces the need for imported chickpea thus improving the overall wealth of Nepal. In fact, the ICM strategy was evaluated over 3 years by more than 3500 farmers across the Nepal *Terai* on small-holder farms and it was shown to double yields to over 2100KgHa^{-1} and, since the investment required for ICM is low, was shown to halve the unit cost for production to NRs. 10.0 kg^{-1} so more than doubles profits. In light of the present project providing more than 500 mini-kits to farmers in 4 districts of Nepal the benefits to the poor must be considerable.

The project has made a significant contribution to the sustainability of the ICM technology by brining DOA on board and thus enabling a far wider out reach through the massive extension vehicle of DOA through district and regional offices and respective staff. As well as DOA and NARC the project has involved NGOs, CBOs and SMEs in the training but possibly most importantly of all has trained over 40 extension workers who will be keen to continue imparting this new found knowledge through their regular work in the coming years. During the present project, notably the DOAs first direct experience of the technologies and promoting them, we have managed to reach more than 500 farmers directly and we have also managed to set up Community base groups, and enable private Agrovets in 3 districts. Along with the NGO FORWARD, these groups will help to ensure sustainability of the technology and wider-scale impact through the development and expansion of their own private interests. More significantly in the first instance is that the potential to promote the technology throughout the reach of the DADOs has now been accomplished and was the main limiting step of earlier work. NARC, our original partner and research division of Ministry of Agriculture and Cooperatives, has an outreach department and thus an interest in developing research strategies for extension. However, it is not the main extension vehicle of MoAC. DOA on the other hand is and by building the capacity for DOA to run with this technology this project has developed the potential is to have an impact on a vast scale with as much as 400,000 Ha of rice left fallow in the winter and with as many as 800,000 farmers who could benefit from this technology.

What follow up action/research is necessary to promote the findings of the work to achieve their development benefit?

The main purpose of this project was to steward the uptake of the successes of the earlier project R7885/R8366 into the mainstream activities of DOA agricultural extension. Considering that our collaboration with the research department (NARC) of MOAC enabled us to reach as many as 3500 farmers over the 3 years, the scale of uptake in the present project was actually lower than we had originally hoped. And this is despite the fact that 40 DOA officers were trained along with many other from NGOs, CBOs and SMEs and more than 350 farmers were reached. However, in the light of this still considerable achievement follow-up action required would be to further steward the uptake of the knowledge beyond the current DOA extension pilot phase and ensure that increasing interest is maintained in the Ministry itself. In the light of this and as part of the NPV course we will hold a field day in Nepalgunj on Thursday 9th March 2006 to demonstrate how DOA have been able to run with the extension of chickpea ICM in collaboration with NARC as technical back-stoppers and indicate how increased funds from government for DOA would enable massive impact on livelihoods in the mid- and far-west of Nepal. It is hoped that many senior ministry staff will come to the field sites and CPP are invited too.

Biometricians Signature

There has been no data collection or analysis required during this project.

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Abbreviations:

ADB	Asian Development Bank
BGM	Botrytis Grey Mould
CBO	Community Based Organisations
CPP	Crop Protection Programme of DfID
DfID	Department for International Development
DOA	Department of Agriculture
FFS	Farmer Field Schools
FORWARD	Forum for Rural Welfare and Agricultural Research and Development
GoN	Government of Nepal
Ha	Hectare
HMGN	His Majesty's Government of Nepal
ICM	Integrated Crop Management
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
MoAC	Ministry of Agriculture and Cooperatives
NARC	Nepal Agricultural Research Council
NARDF	National Agricultural Research and Development Fund
NARS	National Agricultural Research Station
NGLRP	National Grain Legumes Research Program
NGO	Non-governmental Organisation
NORP	National Oils Research Program
NPC	National Planning Commission (Nepal)
NRI	Natural Resources Institute (UK)
NSB	National Seed Board
NSC	National Seed Company
PRSP	Poverty Reduction Strategy Paper
10th Plan.	Poverty Reduction Strategy Paper
PRA	Participatory Rural Appraisal
RARS	Regional Agricultural Research Station
SME	Small & Medium Enterprise

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Appendix 1

Proceedings of Work Plan Meeting

Scaling Up Chickpea ICM Technologies for Enhancing the Income of Resource Poor Farmers of the Terai/Inner Terai

24 May 2005

Nepal Agricultural Research Council (NARC)

Outreach Research Division, Khumaltar

Lalitpur

2005

Proceedings:
An informal meeting of Nepal Agricultural Research Council (NARC), Department of Agriculture (DoA) and Natural Resources Institute (NRI-UK) key personnel was held at NARC conference hall, Singh Durbar Plaza, Kathmandu on 24 May 2005 to discuss and prepare a frame work for implementing the scaling up of chickpea ICM technologies for the year 2005/06. The meeting was co-ordinated by Director Planning and Co-ordination, NARC. Mr D. S Pathic Acting Executive Director NARC, and Mr S. S. Shrestha Director General, DoA were the guests and chief guests at the meeting. There were 20 participants including director planning, program directors and regional director (CDR) DoA, NARC directors, and other personnel from NARC, DoA and NRI.

Director Planning and Co-ordination NARC, welcomed the guests and participant of the meeting and gave highlights on the importance of chickpea in the rice based cropping systems He emphasised on the importance of transfer of chickpea ICM technology to the farmers through active participation of DoA so as to get technologies to a wider geographical area. He pointed out the non- adoption of some of the recommended technologies by farmers in the past and opined that the work plan meeting would focus on technologies relevant to the needs of the farmers.

Mr R. K. Neupane senior scientist outreach Research Division (ORD)/ NARC elaborated the objectives of the meeting to the participants. He mentioned that the meeting was concerned with planning the activities for the scaling up of chickpea ICM technology generated and validated in farmer participatory trials conducted during 1998-2004. ICM technologies have the potentials to more than double the yields over farmer's practice. This meeting would discuss, suggest and agree on the approach for implementing the scaling up activities jointly by DoA and NARC.

Dr PC Stevenson from NRI UK, elaborately presented the findings of the phase 1 and II ICRISAT/DFID-CPP Chickpea IPM project conducted in Nepal. He mentioned that the application of ICM could result in more than doubling the yield levels, apart from reduced cost of production, enhanced employment generation, access to cheap sources of dietary protein and improvement in soil health. The scaling up of ICM technology would also result in export promotion and import substitution, as chickpeas are currently imported to meet the domestic demand. He also highlighted on the draft strategy for the proposed scaling up of chickpea ICM technology and emphasised on enabling policy environment for ICM, enhancement of seed access, implementation of crop insurance as envisaged in the 10^{th} plan, technology support and enhancement through provision of subsidies for chemicals and equipment. He also suggested for exploring the possibility of utilizing multiple sources of funds e.g. DADF (district agriculture development fund, LIF (local initiative fund), DEF (district extension fund), NARDF and others.

Mr R. K Neupane presented the findings of 1998/99-2004 chickpea on-farm research and proposed an outline of proposed scaling up project-activities for the year 2005/06 for discussion in the meeting. Altogether 15 activities were proposed for implementation in four districts Banke, Bardia, Dang and Sarlahi jointly by DOA and NARC.

Mr V.K. Srivastava, DADO Sarlahi reported that chickpea is grown in 4 VDCs in the district, in 80 ha in addition to the area in Lalbandi; BGM was a major problem in his district. They have planned 5 demonstrations from regular extension program in the district; they will be willing to implement the scaling up activities proposed in the meeting.

Mr T B Bom, Regional Director Surkhet opined that chickpea is widely grown in Banke, Bardia, Dang and other districts in the region, However, there were problems of diseases, pod borer and above all seed availability, hence the forthcoming project should concentrate on seed production and training. He said that chickpea was one of the options in the winter. If it were profitable than other alternative crops, wider dissemination would be a possibility. He was ever eager to participate in the scaling up activities in the coming season.

Mr K. C. Sharma, Program Director Extension opined that, in spite of the past efforts on R and D on chickpea, the problems of botrytis grey mould (BGM) disease and pod borer are still prevalent and emphasized on the use of resistant materials if available and reduction in the cost of production. He also stressed on reconfirming the results before launching a full scale scaling up; may be pilot testing in limited districts in the first year. If it benefits to the poor farmers, it should be disseminated widely,

farmers field schools (FFS) was on of the best approaches – as the management of ICM is knowledge intensive.

Mr Daman Dhungana DDG-DoA highlighted on the problems of chickpea production in the eastern terai, which experiences higher humidity during the chickpea growing season, resulting in foliar diseases and pod borer infestation. He pointed out that integrated use of tall varieties, wider spacing and need based foliar application of chemicals were important to manage the disease and get some profit. Only seed was not enough, training to extension workers and farmers as well were important for the dissemination of the technologies.

Dr D B Swar, DDG DoA expressed that the potentials of the ICM technologies of chickpea have been elaborated in details by NARC and a joint action by NARC and DoA is inevitable for dissemination to happen. Employment generation aspect of this project was an important feature of the ICM technology. Pricing of the product was important, though at present there seems to be no problem in marketing. Assured market and pricing should be rational or else farmers would be tempted to opt for other winter crops to chickpea.

Mr R.P Uprety, chief OR division, expressed that the participation of DoA in the meeting was very commendable, that itself was a green signal for scaling up. The suggestion of pilot testing in some district was appreciated however, a commitment from the DoA was very important for the sustainability of the project and expressed that this meeting would be able to get in a sort of commitment for scaling up from the department of agriculture.

Mr BMS Basnet, Chief Communications Publications Distribution Division (CPDD) NARC, expressed that the productivity of chickpea has increased at the national level though the area has decreased in recent years. He also stressed on the need for involvement of women farmers and suggested the promotion of the technology through mass media both electronic and print be inbuilt in the scaling up program to be more effective.

Mr R.L. Karma, Director NARC, suggested the research and extension to go side by side and suggested for implementing the scaling program in Pocket Package Program (PPP) of DoA. Also chickpea variety found promising in earlier projects should be officially released.

S.N. Vaidya, Chief M& E NARC suggested that commitments from DoA are important for the scaling up project, and NARC and DOA should workout for the joint action.

Mr NK Yadav, legume coordinator briefed that chickpea seed is not a problem. Since IPM is knowledge intensive training for extension workers and farmers as well is very important. The proposed program should encompass it.

Director planning and co-ordination NARC opined that farmers like the chickpea ICM technology and they are getting profit from it apart from employment generation. NARC expects the involvement and commitments of DoA for the scaling up ICM of chickpea as a joint program of DoA and NARC. He suggested that marketing of chickpea is not a problem at present and net working for technology dissemination should be very simple and not complicated.

Mr SS Shrestha, Director General DoA expressed that the meeting was very important for familiarizing him on the chickpea ICM technology and various aspects of it. He expressed that scaling up could have been faster, had DoA been involved in the earlier programs. However, now all of us have realized that participation of the mainstream extension is crucial for the take of scaling up that is why all of us from DoA are present here. DOA would welcome and would like to be involved in the dissemination of any legume crop production technology for the three reasons: Nutritional security of the people, soil improvement, and income generation. He noted that creation of awareness among farmers in chickpea ICM technology and strengthening linkage and marketing are important aspects for the scaling up to be successful. Though, chickpea market is not a problem at present, but as the technology gets disseminated through the program, production would increase and farmer may have to face the challenging situation, hence this aspect should take care of from the very beginning. The utilization of rice fallows for the dissemination of chickpea is important and is one of the many options available in the winter Hence, we should be able to convince the farmers that the crop is rewarding or profitable. DOA would be happy to distribute and test any amount of chickpea seeds as minikits.

Realizing the average yield of chickpea to 2 t/ha at the national level is a good target for DoA, through the dissemination of ICM technology. The joint efforts of DoA and NARC would be successful in the scaling up. Formation of farmer groups and their orientation to improved seed and production technology is the need of the hour. Packaging of technology is needed for Outreach and /or extension. Pilot testing in selected sites and further expansion would be the logical steps in scaling up. Networking should be very simple for the technology to spread faster.

Mr R.P Uprety expressed vote of thanks to the participant of the work plan meeting. He expressed his cordial thanks to NARC ED for gracing the meeting, the DG, Program Directors and Regional Director (MWDR), DoA for kindly accepting the invitation and actively participating in the meeting in, spite of their busy schedules. The meeting would have been impossible and incomplete without their participation and valuable inputs. He extended heart-felt thanks to Dr PC Stevenson NRI UK for his thought provoking presentation on the outcome of Phase I & II project and the possibilities of scaling up the project findings through involvement of multi stakeholders, particularly DoA, NARC and others.

He expressed his thanks to Director Planning and Coordination NARC for coordinating the work plan meeting and persuading all the participants to provide comments, suggestions and other inputs in the meeting. Finally, he thanked all the participants including, division chiefs, scientists, coordinators and support staffs from NARC for the active participation and valuable inputs provided in the meeting. Finally, he expressed his wish to all those concerned to get the works implemented as planned.

Conclusion

The meeting was successful in creating awareness among DoA and NARC personnel on the potentials of chickpea ICM technologies in improving chickpea yields in the rice based systems. The participants were convinced of the need for the wider dissemination / scaling up of the technology through joint action by DoA and NARC, in collaboration with other stakeholders. DoA has agreed in principal to go for scaling up in selected pilot districts and has expressed its willingness to distribute and test chickpea minikits in farmer's field. The following were the conclusions of the meeting:

- The technology should be pilot tested in selected districts jointly by DoA and NARC,
- NARC expertise on ICM/IPM technology should be utilized in training/capacity building of DoA Technicians/personnel
- Farmer preferred varieties like Avarodhi; Tara etc should be released officially. The national program should take steps for it.
- Seed production and its availability should be taken into consideration while implementing ICM scaling up activities
- Wherever possible, the program should be integrated with PPP of DoA
- Linkage with marketing should be taken into consideration at the initiation of the scaling up program
- The proposed activities along with the responsibilities were agreed at large by DADO/DoA to be implemented in collaboration with NARC in the coming season
- It was agreed that a separate meeting involving key (Core) personnel from DoA and NARC and ICRISAT (S Pande) will workout the details of action plan based on the proposed outline and will be implemented.
- Incentive package like training etc for the R & D workers should be provided in the projects

Technologies for scaling up

1. Improved chickpea varieties: Avarodhi, Tara, Koselee or Sita
2. Seed dressing with fungicides Bavistin (R) @ 2 g/kg seed
3. Seed priming: Soaking seeds for 8 hours and air dry for two hours before sowing is a non-monetary technology to ensure proper germination and emergence under late sown or moisture deficit soils.
4. Recommended dose of fertilizer as a basal application. In fertile soils, chemical fertilizer should be reduced accordingly.
5. Rhizobium inoculation: Seeds should be inoculated with Rhizobium culture before sowing to ensure better root nodulation
6. Need based foliar application (2-3 times) of Thiodan 35EC @ 2 ML /liter spray solution for protection against pod borer during the reproductive stage of crop.
7. Need based foliar application (2-3 times) of Bavistin @ 1 gm/liter spray solution for protection against botrytis grey mold (BGM) disease.

8. Seed rate 45-50kg/ha, dense planting results in excessive vegetative growth and favors the occurrence of BGM.
9. Crop rotation: Avoid growing chickpea year after year in the same piece of land to reduce the built up of soil borne pathogens e.g. wilt complex.

Proposed Activities and Responsibilities

SN	**Activities**	***Responsibility***		**Remarks**
		NARC	DoA	
1	Work plan meeting	OR Div	-	DoA to participate, ICRISAT/DFID will attend
2	Site selection	-	DADO	
3	Formation of farmer groups	-	DADO	
4	Minikits testing	-	DADO	NARC to provide technical inputs and seed source
5	Large plot demonstrations	-	DADO	NARC to provide technical information and inputs
6	Community seed increase	-	DADO	NARC will provide technical information and inputs
7	Farmer trainings	-	DADO	
8	Training to extension technicians	ORD/ NARC	-	In collaboration with commodity program/RARSs/ ARSs
9	Organizing farmer field days	-	DADO	In collaboration with RARS/ARS
10	Awareness campaign for chickpea technologies	ORD/ NARC	DADO	
11	Strengthening linkages with R & D projects having interest in chickpea promotion	ORD/ NARC	DADO	
12	Publication of farmer useful leaflets /brochures	ORD/ NARC	-	
13	Annual review meetings	ORD/ NARC	-	Concerned DADOs/DoA will participate
14	Reporting trimester and annual	ORD/ NARC	DADO	DADO to send periodic reports & data to ORD. Consolidated report to be sent by ORD

Participants of work plan meeting

SN	Name	Designation
1	Mr D. S Pathic	Act ED NARC, Singhdurbar Plaza Kathmandu Nepal
2	Mr S.B. Pandey	Director Planning and Coordination, NARC
3	Mr Shiva S. Shrestha	Director General, DoA, Harihar Bhawan, Pulchowk, Lalitpur
4	Mr D. B. Dhungana	Deputy Director General, DoA
5	Mr Deep Bahadur Swar	Deputy Director General, Planning DoA
6	Mr Tek Bahadur Bom	Regional Director, Surkhet
7	Mr K. C. Sharma	Program Director, Agri Extension Directorate,
8	Mr V.K. Shrivastava	ADO, DADO, Sarlahi
9	Mr Narayan Bahadur Thapa	Agronomist, CDP, DoA
10	Mr P.L Karna	Officiating Director Crops & Hort, NARC
11	Mr Ram P. Uprety	Principal Scientist, ORD NARC, Khumaltar Nepal
12	Mr Bholaman Singh Basnet	Chief, Communication Publication Dissemination Division, Khumaltar
13	Mr S. N Vaidya	Senior Scientist, M & E NARC,
14	Mr B.P Chaudhury	Senior Scientist, NORP Nawalpur, Sarlahi
15	Dr P. C. Stevenson	Principal Scientist, NRI, Greenwich, UK
16	Mr D. N. Pokhrel	Technical Officer, RARS Nepalgunj
17	Mr R. K. Neupane	Senior Scientist, ORD NARC Khumaltar, Lalitpur

		Nepal
18	Mr N.K. Yadav	Coordinator NGLRP, Rampur
19	Mr Rajendra Bajracharya	Camera man, CPDD
20	Mr Ramesh Mahat	Computer Operator, NARC

Appendix 2

Proceedings of Site Plan Meeting

Scaling Up Chickpea ICM Technologies for Enhancing the Income of Resource Poor Farmers of the Terai/Inner Terai

03 Aug 2005

Nepal Agricultural Research Council (NARC)
Outreach Research Division, Khumaltar
Lalitpur
2005

Introduction

An informal meeting of Nepal Agricultural Research Council (NARC), Department of Agriculture (DoA), DADOs of project districts and ICRISAT key personnel was held at NARC conference hall, Singh Durbar Plaza, Kathmandu on 03 August 2005 to discuss and finalize the site specific plan of activities for implementing the scaling up of chickpea ICM technologies for the year 2005/06. This was a follow up of the earlier concluded DFID/ICRISAT-Nepal work plan meeting organized at NARC on May 24 2005, wherein the outlines of the scaling up program were discussed and agreed in principles to be conducted at potential production pockets of chickpea. The site plan meeting was co-coordinated by Dr D. B. Swanr, Deputy Director General DoA. There were 16 participants including Dr SL Maskey Director Crops and Hort, Mr S.B Pandey Director Planning and Co-ordination NARC, Mr K.C Sharma, Program Director Extension (DoA) and other key personnel from NARC and DoA.

Director planning and co-ordination NARC initiated the meeting expressing that farmers like the chickpea ICM technology and they are getting profit from it apart from employment generation. NARC was happy from the commitments of DoA for the scaling up ICM of chickpea, in the previous work plan meeting. In this context, this site plan meeting would discuss and finalize the targets for activities to be conducted in the coming season. He requested all participants to actively participate and contribute to make the site-specific plans more realistic.

Mr R.P Upreti, Outreach Research Division Chief, welcomed the guests and participant of the meeting and gave highlights on the importance of chickpea in the rice based cropping systems He stressed on the need of transferring chickpea ICM technology to farmers through active participation of DoA so as to get technologies to a wider geographical area in a minimum time frame. He pointed out the non- adoption of some of the recommended technologies by farmers in the past and opined that the site plan meeting would focus on relevant issues for the effective dissemination of chickpea ICM technologies to the target districts.

Dr Suresh Pande Principal Scientist ICRISAT gave highlights on the findings of the ICRISAT/DFID-CPP Chickpea IPM project conducted in Nepal. He mentioned that the application of ICM could result in more than doubling the yield levels of chickpea at farm level. He elaborated the constraints to chickpea production as revealed from PRA and nicknamed as 6Bs: Boron, (B) wilt, Blue bull (nil gai) Borer (pod borer), Botrytis grey mould, and Bruchids. However pod borer and BGM was the major biotic factors or yield reducers.

Mr R. K. Neupane senior scientist outreach research division NARC elaborated the objectives of the meeting to the participants. He mentioned that the meeting was concerned with formulation of site specific plan of activities for scaling up of ICM technology generated and validated in farmer participatory trials conducted during 1998-2004. This meeting would discuss, suggest and agree on the approach for implementing the scaling up activities jointly by DoA and NARC. Altogether 15 activities were proposed for implementation in four districts Banke, Bardia, Dang and Sarlahi jointly by DoA and NARC. Al the activities were discussed thoroughly among the participants.

Dr Hari Bhandari, Program Director DoA, emphasized on the need of environment friendly options like NPV, botanicals etc for the control of chickpea pod borer, instead of depending on the use of chemicals alone. He also suggested for the inclusion of travelling workshop, joint monitoring tours during the crop season for exposing the concerned DoA and NARC personnel to the field problems and potential solutions. A project visit by Nepal workers to neighbouring Indian chickpea production area/projects was also suggested. The possibility of providing subsidy for the purchase of seed bins to seed producer farmers was discussed.

Dr S.L Maskey, Director Crops and Hort NARC, suggested that seed-back system be introduced in the project so that, participant farmers would give back the seed to the project, and the would be available for distribution to other farmers in the next season. The incorporation of chickpea utilisation aspect in the farmers' training program through involvement of food research unit was also suggested.

Mr K. C. Sharma, Program Director Extension (DoA), opined that in spite of the past efforts on R and D on chickpea, the problems of botrytis grey mould (BGM) disease and pod borer are still prevalent and emphasized on the use of resistant materials if available and reduction in the cost of production. He stressed on the need of training to farmers and extension workers and suggested that frequent

interaction among research and extension workers were desirable for effective transfer of technologies. Orientation training to farmers should be conducted in three crop growth stages to expose them to various problems in chickpea production.

Mr V.K. Shrivastava, DADO Sarlahi and B.P. Gupta, DADO Banke requested for more number of seed kits for testing in their districts. The proposed activities were acceptable. However, they suggested that provision of training to extension workers was desirable.

S.N. Vaidya, Chief M& E NARC suggested that community level seed production program was important and all inputs should be provided from the project. This should be linked to DISSPRO of concerned district, so that seed produced through the project could be purchased through DADO or other concerned organizations.

Mr R.P. Upreti, Chief OR Division, expressed that the participation and inputs of DoA in the meeting was very commendable, that itself was a green signal for scaling up. He expressed cordial thanks to all the participants for kindly accepting the invitation and actively participating in the meeting in, spite of their busy schedules. The meeting would have been impossible and incomplete without their participation and valuable inputs. Finally, he thanked all the participants including, directors, division chiefs, scientists, coordinators and support staffs from NARC for the active participation and valuable inputs provided in the meeting and expressed his wish to all those concerned to get the works implemented as planned.

Conclusion

The meeting was successful in finalizing the site-specific plans and implementation procedures for the year 2005/06. The participants were convinced of the need for the wider dissemination / scaling up of the technology through joint action by DoA and NARC, in collaboration with other stakeholders. Site-specific plans for Banke, Bardia, Dang and Sarlahi districts were discussed and agreed upon.

The following were the conclusions of the meeting:

- The site specific plans for Sarlahi, Banke, Bardia and Dang were discussed, amended and agreed for implementation in the coming season (Table 1 and 2).
- CU (ORD) will submit project proposal to NARC (*for activities finalized*) for approval and fund release as per NARC format.
- NARC will release funds to CU for the activities finalized in this meeting.
- CU wills advance/ disimburse funds to collaborators (DADO/ARS/RARS) for expenses incurred as per existing financial rules/ regulations in implementing the approved activities.
- NARC expertise on ICM technology would be utilized in training/capacity building of DoA field technicians/personnel.
- National oilseeds research program (NORP) and Regional Agriculture Research Station (RARSN) scientists will organize specific data collection from concerned district/sites in collaboration with concerned DADOs.
- Concerned DADOs will invite RARS/ARS collaborators for farmers' training, farmers' field days and monitoring as per mutual consultation.
- ORD/NARC and ICRISAT will organize training for field technicians in chickpea ICM technologies.
- DADOS will arrange to get seed back guarantee from participant farmers and so that seed could be used for next season.
- In seed multiplication block, respective DADOs will mange to complement wherever feasible to support the purchase of seed bins by seed growers, by availing subsidies through existing mechanism.
- Wherever possible, the program would be integrated with DISSPRO & PPP of DoA.
- ICRISAT (Dr S Pande) would explore the possibility of organising travelling seminar for R & D workers involved in the project.

Table 1. Agreed site-specific plan for ICM of chickpea scaling up program for 2005/06

Activities	District Agriculture development Office (DADO)				Remarks
	Sarlahi	Banke	Bardia	Dang	Total
Site selection	√	√	√	√	4
Formation of farmer groups	√	√	√	√	4
Seed kit distribution (I katha each)	200	100	100	100	500
Frontline demonstrations (10 katha each) (No)	3	3	3	3	12 (4 ha)
Community seed multiplication (ha)	1	1	1	1	4
Farmer orientation trainings	3	3	3	3	12
Organizing farmers' field days	1	1	1	1	4
Recognition of best farmers	1	1	1	1	4
Reporting quarterly and annual	√	√	√	√	

Table 2. Tentative site plan for ICM of chickpea scaling up program FY 2005/06

Activities	NARC			
	RARS Nepalgunj	NORP Nawalpur	NGLRP Rampur	Outreach Research Division (ORD)
Training for Ext technicians	To collaborate & provide expertise			1
National Monitoring	To participate			1
Work plan/ review/ meetings	To participate			1
Seed kit distribution	Collaborate data collection			To facilitate
Front line demonstration	Collaborate			To facilitate
Community seed production	Collaborate			To facilitate
Farmer orientation trainings	To participate & provide expertise			To facilitate
Farmers' field days	To help organize and participate			To facilitate
On station seed multiplication	1 ha	1 ha	-	To facilitate
Reporting quarterly and annual	√	√	√	√

Appendix 3

Technologies for scaling up

Improved chickpea varieties: Avarodhi, Tara, Koselee

1. Seed dressing with fungicides Bavistin (R) @ 2 g/kg seed
2. Seed priming: Soaking seeds for 8 hours and air dry for two hours before sowing is a non-monetary technology to ensure proper germination and emergence under late sown or moisture deficit soils.
3. Recommended dose of fertilizer as a basal application. In fertile soils, chemical fertilizer should be reduced accordingly.
4. Rhizobium inoculation: Seeds should be inoculated with Rhizobium culture before sowing to ensure better root nodulation
5. Need based foliar application (2-3 times) of Thiodan 35EC @ 2 ML /litre spray solution for protection against pod borer during the reproductive stage of crop.
6. Need based foliar application (2-3 times) of Bavistin @ 1 gm/litre spray solution for protection against botrytis grey mold (BGM) diseases. High relative humidity and cloudy weather at flowering favours the occurrence of BGM.
7. Seed rate 45-50kg/ha, dense planting results in excessive vegetative growth and favours the occurrence of BGM.

Crop rotation: Avoid growing chickpea year after year in the same piece of land to reduce the built up of soil borne pathogens e.g. wilt complex

Appendix 4

Personnel involved in project implementation

Central level

Personnel	**Area of responsibility/involvement**
DOA Mr. S. S Shrestha DoA (*Drector General*) Mr. Sharma (*Program Director*, Directorate of Extension)	1. Participation in planning meetings 2. Providing directives to district offices 3. Liaison with NARC
NARC Dr R.P Sah, *Executive Director* Dr SL Maskey *Director* Crops and Hort Mr. S.B. Pandey *Director* Planning and Coordination Mr. RP Uprety *Chief* Outreach Research Division, Mr. R.K. Neupane, *Senior Scientist* ORD/ NARC **(in-country project coordination)**	1. Participation in planning meetings 2. Providing guidance for project implementation 3. Liaison with DoA, NRI and ICRISAT 4. Reporting
DoA Mr. S. Upadhyay, ADO Banke Mr. A Rahman, ADO Dang Mr. K. K. Jha, ADO Bardia Mr. B.N. Jha, ADO Sarlahi ADO = Agricultural Development Officer	❖ Facilitate activity implementation at the project sites ❖ Liaison with Outreach division ❖ Depute support staff project activity implementation
NARC Mr. B Mishra. Coordinator NORP Sarlahi Mr. A. R. Ansari, Senior Scientist RARS Nepalgunj	❖ Facilitate activity implementation at the project sites ❖ Depute officers/scientist for monitoring and training activities ❖ Manage seeds and inputs for the project sites Manage funds
DoA Mr. V. K. Srivastava, Agronomist DADO Sarlahi Mr. B Regmi Agronomist DADO Dang Mr. BR Chaudhary Technician Dang Mr. R.K. Mahato Agronomist Bardia Mr. S. Upadhyay DADO Banke	❖ Activity implementation ❖ Farmers selection, group formation, seed kit distribution, and testing ❖ Farmers training ❖ Activity monitoring and data coll
NARC Mr. DN Pokhrel technical officer RARS Nepalgunj Mr. BP Mahato, Technical Officer RARS Nepalgunj Mr. P Jha Scientist, RARS Nepalgunj Mr. B Chaudhary, Senior Scientist NORP Sarlahi	❖ Organize seed packaging and delivery ❖ Organize training ❖ Trial monitoring ❖ Participate in farmers field days and data collection
NGO/CBOs Dahal Agrovet Lalbandi FORWARD Nepalgunj National Agrovet Nepalgunj Santosh Agrovet Mainapokhar Bardia	❖ Participate in training and visit programs ❖ Disseminate ICM technology to their clients ❖ Help in seed procurement as per their need
Farmer groups and farmers 1. Shiva Shakti Mixed farmers group Sanoshree, Bardia 2. Meghnarayan Mahato leader farmer-Farmers group Satbaria 3. Other groups	❖ Organize farmers into groups ❖ Participate in orientation training ❖ Carryout field operation including sowing, weeding, application of plant protection materials ❖ Keep records of seed production and demonstration plots ❖ Help visitors to observe trials plots ❖ Manage seed procurement storage and sale for the next season

Appendix 5

Seed and technology distribution including individual farmers

Seed kit distribution

District	Villages			Total kits (No)
Dang	Satbaria (Lamahi)	Tulsipur		100
Banke	Bankatti	Puraina	Kamdi	100
Bardia	Sanoshree			100
Sarlahi	Janakinagar	Murtiha		200
Total				500

Frontline demonstration

District	Villages			Area (ha)
Dang	Satbaria	Tulsipur		1
Banke	Bankatti	Puraina	Kamdi	1
Bardia	Sanoshree (Taratal)			1
Sarlahi	Janakinagar	Murtiha		1
Total				4

Community level seed increase

District	Villages			Area (ha)
Dang	Satbaria			1
Banke	Bankatti	Puraina	Kamdi	1
Bardia	Sanoshree (Taratal)			1
Sarlahi	Janakinagar	Murtiha		1
Total				4

Details of chickpea seed kit distribution

SN	Farmers Name	Address	Variety	Area M^2
1.	Mrs. Kaushala Gautam	Chaulahi 4, Dang	Sita	333
2.	Mrs. Chamela Ghimire	Chaulahi 4, Dang	Sita	333
3.	Mrs. Sushila Sharma	Chaulahi 4, Dang	Sita	333
4.	Mr. Suka Dev Chaudhary	Chaulahi 4, Dang	Sita	333
5.	Mr. Gopi Lal Chaudhary	Chaulahi 3, Dang	Sita	333
6.	Mr. Kali Prasad Chaudhary	Chaulahi 3, Dang	Avarodhi	333
7.	Mr. Dhol Bahadur Chaudhary	Chaulahi 3, Dang	Avarodhi	333
8.	Mr. Lawati Chaudhary	Chaulahi 5, Dang	Avarodhi	333
9.	Mr. Kali Prasad Chaudhary	Chaulahi 5, Dang	Avarodhi	333
10.	Mrs. Bed Maya Chaudhary	Chaulahi 5, Dang	Avarodhi	333
11.	Mr. Bira Nanda Chaudhary	Chaulahi 8, Dang	Avarodhi	333
12.	Mr. Deepak Chaudhary	Chaulahi 8, Dang	Avarodhi	333
13.	Mr. Sundar Prasad Chaudhary	Chaulahi 8, Dang	Avarodhi	333
14.	Mr. Kanchha Chaudhary	Chaulahi 8, Dang	Avarodhi	333
15.	Mr. Chhunu Lal Chaudhary	Chaulahi 8, Dang	Avarodhi	333
16.	Mr. Sanu Prasad Chaudhary	Satbaria 5, Dang	Sita	333
17.	Mr. Krishna Ram Chaudhary	Satbaria 5, Dang	Sita	333
18.	Mr. Puni Ram Chaudhary	Satbaria 5, Dang	Sita	333
19.	Mr. Umesh Chaudhary	Satbaria 5, Dang	Sita	333
20.	Mr. Saji Ram Chaudhary	Satbaria 5, Dang	Sita	333
21.	Mr. Khoji Ram Chaudhary	Satbaria 5, Dang	Sita	333
22.	Mr. Shobha Ram Chaudhary	Satbaria 5, Dang	Sita	333
23.	Mr. Tulsi Ram Chaudhary	Satbaria 5, Dang	Avarodhi	333
24.	Mr. Dhani Ram Chaudhary	Satbaria 5, Dang	Avarodhi	333
25.	Mr. Santa Ram Chaudhary	Satbaria 5, Dang	Sita	333
26.	Mr. Sudarshan Chaudhary	Satbaria 5, Dang	Sita	333
27.	Mr. Krishna Bdr Chaudhary	Satbaria 5, Dang	Sita	333

28.	Mr. Asha Ram Chaudhary	Satbaria 5, Dang	Sita	333
29.	Mr. Bejhu Ram Chaudhary	Satbaria 5, Dang	Sita	333
30.	Mr. Ram Duwary Chaudhary	Satbaria 5, Dang	Sita	333
31.	Mr. Nepalu Chaudhary	Satbaria 5, Dang	Sita	333
32.	Mr. Dilli Chaudhary	Satbaria 5, Dang	Sita	333
33.	Mr. Khusi Ram Chaudhary	Satbaria 5, Dang	Sita	333
34.	Mr. Mahanta Chaudhary	Satbaria 5, Dang	Sita	333
35.	Mr. Rebati Chaudhary	Satbaria 5, Dang	Sita	333
36.	Mr. Bhansa Ram Chaudhary	Satbaria 5, Dang	Avarodhi	333
37.	Mr. Chandra Bdr Chaudhary	Satbaria 5, Dang	Avarodhi	333
38.	Mr. Sudarsan Chaudhary	Satbaria 5, Dang	Avarodhi	333
39.	Mr. Sano Prasad Chaudhary	Satbaria 5, Dang	Avarodhi	333
40.	Mr. Dilli Chaudhary	Satbaria 5, Dang	Sita	333
41.	Mr. Hanuman Chaudhary	Satbaria 5, Dang	Avarodhi	333
42.	Mr. Hira Lal Chaudhary	Satbaria 5, Dang	Avarodhi	333
43.	Mr. Chet Ram Chaudhary	Satbaria 5, Dang	Avarodhi	333
44.	Mr. Shree Ram Chaudhary	Satbaria 5, Dang	Avarodhi	333
45.	Mr. Khusiram Chaudhary	Satbaria 5, Dang	Avarodhi	333
46.	Mr. Mahanta Chaudhary	Satbaria 5, Dang	Avarodhi	333
47.	Mr. Rebati Chaudhary	Satbaria 5, Dang	Avarodhi	333
48.	Mr. Bir Bahadur Chaudhary	Satbaria 5, Dang	Sita	333
49.	Mr. Salik Ram Chaudhary	Satbaria 5, Dang	Avarodhi	333
50.	Mr. Hira Lal Chaudhary	Satbaria 5, Dang	Avarodhi	333
51.	Mr. Rajendra Pokhrel	Manpur –3, Tulsipur	Tara	333
52.	Mr. Dilli Chaudhary	Satbaria 5, Dang	Avarodhi	333
53.	Mr. Dandpani Pokhrel	Manpur –3, Tulsipur	Sita	333
54.	Mr. Dhan Bd. Oli	Bijauri -7, Tulsipur	Tara	333
55.	Mr. Budhiram K.C.	Bijauri -7, Tulsipur	Tara	333
56.	Mr. Ram Bd. Khatri	Bijauri -7, Tulsipur	Sita	333
57.	Mr. Nimraj Mahara	Bijauri -7, Tulsipur	Tara	333
58.	Mr. Shankar K.C.	Bijauri -7, Tulsipur	Tara	333
59.	Mr. Bishnu Chaudhary	Bijauri -7, Tulsipur	Sita	333
60.	Mr. Kangu Chaudhary	Bijauri -7, Tulsipur	Tara	333
61.	Mrs. Shushila Rajaure	Bijauri -7, Tulsipur	Tara	333
62.	Mr. Khushiram Chaudhary	Bijauri -7, Tulsipur	Tara	333
63.	Mr. Krishna Pd. Bhushal	Bijauri -7, Tulsipur	Tara	333
64.	Mr. Indra Bd. K.C.	Bijauri -7, Tulsipur	Tara	333
65.	Mr. Ganesh Subedi	Bijauri -7, Tulsipur	Sita	333
66.	Mr. Khinti Chaudhary	Bijauri -7, Tulsipur	Tara	333
67.	Mr. Jugmani Chaudhary	Bijauri -7, Tulsipur	Tara	333
68.	Mrs. Rupkala Oli	Bijauri -7, Tulsipur	Tara	333
69.	Mr. Man Bd. Chaudhary	Bijauri -7, Tulsipur	Tara	333
70.	Mr. Raghab Gautam	Bijauri -7, Tulsipur	Tara	333
71.	Mrs. Lalita Chaudhary	Bijauri -7, Tulsipur	Tara	333
72.	Mr. Opendra Oli	Bijauri -7, Tulsipur	Tara	333
73.	Mr. Tesiram Pokhrel	Manpur -3, Tulsipur	Sita	333
74.	Mr. Tika Bhattarai	Manpur -1, Tulsipur	Tara	333
75.	Mrs. Sheila Chaudhary	Bijauri -7, Tulsipur	Tara	333
76.	Mr. Kaluram Chaudhary	Bijauri -7, Tulsipur	Tara	333
77.	Mr. Hari Bd. Oli	Bijauri - 5, Tulsipur	Sita	333
78.	Mr. Sebakram Rajaure	Bijauri - 5, Tulsipur	Sita	333
79.	Mr. Laxmi Pd. Bhushal	Bijauri -5, Tulsipur	Sita	333
80.	Mr. Durga Bd. Raut	Manpur -1, Tulsipur	Sita	333
81.	Mr. Rati Oli	Manpur -1, Tulsipur	Sita	333
82.	Mrs. Santa Bhattarai	Manpur -1, Tulsipur	Sita	333
83.	Mr. Udhai Bd. Budhathoki	Manpur –1, Tulsipur	Sita	333
84.	Mr. Chandra Bd. Dangi	Manpur -1, Tulsipur	Sita	333

85.	Mrs. Madhumaya G.C.	Bijauri -5, Tulsipur	Sita	333
86.	Mrs. Nima Oli	Bijauri -5, Tulsipur	Sita	333
87.	Mr. Krishna Bd. Bhandari	Bijauri -5, Tulsipur	Sita	333
88.	Mr. Aiti Mahara	Bijauri -5, Tulsipur	Sita	333
89.	Mr. Jitram Chaudhary	Bijauri -5, Tulsipur	Sita	333
90.	Mr. Neb Bd. K.C.	Bijauri -5, Tulsipur	Sita	333
91.	Mrs. Sharada Sharma	Bijauri -5, Tulsipur	Sita	333
92.	Mrs. Shabitri Sharma	Bijauri -5, Tulsipur	Sita	333
93.	Mr. Gopal Sharma	Bijauri -5, Tulsipur	Sita	333
94.	Mr. Matura Chaudhary	Bijauri -5, Tulsipur	Sita	333
95	Mr. Hari Pd. Chaudhary	Bijauri -5, Tulsipur	Sita	333
96	Mrs. Gita K.C.	Bijauri -5, Tulsipur	Sita	333
97	Mr. Champha K.C.	Bijauri -5, Tulsipur	Sita	333
98	Mr. Durga Bd. K.C	Bijauri -5, Tulsipur	Sita	333
99	Mr. Khim Bd. Upadhaya	Bijauri -5, Tulsipur	Sita	333
100	Mr. Dipendra Pokhrel	Bijauri -5, Tulsipur	Sita	333
101	Mr. Rabi Chandra Sharma	Bijauri -6, Tulsipur	Sita	333
102	Mr. Ram Aasre Koiri	Puraina–9, Banke	Avarodhi	333
103	Mr. Ismail Khan	Puraina –9, Banke	Avarodhi	333
104	Mr. Tassabar	Puraina –9, Banke	Avarodhi	333
104	Mr. Lallu Khan	Puraina –9, Banke	Avarodhi	333
105	Mr. Sakroom Khan	Puraina –9, Banke	Avarodhi	333
106	Mr. Mohara Pathan	Puraina –9, Banke	Avarodhi	333
107	Mr. Hasrbul Khan	Puraina –9, Banke	Avarodhi	333
108	Mr. Holi Khan	Puraina –9, Banke	Avarodhi	333
109	Mr. Saref Khan	Puraina –9, Banke	Avarodhi	333
110	Mr. Sami Ullah	Puraina –9, Banke	Avarodhi	333
111	Mr. Kabir Khan	Puraina –9, Banke	Avarodhi	333
112	Mr. Sagir Khan	Puraina –9, Banke	Avarodhi	333
113	Mr. Jamil Khan	Puraina –9, Banke	Avarodhi	333
114	Mr. Tirath Koiri	Puraina –9, Banke	Avarodhi	333
115	Mr. Vishnu Koiri	Puraina –9, Banke	Avarodhi	333
116	Mr. Ram Sing Koiri	Puraina –9, Banke	Avarodhi	333
117	Mr. Jang Bahadur Khan	Puraina –9, Banke	Avarodhi	333
118	Mr. Panchu	Puraina –9, Banke	Avarodhi	333
119	Mr. Imam Khan	Puraina –9, Banke	Avarodhi	333
120	Mr Prem Bahadur Oli	Sano Shree 2, Bardia	Avarodhi	333
121	Mrs. Harikala Dangi	Sano Shree 2, Bardia	Avarodhi	333
122	Mrs. Amrita Basnet	Sano Shree 2, Bardia	Avarodhi	666
123	Mrs. Nairata Oli	Sano Shree 2, Bardia	Avarodhi	666
124	Mrs. Suki Basnet	Sano Shree 2, Bardia	Avarodhi	666
125	Mrs. Mina DC	Sano Shree 2, Bardia	Avarodhi	333
126	Mr. Krishna Bhandari	Sano Shree 2, Bardia	Avarodhi	333
127	Mrs. Pampha Shahi	Sano Shree 2, Bardia	Avarodhi	666
128	Mrs. Bhumisara Bhandari	Sano Shree 2, Bardia	Avarodhi	666
129	Mrs. Sashi Dangi	Sano Shree 2, Bardia	Avarodhi	333
130	Mrs. Aiti Dangi	Sano Shree 2, Bardia	Avarodhi	333
131	Mrs. Durga Dangi	Sano Shree 2, Bardia	Avarodhi	333
132	Mrs. Bimala Oli	Sano Shree 2, Bardia,	Avarodhi	333
133	Mrs. Mina Oli	Sano Shree 2, Bardia	Avarodhi	333
134	Mrs. Nandakali Khadka	Sano Shree 2, Bardia	Avarodhi	333
135	Mrs. Kalawati Oli	Sano Shree 2, Bardia	Avarodhi	333
136	Mrs. Khagisara Oli	Sano Shree 2, Bardia	Avarodhi	333
137	Mr. Bhim Bahadur Oil	Sano Shree 2, Bardia	Avarodhi	333
138	Mrs. Laxmi Basnet	Sano Shree 2, Bardia	Avarodhi	333
139	Mrs. Jhupi Budhathoki	Sano Shree 2, Bardia	Avarodhi	333
140	Mr. Chetakanta Sapkota	Sano Shree 2, Bardia	Avarodhi	333

141	Mr. Ram Bahadur GC	Sano Shree 2, Bardia	Sita (4)	1332
142	Mrs. Maya Gurung	Sano Shree 2, Bardia	Tara (6)	1998
143	Mrs. Sumitra Kandel	Sano Shree 2, Bardia	Avarodhi (3)	999
144	Mrs. Sima Ramjali	Sano Shree 2, Bardia	Avarodhi	333
145	Mrs. Nirmala Kandel	Sano Shree 2, Bardia	Avarodhi	333
146	Mrs. Kalawati Chaghai	Sano Shree 2, Bardia	Avarodhi (2)	666
147	Mr. Tulsi GC	Sano Shree 2, Bardia	Avarodhi	666
148	Mrs. Samundra Bhandari	Sano Shree 2, Bardia	Avarodhi	666
149	Mrs. Chandra Oli	Sano Shree 2, Bardia	Sita (4)	1332
150	Mrs. Ganga Budha	Sano Shree 2, Bardia	Sita (6)	1998
151	Mrs. Tika BK	Sano Shree 2, Bardia	Avarodhi (5)	1665
152	Mr. Harindra Oli	Sano Shree 2, Bardia	Avarodhi	666
153	Mrs. Deepa Dhungana	Sano Shree 2, Bardia	Tara (2)	666
154	Mrs. Dhansara GC	Sano Shree 2, Bardia	Avarodhi (2)	666
155	Mr. Rajjat Khan	Sano Shree 2, Bardia	Avarodhi (4)	1332
156	Mr. Nanda Ram Kandel	Sano Shree 2, Bardia	Avarodhi	333
157	Mr. Ganga Bahadur Khadka	Sano Shree 2, Bardia	Avarodhi	333
158	Mrs. Durga Oli	Sano Shree 2, Bardia	Avarodhi (6)	1998
159	Mrs. Bhabisara	Sano Shree 2, Bardia	Avarodhi	1332
160	Mr. Chandra BC	Sano Shree 2, Bardia	Avarodhi (4)	1332
161	Mr. Kul Bahadur BC	Sano Shree 2, Bardia	Avarodhi (6)	1998
162	Mr. Tika Ram Kandel	Sano Shree 2, Bardia	Avarodhi (6)	1998
163	Mrs. Uma BK	Sano Shree 2, Bardia	Avarodhi (6)	1998
	Farmers from Sarlahi (List to be sent later on)	Janakinagar/ Murtiha, Sarlahi	Avarodhi (200)*	66666
	* figures within parentheses are no. of seed kits. 1 kit= 333 M^2			

SN	***Community Seed Increase***			
1.	Mr. Ganga Bdr Khadka/ Dhansara Khadka			
2.	Mrs. Kasturi Sunar/Purna Bdr. Thapa	Sano Shree 2, Bardia	Koselee	5000
3.	Mr. Meghnarayan Chaudhary	Sano Shree 2, Bardia	Avarodhi	5000
4.	Khushiram Chaudhary	Satbaria 5, Dang	Avarodhi	3333
5.	Mr. Shree Ram Tharu	Satbaria 5, Dang	Avarodhi	1666
6.	Mr. Phulram Chaudhary	Satbaria 5, Dang	Avarodhi	1666
7.	Mr. Manhark Baral	Bijauri 5, Tulsipur	Avarodhi	10000
8.	Mr. Ek Ram Khan	Bankatti -9, Banke	Tara	5000
9.	Mr. Shanker Prasad Gyanwali	Puraina-9, Banke	Koselee	3333
10.	Mr. …….	Bankatti 9, Banke	Avarodhi	3333
	Frontline demonstration	Janakinagar/Murtiha Sarlahi	Avarodhi	10000
1.	Mr. Nanda Ram Kandel			
2.	Mr. Rajjat Khan	Sano Shree 2, Bardia	Sita	3333
3.	Mr. Bhog Bahadur Oli	Sano Shree 2, Bardia	Tara	3333
4.	Mr. Janak Dulari Chaudhary	Sano Shree 2, Bardia	Tara	3333
5.	Mr. Goma Chaudhary	Bijauri –5, Tulsipur	Sita	3333
6.	Mr. Manbir Chaudhary	Bijauri –5, Tulsipur	Tara	3333
7.	Mr. Rhizwan Khan	Bijauri -5, Tulsipur	Tara	3333
8.	Mr. Shankar Pd. Gyanwali	Purina –9, Banke	Sita	3333
9.	Mr	Bankatti –9, Banke	Avarodhi	3333
10.				

Appendix 6

Participants of the training program Sept 18-23, 2005

SN	Name	Designation	Address
1.	Mr Ashok K. Mandal	Junior Technical Assistant	DADO Kanchanpur
2.	Mr A.S. Bhandari	Junior Technical Assistant	DADO Kanchanpur
3.	Mr D.S. Aier	Junior Technician	DADO Kanchanpur
4.	Mr R.B. Malla	Junior Technical Assistant	DADO Kanchanpur
5.	Mr K.B Singh	Junior Technical Assistant	DADO Kanchanpur
6.	Mr M.S. Karki	Junior Technician	DADO Kanchanpur
7.	Mr B.B. Kunwar	Junior Technician	DADO Kanchanpur
8.	Mr N.B. Shahi	Junior Technical Assistant	DADO Kanchanpur
9.	Mr D.N. Khadka	Junior Technical Assistant	DADO Kanchanpur
10	Mr Ramashis Sah	Junior Technician	DADO Bardia
11	Mr Mahadev Sah	Junior Technical Assistant	DADO Bardia
12	Mr Ram Narayan Mahato	Junior Technical Assistant	DADO Bardia
13	Mr Bisheshwor Prasad Yadav	Junior Technician	DADO Bardia
14	Mr Ram Krishna Pandey	Junior Technical Assistant	DADO Bardia
15	Mr Man Bahadur Chhetri	Junior Technician	DADO Bardia
16	Mr Deepak Sharma	Social Mobilizer	DADO Bardia
17	Mr Bashudev Prasad Chaudhary	Junior Technician	DADO Bardia
18	Mr Mahendra Kumar Ojha	Junior Technician	DADO Bardia
19	Mr Yeg Narayan Singh	Junior Technical Assistant	DADO Bardia
20	Mr Vinay Kumar	Junior Technical Assistant	DADO Bardia
21	Mr Agnidhar Lamichhane	Junior Technical Assistant	DADO Banke
22	Mr Jadho Lal Sah	Junior Technical Assistant	DADO Banke
23	Mr Challu Prasad Chaudhary	Junior Technician	FORWARD Banke
24	Mr Md Mohar Ali	Junior Technician	DADO Banke
25	Mrs Sharada Gyanwali	Junior Technical Assistant	DADO Banke
26	Mrs Bishnu Maya Chhetri	Junior Technical Assistant	DADO Banke
27	Mr Om Prasad Sharma	Junior Technical Assistant	DADO Banke
28	Mr Tej Prasad Sharma	Junior Technician	DADO Banke
29	Mr Ram Chandra Pokhrel	Junior Technical Assistant	DADO Banke
30	Mr Daya Ram Basnet	Junior Technical Assistant	DADO Banke
31	Mr Bidhya Sagar Yadav	Junior Technician	DADO Banke
32	Mr Hemant K Mahato	Junior Technician	DADO Dang
33	Mr Keshav Bd Rawat	Junior Technical Assistant	DADO Dang
34	Mr Bandhu Ram Chaudhary	Junior Technician	DADO Dang
35	Mr Budhi Bahadur	Junior Technical Assistant	DADO Dang
36	Mr Shiv K. Devkota	Junior Technical Assistant	DADO Dang
37	Mr Mahesh Yadav	Junior Technician	DADO Dang
38	Mr Bal Krishna Shah	Junior Technician	DADO Dang
39	Mr Deepak Budhathoki	Junior Technical Assistant	DADO Dang
40	Mr Pashupati Sharma	Junior Technical Assistant	DADO Dang
41	Mr Keshab Bahadur Rawat	Junior Technical Assistant	DADO Dang

Resource persons involved in the training program

SN	Resource persons	Designations	Address
1.	Mr. Puroshottam Jha	Scientist pl pathology	RARS Nepalgunj
2.	Mr.A R. Ansari	S Scientist Entomology	RARS Nepalgunj
3.	Mr. Rajendra. Darai	Sr technical Officer	NGLRP Rampur
4.	Mr. R.K. Neupane	Sr Scientist	OR Division NARC
5.	Mr. DN Pokhrel/BP Mahato/ RA Sah	Technical officers	RARS Nepalgunj

Appendix 7

Course Schedule for NPV Training Course Nepal
Tuesday: 14 March 2006

Time	Session	Content	Room/ Building	Staff
0800	Registration			
0830	Introduction	Welcome from Director, NARC or deputy		All
0900	Participants' perspectives	Participants are asked to present their own perspectives on NPV and their interest and aims from course, 10 minutes each		All
1000	Coffee/tea break			
1030	Seminar: Introduction to NPV and biopesticides	Morphology Mode of action		DG
1115	Seminar: Use of NPV in Crop protection			DG
1230	Lunch			
1330	Practical: Virus identification	Short introduction Use of phase-contrast microscope Preparation of microscope slides Virus recognition and identification		DG, PS
1500	Short coffee/tea break			
1515	Practical continued			DG
1730	Concluding remarks and close			PS

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Wednesday: 15 March

Time	Session	Content	Room/ Building	Staff
0830	NPV Production	Theoretical background		DG
0915	Seminar: NPV production	Infection Harvesting Processing		DG
1000	Coffee/tea break			

1030	Quality control of NPV	Brief description of purpose and variety of counting and bioassay techniques		DG
1115	Practical: Counting Virus	Use of haemocytometer		DG, PS
1215	Lunch			
1320	Practical: Bioassay	Introduction to equipment Making a dilution series		DG
1400	Practical for students	Leaf dip bioassay		DG
1500	Coffee/tea break			
1520	Practical continued	• Assessing assay • Calculating results • Interpreting results		DG & PS
1700	Close			

Thursday: 16 March

Time	Session	Content	Room/ Building	Staff
0830	Visit to station field trials of NPV	Practical and seminar on NPV trials, application and monitoring.		SP DG, and PS
1300	Lunch			
1400	Visit to farmer field trials	Demonstration of farmer use of NPV Discussion with farmers		SP, PS, DG,
1700	Seminar on Field visit	Analysis, lesson learning		SP PS
1800	Close			
1830	Evening buffet	Informal buffet for participants		All

DG = David Grzywacz (NRI)
PS = Phil Stevenson (NRI)
SP = Suresh Pande (ICRISAT)

Appendix 8

*Participants of village level HearNPV production orientation training organized through NARC/ICRISAT project on HNPV production at village level (*Through Dr GV Ranga Rao, ICRISAT**)**

SN	Name	Address	Remarks
1	Mr Nanda Ram Kandel	Sanoshree 2, Bardia	Refrigerator, centrifuge, grinder and larva rearing trays delivered through NARC/ICRISAT collaborative project
2	Mr Shambhu Prasad Dhungana	Sanoshree 2, Bardia	
3	Mr Ram Bahadur GC	Sanoshree 2, Bardia	
4	Ms Geeta Tharu	Mainapokhar 6, Bardia	Refrigerator, Centrifuge, grinder and larvae rearing trays delivered through NARC/ICRISAT collaborative project
5	Mr Barati Tharu	Mainapokhar 6, Bardia	
6	Mr Dil Bahadur Tharu	Mainapokhar 6 Bardia	
7	Mr Basanta Khatri	Bageshwory 4, Banke	Refrigerator, Centrifuge, grinder and larva rearing trays delivered through NARC/ICRISAT collaborative project
8	Mr Pradeep Thapa	Bageshwory 4, Banke	
9	Mr Tek Bahadur Gurung	Bageshwory 4, Banke	
10	Mr Yunus Khan	Birta, Banke	Refrigerator, Centrifuge, grinder and larva rearing trays delivered through NARC/ICRISAT collaborative project
11	Mr Ek Ram Khan	Birta, Banke	
12	Md Rasid Khan	Birta, Banke	
13	Mr Jagadish Karwal	Bhikharipur, Banke	Refrigerator, Centrifuge, grinder and larva rearing trays delivered through NARC/ICRISAT collaborative project
14	Mr Giriraj Baral	Bankatta, Banke	
15	Mrs. Shova Gyanwali	Bankatta, Banke	

Appendix 4.

The following books/paper were published

Pande, S., Stevenson, P.C., Neupane R.K. and Grzywacz, D. (eds.) 2005. Policy and Strategy for Increasing Income and Food Security through Improved Crop Management of Chickpea in Rice Fallows in Asia. Summary of a NARC-ICRISAT-NRI Workshop, 17-18 Nov 2004, Kathmandu, Nepal. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics; and Chatham, Maritime, Kent ME4 4TB, UK: Natural Resources Institute. 252 pp. ISBN 92-9066-479-7.

Stevenson, P.C., Pande, S., Pound, B. and Neupane RK. 2005. A strategy for wealth generation through chickpea production. Information Bulletin No. 70. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 24 pp. ISBN 92-9066-482-7.

Pande, S., Stevenson, P.C., Narayana Rao, J., Neupane R. K., Chaudhary, R. N., Grzywacz, D., Bourai, V. A., Krishna Kishore, G. (2005) Reviving Chickpea Production in Nepal Through Integrated Crop Management, with Emphasis on Botrytis Gray Mold. *Plant Disease*, Vol. 89, No. 12, 1252-1262.