

PROJECT COMPLETION SUMMARY SHEET (PCSS)**DATE Sheet Completed: 17 September 2003**

Project Title:	Promoting the adoption of improved disease and pest management technologies in chickpea by poor farmers in mid hills and hillside cropping systems in Nepal
DFID Project Reference No:	R7885
Programme:	Crop Protection Programme
Programme Manager (Institution):	Dr Frances Kimmins (NR International)
Sub-Contractor:	NRI, University of Greenwich
Production System:	Hillsides
Programme Purpose:	Benefits for poor people generated by application of new knowledge on crop protection to cultivation of herbaceous crops in Hillsides production systems.
Commodity Base:	Chickpea, Legumes
Beneficiaries:	Poor farmers in Nepal, NGOs.
Target Institutions:	Nepal Agricultural Research Council, Kathmandu. SAATHI (NGO), Nepalgunj, Nepal Peoples Awareness Centre Bohara, Nepalgunj
Geographic Focus:	Nepal
Total Cost:	£219,649
Start Date:	01 April 2000
Finish Date:	31 July 2003

1. Project Purpose:

Chickpea is major source of protein throughout South Asia but is also versatile and important for making a variety of products including breads, sweets, and biscuits and even has an important religious role for Hindus. Although demand for the pulse increases as the population does, in Nepal production has declined severely with the increasing prevalence of *Botrytis grey mould* (BGM), a disease that causes flower drop, and the *Helicoverpa armigera* pod borer which consumes the pods of plants that have escaped BGM. IN any one season one or other will likely have a severe affect on yield such that farmers now are reluctant to waste their time growing a crop that regularly fails.

The purpose of this project was to reduce poverty by increasing chickpea production through the adoption of effective and appropriate IPM technologies by resource poor farmers so that losses caused by the diseases and pests directly responsible for the recent decline in the supply of locally grown chickpeas in Nepal could be reduced. The major specific purposes of the project were to increase, validate and evaluate a complete integrated crop management strategy for chickpeas on farms and to persuade farmers to adopt the strategy through workshops and farm trials. The project also aimed to promote the strategy widely to the press and other stakeholders including non-government organisations the Department of Agriculture and to private sector companies. Furthermore there are tens of thousands of hectares of winter rice fallows where farmers could grow chickpea successfully. It was intended that the use of this land be encouraged. Farmer socio-economic surveys were used to determine the impact of the use of this strategy on farmers' livelihoods.

Thiodan is an insecticide and is one of the components of the strategy described above. The project advised farmers to use it judiciously to control pod borer. There is no other practically and widely available alternative available to farmers that can prevent the frequent crop devastation caused by the pod borer. However, the quality of the insecticide is often poor thus efficacy is inconsistent. There are also increasing reports in Nepalgunj and further west of insecticide resistance, using the chemical is environmentally damaging for other ecosystems and farmer health and safety is invariably casual. A viable alternative to chemical insecticides is the bio-

pesticide *Helicoverpa armigera* NPV. So another major purpose of the project was to evaluate and validate NPV in laboratory, on research stations and in farmers fields.

No major changes in the project purpose were made.

2. Outputs:

This project has successfully validated the application and use by farmers of an integrated crop management strategy to increase productivity and reliability of chickpea production by poor farmers in Nepal. The principal components were 1) the adoption of an improved cultivar *Avarodhi* resistant to Fusarium wilt, 2) use of seed priming 3) BGM control with Bavistin once per week when weather very misty 4) pod borer control with only 2 sprays of Thiodan 5) fungicidal treatment of seed with Thirum & Bavistin 6) Rhizobium inoculum 7) fertilizer applied – diammonium phosphate 8) maintenance of an open canopy by avoiding irrigation and additional fertilizer. Overall, farmers who used this IPM practice produced at least twice as much crop. The cost of production reduced from Rs17/kg to Rs9/kg.

This process included the evaluation and validation of *Helicoverpa armigera* nucleopolyhedrovirus (*HearNPV*) in the laboratory on farms and on research stations. Although laboratory studies indicated chickpea reduced efficacy through an interaction between the virus and the leaf surface of chickpea, simple formulation ingredients based on milk powder improved the efficacy of *HearNPV* on chickpea when sprayed as a mixture on to the leaves by up to 3 times. *HearNPV* was at least as effective as the insecticide Thiodan at controlling pod borer and in many cases were more effective. The efficacy was affected by the variety of chickpea on which the NPV was used. *Avarodhi* the preferred variety for all other agronomic characters was also the most suitable variety for optimum effects of the virus at controlling the pod borer.

The information, support and technologies validated as described above were provided directly to at least 3500 farmers to grow chickpea in Nepal using an integrated and economically and environmentally acceptable approach to the management of biotic and abiotic constraints. Overall, the chickpea yields of participating farmers' more than doubled to 2100Kg ha⁻¹ when employing ICM with improved varieties. The net cost of production decreased from Rs 17.5/kg to NRs 9.3/kg. With a market price of approximately NRs 30/kg this more than doubles profits from this crop. Overall farmers increased their wealth by US\$216 per annum by growing chickpea using the technologies promoted by this project. Thus, by reaching 3500 farmers the project increased the overall wealth of project farmers by up to US\$750,000. The impact on livelihoods was substantial with the majority of farmers describing improvements in all aspects of domestic life although the extent of these impacts was dependent on size of holding. One dramatic change was in the number of farmers moving from mud houses to brick houses (5–10%) and many farmers reported paying off debts (22%) with dramatic increases in expenditure on education for children, clothes and healthcare. The project activities were promoted widely in publications and newspapers.

3. Contributions of Outputs to Project Goal:

The outputs of the project have all been achieved and some exceeded. Output 1. *Presentation of project activities, socio-economic analysis and projected outputs in project workshop to NARC/NGO staff and farmers.* This output was achieved and highlighted the key components of the project to stakeholders and provided a foundation for achieving the project goals. Output 2. *A survey of the constraints to chickpea production and the impact of chickpea production on livelihoods assessed.* Through this output we were able to determine the factors on which we needed to focus the project and were able to establish baseline data on which the impact of chickpea production would be assessed. Output 3. *An improved IPM package appropriate for poor farmers in the mid-hills and hillside regions of Nepal developed and validated.* Based on the findings in output 2 an ICM strategy was developed and validated providing the project with the practical tool to achieve the project goal. Output 4. *New IPM promotion tools produced and disseminated to hillside farmers in Nepal.* The promotion tools consisted of various devices for describing to farmers at field schools the nature of constraints and how to manage them. The information sheet was the principal tool

and a guide for production of chickpea that farmers could keep and refer to throughout the cropping season. Output 5. *New IPM technologies for chickpea production promoted to 500 mid-hills and hillsides farmers in principal chickpea growing districts of Nepal*. This output was exceeded. The ICM production of chickpea was promoted to up to 3500 farmers over the course of three years and many thousands more through farmer to farmer dissemination and via other projects in Nepal that used our technology tools and varieties to promote to farmers in their projects (e.g. PSRP rainfed rabi cropping systems). Since the principal goal was to promote a successful chickpea production strategy to farmers in Nepal then the project has achieved this many times over and has directly affected the wealth of those farmers involved in the project by at least US\$216 per annum and overall by at least US\$750,000. Output 6. *Socio-economic survey to determine the impact of improved chickpea IPM on rural livelihoods, poverty alleviation and nutrition in target districts*. The increased wealth achieved through the successful promotion of activities described above was used directly to improve livelihoods of farmers in many ways including education, improving houses and paying off debts. Output 7. *Publications evaluating new IPM systems in international refereed journals and in appropriate local*. The successes and achievements of the project were published in various formats including several information bulletins for informing local research organizations in South Asia (ICRISAT distribution), through many newspapers articles, through radio interviews and will be published in internationally refereed journals now that all the results of field data have been collected.

4. Publications:

*BOURAI, V.A., PANDE, S., JOSHI, P.K. and NEUPANE, R.K. (2003) Chickpea production constraints and promotion of integrated pest management in Nepal. On-farm IPM of Chickpea in Nepal-1. Information Bulletin No. 64. International Crops Research Institute for the Semi Arid Tropics, Andhra Pradesh, India. ISBN 92-9066-462-2. Order code IBE064.

* BOURAI, V.A., PANDE, S., JOSHI, P.K. and NEUPANE, R.K. (in press) Empowerment through enrichment. IPM of Chickpea in Nepal-2. Information Bulletin No. 65. International Crops Research Institute for the Semi Arid Tropics, Andhra Pradesh, India.

*BOURAI, V.A., PANDE, S. and NEUPANE, R.K. (in press) Wealth generation through chickpea revolution. IPM of Chickpea in Nepal-3. Information Bulletin No. 66 International Crops Research Institute for the Semi Arid Tropics. Andhra Pradesh, India:

STEVENSON, P.C. (2001) Project outputs, dissemination, adoption and promotion strategies. pp. 85–93. In: *On-farm IPM of chickpea in Nepal: proceedings of the International Workshop on Planning and Implementation of On-farm IPM of Chickpea in Nepal, 6–7 September 2000, Kathmandu, Nepal*. Pande, S., Johansen, C., Stevenson, P.C. and Grzywacz, D. (Eds.). International Crops Research Institute for the Semi-Arid Tropics, Andhra Pradesh, India, and Natural Resources Institute, Chatham Maritime, Kent, UK: 133 pp. ISBN 92-9066-438-X.

GRZYWACZ, D. (2001) Nucleopolyhedrovirus: potential in the control of pod borer (*Helicoverpa armigera* on chickpea in Nepal. pp. 94–98. In: *On-farm IPM of chickpea in Nepal: proceedings of the International Workshop on Planning and Implementation of On-farm IPM of Chickpea in Nepal, 6–7 September 2000, Kathmandu, Nepal*. Pande, S., Johansen, C., Stevenson, P.C. and Grzywacz, D. (Eds.). International Crops Research Institute for the Semi-Arid Tropics, Andhra Pradesh, India, and Natural Resources Institute, Chatham Maritime, Kent, UK: 133 pp. ISBN 92-9066-438-X.

JOSHI, P.K. (2001) Socioeconomic issues and institutional policy: constraints for increasing chickpea production in Nepal. In: *On-farm IPM of chickpea in Nepal: proceedings of the International Workshop on Planning and Implementation of On-farm IPM of Chickpea in Nepal, 6–7 September 2000, Kathmandu, Nepal*. Pande, S., Johansen, C., Stevenson, P.C. and Grzywacz, D. (Eds.). International Crops Research Institute for the Semi-Arid Tropics, Andhra Pradesh, India, and Natural Resources Institute, Chatham Maritime, Kent, UK: 133 pp. ISBN 92-9066-438-X.

PANDE, S., JOHANSEN, C., STEVENSON, P.C. and GRZYWACZ, D. (Eds.) (2001) *On-farm IPM of chickpea in Nepal: proceedings of the International Workshop on Planning and Implementation of On-farm IPM of Chickpea in Nepal, 6–7 September 2000, Kathmandu, Nepal*. International Crops Research Institute for the Semi-Arid Tropics, Andhra Pradesh, India, and Natural Resources Institute, Chatham Maritime, Kent, UK: 133 pp. ISBN 92-9066-438-X.

5. Internal Reports:

VS9462 BTOR: Visit by Phil Stevenson to Nepal on the Promotion of the Adoption of improved technologies for the production of chickpea in the Nepal Terai. 18/01/2003 to 25/01/2003. Phil Stevenson 04/02/2003

VS9379 BTOR: Visit by Phil Stevenson to India and Nepal on the Promotion of the Adoption of improved technologies for the production of chickpea in the Nepal Terai. 21/10/2002 to 02/11/2002. Phil Stevenson 07/11/2002

VS8876 BTOR: Visit by Phil Stevenson to Nepal with Simon Eden-Green on the Promotion of the Adoption of improved technologies for the production of chickpea in the Nepal Terai. 8/3/02-16/3/02 08/03/2002 to 16/03/2002. Phil Stevenson 19/03/2002

V8863 BTOR: Visit of D Grzywacz to Nepal to monitor on farm Integrated Crop Management trials of Chickpea in Nepal on CPP Project A0985 (R7785) 9/01/2002 to 22/02/2002 09/02/2002 to 22/02/2002. David Grzywacz 25/02/2002

VS8262 BTOR: Visit by Phil Stevenson to Nepal on the Promotion of the Adoption of improved technologies for the production of chickpea in the Nepal Terai. 10/04/2001 to 20/04/2001. Philip C Stevenson 30/04/2001

VS 8157 BTOR: Visit of D Grzywacz to Nepal to monitor on farm Integrated Crop Management trials of Chickpea in Bardia, Banke and Chitwan districts of Nepal on CPP Project A0985 (R7785) 12/03/2003 to 02/02/2004. David Grzywacz 09/04/2001

VS 7694 BTOR: Visit to Kathmandu (Nepal) by Phil Stevenson and David Grzywacz, ARMD Adoption of improved technologies for the production of chickpea in Nepal 03/09/2000 to 10/09/2000. P.C. Stevenson 09/01/2001

* GRZYWACZ, D. Report on field trials to test use of *Helicoverpa armigera* nucleopolyhedrovirus (*HeanNPV*) bio-insecticide on chickpea in Nepal 2003 as part of DFID CPP project R7885. 17th September 2003.

6. Other Dissemination of Results:

Promotion sheet for farmers field schools.

*Video 12 mins. A Natural Resources Institute Project funded by The Crop Protection Programme of DfID. A natural virus to protect chickpea from the pod borer. by Phil Stevenson, Dave Grzywacz and Reju D'Cunha.

*D'CUNHA, R., STEVENSON, P.C. and GRZYWACZ, D. (2003) Differential activity of *Helicoverpa armigera* nucleopolyhedrovirus on cotton, chickpea and tomato. Proceedings from the society of Invertebrate Pathology Annual meeting Burlington USA 25-30th July 2003.(poster)

*PANDE, S. (2002) NARC-ICRISAT-NRI Partnership on Rehabilitation of Chickpea via Integrated Pest Management (IPM). NARC ICRISAT Silver Jubilee celebration. Strengthening cooperation and capacity building between NARC and ICRISAT, 18 May 2002.(Poster)

*STEVENSON, P.C., D'CUNHA, R. and GRZYWACZ, D. (2002) Baculovirus: a natural and safe alternative to chemical pesticides. Powerpoint presentation and video presentation at Science Museum as part of Antenna Exhibition in the Wellcome Wing.

www.sciencemuseum.org.uk/corporate_commercial/press/ShowPressRelease.asp?Show=157

Several Newspaper reports – notably 3 in the Rising Nepal by Deputy Editor

7. Listing and reference to key datasets generated:

Joshi K and Bourai V. (2001) Dataset: Raw data from a Rural Appraisal./livelihood study on impact of IPM in chickpea University of Dehra Dun/ICRISAT. April 2001.

Bourai, V and Pande S (2002) Dataset: Raw data from a Mid term livelihood impact assessment of IPM in chickpea University of Dehra Dun/ICRISAT. October 2002..

Bourai Vand Pande S (2003) Dataset: Raw data from a Mid term livelihood impact assessment of IPM in chickpea University of Dehra Dun/ICRISAT. October 2002.

Dave Grzywacz (2003) Raw data set for NPV field and station evaluation. Natural Resources Institute.

8. Follow-up indicated/planned:

This project has been primarily adaptive with strategic elements. However, a funding extension is sought to determine the most appropriate pathways to ensure sustainability of the project outputs and promote them more widely by providing the principal extension vehicles in Nepal (NGOs and Department of Agriculture) with lessons learned from this project and identify an exit strategy for the project by producing policy briefs and informative papers for all stakeholders. Continued interest in current PSRP projects in Nepal will continue to promote the outputs of this project.

9. Name of author of this report:

P.C. Stevenson