

**CROP PROTECTION PROGRAMME**

**Policy and strategy for increasing income and food security for  
poor farmers in Nepal and South Asia through improved crop  
management of high yielding chickpea in rice fallows**

**R 8366 (ZA 0616)**

**FINAL TECHNICAL REPORT**

**1 April 2004 – 31 March 2005)**

Project Leader - Philip C Stevenson

Natural Resources Institute,

Date FTR completed 31 March 2005

*"This publication is an output from a research project funded by the United Kingdom Department for International Development for the benefit of developing countries. The views expressed are not necessarily those of DFID."*  
**[R8366 Crop Protection Programme]**

	page number
Table of contents	
Table of Contents	2
Executive Summary	3
Background	4
Project purpose	5
Research Activities	6
Outputs	8
Contribution of outputs to development impact.	16
References	18
Abbreviations	19
Contacts	20
Appendix 1	22
Results and discussion of workshop.	
Appendix 2.	26
Lessons Learned – bullet pointed feedback from workshop participants	
Appendix 3.	29
Mini-kit contents and cost	
Appendix 4.	30
Papers presented and in press for the proceedings of the Kathmandu Meeting	
Appendix 5.	32
Lessons learned paper (in press)	
Appendix 6.	38
Policy paper plan and format.	
Appendix 7.	39
Newspaper articles published about the project Previous	
Appendix 8.	42
Updated information sheet for framers and extension workers.	

## Executive Summary

Chickpea (*Cicer arietinum* L.) is a major component of the largely vegetarian Nepalese diet providing an important source of protein and, potentially, income for the rural poor. Chickpea is also highly versatile so it is culturally important too. Yet the area under production in Nepal has declined recently owing to regular disease and insect damage that has affected farmer confidence in a crop that often fails. Where it is grown, yields are low at <math>800\text{kgHa}^{-1}</math>. An integrated crop management (ICM) strategy evaluated by 3500 farmers in Nepal over 3 years under R7885 demonstrated that farmers can more than double yields and moreover, if correctly implemented, the technology virtually guarantees a harvest. The investment required for this is surprisingly low and effectively halves the unit production costs so more than doubles profits. The ICM approach to production used improved cultivars, ultra-low and judicious pesticide application, seed priming, reduced fertilizer inputs and rhizobium inoculation.

Chickpea is also drought tolerant and so suited to the dry winters of Mid and Far-Western Nepal, two geographic foci of the Poverty Reduction Strategy Paper 10<sup>th</sup> Plan. Currently, Nepal imports 90% of its chickpea but there is potential to expand production into almost 400,000 Ha of rice fallow. In the Western region alone there are 138,000 Ha of fallow and its exploitation with chickpea could increase farmer wealth by US\$250 family<sup>-1</sup> annum<sup>-1</sup>.

The lessons from this earlier work have been synthesised along with those of related projects whose outputs were presented at a meeting in Kathmandu (November 2004) that was organised as a major activity of the present project. A 'lessons learned' paper is now *in press* as an article in the proceedings of the meeting which will also contains 20 other papers presented. The meeting provided a foundation on which to build a strategy for the broad up-scaling of the chickpea ICM programme and embed its activities into the agricultural strategy of Nepal; the ultimate goal of the project. We also raised awareness of the value of chickpea ICM to the Minister of Agriculture, senior civil servants, and others key policy setters and agricultural workers who attended. The Minister of Agriculture agreed to back chickpea rehabilitation within the national strategy for agriculture.

To enable up-scaling we produced a policy document that describes the policy, strategy and technology changes needed to ensure that the improvements in farmers' livelihoods witnessed in R7885 could be achieved across Nepal and that the country can reverse the dependence on imports for chickpea. The rewards for Nepal are import substitution, export promotion, improved human and livestock nutrition, enhanced soil health and ultimately enhanced farmer wealth. Overall the mechanisms are in place to impact significantly on the poorest farmers. Focus areas for change include –

- Marketing
- Changing government perceptions
- Equity in subsidy for pulses
- Seed availability
- Further development of technologies
- Action on pesticide quality
- Advocacy and promotion of success stories.
- Improve complementarity among GOs, NGOs, CBOs and private enterprises.

## 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) 10<sup>th</sup> 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 10<sup>th</sup> 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 the forerunner project could be one. The rice fallows in western Nepal could be exploited using chickpea production along with other pulses and vegetables 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 and 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 stuff 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<sup>-1</sup> 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<sup>-1</sup> annum<sup>-1</sup> (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 small-holder farms in Nepal under the forerunner DFID project (R7885) (Stevenson, 2003, Pande *et al.*, 2003b & c). The ICM strategy required that farmers adopt the improved cultivars Avarodhi or Tara (good yield and tolerant to Fusarium wilt, seed priming, judicious fungal and insect control using available pesticides or biological pesticides (NPV provided by project), Rhizobium treatment in deficient areas and management of sowing density, fertilizer inputs and water to prevent dense canopies (Pande *et al.*, 2001). The biological pesticide *Helicoverpa armigera* nucleopolyhedrovirus (*HeaNPV*) is designed to control the main insect pest of chickpea, the pod borer (*Helicoverpa armigera*). Field trials, demonstrated that *HeaNPV* was highly effective at reducing the population of pod borer both under optimal controlled field conditions and when provided to farmers with basic coaching in their application. In fact in several areas, especially on the improved variety Avarodhi, NPV was more effective than Thiodan, the insecticide used most commonly by farmers to control the insect (Stevenson, 2003).

The project provided a profitable strategy to rehabilitate chickpea in rice cropping systems in Nepal that was both acceptable to farmers and sustainable. One sample from the 3500 farmers 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). DFIDs millennium goals aim to reduce the proportion of individuals below the poverty threshold of US\$1 day<sup>-1</sup> poverty. Implementing the outputs of R7885 could impact significantly on poverty in rural areas of Nepal addressing both the ambitions of the 10<sup>th</sup> Plan and DFID. This project aimed to promote the successes and outcomes of R7885 to key policy setters in government and private sector and ensure that crop production in rice fallows, particularly of chickpea, increases across the country both in terms of total area sown as well as yield.

## **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. As described above this was validated by 3500 farmers in 14 of the 20 districts in the Nepal Terai, the principal chickpea-growing region. However, it has been estimated by NARC that this approach could be extended to more than 100,000 farming households in Nepal and larger numbers still in Bangladesh and India where yields are similar to those in Nepal. Potentially the technology could be adapted for Pakistan and Afghansitan and also to East Africa where there is increasing interest in the potential of pulse legumes. One of the major purposes of the present project was to identify and synthesise lessons from the preceding project to enable the development of a more robust and sustainable strategy for broadening the adoption of the activities validated in R7885. Other objectives were to raise awareness of NGOs, the private sector and Government Organisations (GOs) to these benefits of chickpea ICM and in doing so, strengthen their capacity to provide farmers with the information and support needed to embed the practise of producing high yielding chickpea throughout chickpea growing regions of Nepal. Furthermore, we sought to influence similar institutions in Bangladesh and India – thereby improving the livelihoods of rice & chickpea farmers across Asia.

By raising awareness in Nepal we intended to make key policy setters in MoAC/NARC (Nepal) aware of the success of R7885 and we proposed to achieve this via a series of meetings in April 2004 and through an interntational workshop in Kathmandu. This brought together policy makers (politicians and administrators) with stakeholders (private sector, farmers, women's groups and NGOs) and through discussion identify lessons learned and enable project partners to recognize obstacles to successful uptake of the outputs of R7885. The proceedings are now in press and will be published in May 2005 as a 120pp volume. The workshop was also intended to determine the most appropriate ways to overcome the obstacles, ensure sustainability of the chickpea ICM adoption strategy and implement the adoption of ICM for chickpea production across the country. The success of R7885 provides an excellent model with which to exploit rice fallows and ultimately contribute to the expansion of legume based winter crops.

Ultimately, the key objective was to obtain government adoption of chickpea ICM to its agricultural program to ensure the optimum impact. One aspect of the Kathmandu meeting was to provide the opportunity to make clear how important the role of government would be in ensuring that benefits could be gained from chickpea rehabilitation across the country. But the key tool for ensuring uptake was to produce a policy document in which the lessons learned from R7885 and outcomes of the workshop would be synthesised and documented along with new information that comes to light through continued enquiry of Nepal's agricultural infrastructure and its capacity to implement and support the various elements of

the ICM programme developed by R7885. The target for this document is senior government policy setters in Nepal and elsewhere (e.g., Bangladesh, India, Pakistan, Afghanistan), NGOs, private sector stakeholders, NARS and extension organisations as well as for international donor organisations and research institutes. It was also intended that the document synthesise inputs from meetings with stakeholders on how components of the ICM strategy for rehabilitation and expansion of chickpea in Nepal could be embedded in national extension programmes especially in the Mid-West and Far West Nepal and similarly into Bangladesh, India and elsewhere.

No major changes in the project purpose were made.

## Research Activities

Owing to the nature of the outputs of the project there are few activities that could be considered research activities, as such. The principal activities described in the PMF were based around discussions, consultations and meetings that focussed on the synthesis of lessons learned and the development of a strategy for broad up-scaling of the technologies in Nepal. However, one of the activities at the November 2004 workshop (Output 3) surveyed from R7885 the participants opinions within the context of 4 broad areas of what they considered were limiting or enabling factors within the current Nepali R7885. Participants were arranged into 4 groups.

The participants (list available in Pande et al., 2005) included farmers, Head of the national Seed Board of Nepal (HMGN), the Director of Dept of Agriculture (HMGN), the Executive Director of NARC, international scientists from UK and ICRISAT, Bangladesh and India including the Deputy Director of ICRISAT, representatives of NGOs, scientists from Nepal and journalists.

In all about 32 participants were introduced to the discussion groups through a brief talk by B Pound who highlighted facts to help focus thoughts for example indicating that the process of scaling-up has two dimensions:

- a) Extending the coverage of the technology over a wider geographical area and a greater number of people (horizontal scaling up),
- b) Incorporating the technology into the norms, structures, processes and practices of relevant research and development institutions (vertical scaling up).

Participants were also made aware of the importance of bearing equity, the heterogeneity of clients and sustainability (institutional, financial and environmental) in mind while developing the strategy and the importance of processes enabling good monitoring and evaluation, together with the flexibility to respond to what comes out of the evaluation/reflection processes was also emphasised.

The topics chosen for Groups 1-3 were key to scaling-up chickpea in Nepal and the wider Region, while Group 4 drew on the experience of Nepali chickpea farmers that have actively participated in R7885. The four topics are shown in Box 1.

### Box 1. Topics for group discussion

GROUP 1: Policy and funding issues

GROUP 2: Seed multiplication issues

GROUP 3: Information supply issues

GROUP 4: Farmer experience with chickpea technology

For each Group, a series of guide questions were formulated, as detailed below. The Groups kept to the questions during the 2 hours allotted for this exercise, and then presented the outcomes in a plenary.

#### Group 1: Policy and funding issues

1. *What are the elements of an enabling policy environment for the scaling-up of chickpea in Nepal and in the wider region? Put in priority order.*
2. *How should each element be addressed and who should be responsible for each action?*
3. *How will up-scaling countrywide be paid for (excluding direct support from major donors)?*
4. *Is there a good market for chickpea? Are there problems with processing and marketing the crop, and if so how can these problems be resolved?*

#### Group 2: Seed multiplication issues

1. *What different models exist for making seed available to farmers?*
2. *What are the stages of the model, and who are the responsible organisations at each stage?*
3. *What are the advantages and disadvantages of each model?*
4. *What are the roles of government institutions, NGOs, CBOs and private organisations in each model?*

#### Group 3: Information supply

1. *What types of information are needed by different stakeholders, and how can your suggestions be validated?*
2. *What options exist for developing and transmitting the information needed by each stakeholder?*
3. *What are the advantages and disadvantages of each option?*

#### Group 4: Farmers experience with chickpea

1. *What has worked well, and what has not worked so well with the introduction of new chickpea technology, in their experience?*
2. *What would they like to see happen next? Who should be responsible for each action? What is the role of the community?*
3. *How can chickpea production and marketing be made sustainable so that communities are not dependent on the project or on government?*
4. *How do they suggest that new communities are helped to adopt chickpea?*
5. *What information do farmers need, and how would they like it to be presented?*
6. *Is there a good market for chickpea? Are there problems with processing and marketing the crop, and if so how can these problems be resolved?*

The unedited results of this survey are presented in **Appendix 1**.

Participants who were presenting their work were asked to highlight some of the lessons they had learned from their experience of up-scaling activities. These were recorded for each presentation and combined with those derived through former discussions with stakeholders (farmers, NGOs, CBOs and MoAC in April 2004) and were used to form the basis of the lessons learned paper discussed in more detail under outputs. The specific lessons reported by each participant are listed in **Appendix 2**. Not all contributions were as comprehensive as each other however but when combined with the information gathered during the visit of April 2004 and the feedback from farmers, NGOs and NARC staff throughout the project provided very valuable information for the production of a lessons learned paper.

## Outputs

Due to the nature of the work in which the project partners were engaged during this project, the outputs are not particularly numeric and do not therefore conform to presentation as tables or figures. However, findings are presented as succinctly as possible.

The specific planned outputs from the project were

1. *Lessons from previous promotional phase, and the current phase, identified and documented,*
2. *Awareness of policy makers and implementers on the value of chickpea rehabilitation raised in the target institutions and countries,*
3. *Strategy for wider promotion of chickpea rehabilitation developed with key policy players in Nepal,*
4. *Advise target institutions (NARC/DoA) on approaches to sourcing funds to promote chickpea rehabilitation.*

Meetings were held in Kathmandu, Nepal, during April 2004 to raise awareness of the successes R7885 to various senior staff in the Ministry of Agriculture, to synthesise lessons learned from that experience and to better understand the policy issues relating to up-scaling of agricultural technology and so develop strategies for the broad uptake of the outputs of R7885. Meetings were held with various individuals including the Joint Secretary (MoAC), Directors of DoA and NARC, and those administering funding bodies. The full report of this visit is has been submitted to CPP but briefly the objectives were,

- *Discuss successes of previous project with stakeholders and partners and determine lessons learned.*
- *Raise awareness of previous project among policy makers and extension services.*
- *Discuss approaches to extension of project outputs countrywide with policy makers and extension services.*

The main outcomes were from meetings with the following individuals

- Dr Verma Sharma , *Joint Secretary* (Ministry of Agriculture & Cooperatives). He was particularly interested in work that promotes pulses. He was surprised and somewhat dismayed that NARC had not already highlighted the activities of our project to MoAC and agreed with us that it was now at a stage for DoA to take up. It was considered that NARC had a vested interests are in maintaining a link with a non-HMGN funding body. We suggested mini-kits as a way forward with our work and Dr Verma indicated that this was the correct approach advising us to discuss further with the DoA. An example mini-kit is presented with costs in **Appendix 3**. Dr Verma endorsed and offered to contribute at the workshop in November and which was at this at this stage still in the planning stage for Nove 2004.
- Dr. Shiva Sundar Shrestha, *Director General*, DoA, also noted surprise that the impact and success had not been brought to his attention by NARC and welcomed our awareness raising. We discussed the organization and implementation of pilot mini-kit extension starting in November 2005 to familiarize DoA staff with the technologies. This has been enabled by activities and outputs of a follow-on project R8427. One hurdle to overcome, however, was the registration of the seed variety and the technologies via the Seed Quality Control Centre (SQCC) and by the



National Seed Board. This is a NARC responsibility and may prove a hurdle as NARC had been unwilling so far to progress these activities forward.

- Dr Helen Wedgwood, *NR advisor* (DFID Nepal), provided introductions to Dr Tek Bahadur Thapa (NARDF) and Dr Jan Morrenhof (APPSP) regarding bilateral funding strategies being developed in Nepal. Current approaches to funding in agriculture in Nepal are attempting to circumvent the lack of accountability in current funding mechanisms. DFID is helping Nepal move towards decentralized control at the district and local level through District Agricultural Development Committees (District Extension funds & Local Initiative Funds) under the Agricultural Perspective Plan Support Programme (HMGN).
- Jan Morrenhof, *Programme Adviser* (Agricultural Perspective Plan Support Programme - APPSP) is implementing Nepal's District and National APP and provided details on the current agricultural development spending in Nepal and HMGN poverty reduction strategy. The APPSP (begun in August 2003) provides guidelines for rural development with a focus on 4 specific inputs/outputs; fertilizer, knowledge, infrastructure and irrigation. Part of the funding reform process aims to give greater recognition to the role of the private sector – notably in the provision of fertilizer. Also the subsidy on irrigation is to be lifted. The 20 year targets have been drawn up and the 9<sup>th</sup> and 10<sup>th</sup> Poverty Reduction Strategy Papers were based on the APP targets. Morrenhof detailed the nature of future spending as the District Extension Fund and the Local Initiative fund. Both sources would be available to stakeholders (farmers, private sector, NGOs and government officers) who would benefit from outputs of the previous chickpea promotion project and as such these sources of funds would be targets for developing the exit strategy for R7885.
- Tek Bahadur Thapa, *Secretary for the Fund Management Committee* (FMC) National Agricultural Research and Development Fund (NARDF) chairs the 7 member FMC who together manage this facility worth in the region of 3 million NRsb annum<sup>-1</sup>. These funds have been identified as a target for building capacity in NPV quality control and application skills and on forecasting research for BGM. The program also supports extension initiatives although these initiatives may be better suited to the LIF and DEF described above. We may be able to assist local groups (NGOs and CBOs) to bid for money to enable new approaches in pest control – e.g., farmer groups who specifically want to continue trying or using NPV.
- Nityananda Khanal *Senior Program Manager* (Forum for Welfare, Agricultural Research and Development FORWARD) offered to play a major role in any up-scaling provided funds were available for their involvement. We also talked further about the possibility of capacity building projects to enable Nepal to support a biological pesticides program. This would require funds for training and equipment and could be developed as a partnership building of the capacity in the Chitwan area of Nepal where there is also an effective research station of NARC at Rampur.
- Dr Krishna Joshi *Project Leader* (CYMMIT) we discussed activities of DFIDs Plant Sciences Research Program projects on the Rabi cropping systems under the project management of Dr David Harris. We discussed the potential value of our experience with biological pesticides in the control of insect pests of legumes for his project especially those gained under R7885 and the hurdles to more widespread adoption by farmers. He agreed with us that that the infrastructure in Nepal was not yet suitable for widespread adoption and that capacity building for technology support and quality control is needed. This is now an output of the next phase of the project R8427 (ZA0656).

- Presently, the PSRP project depends on ICRISAT for biopesticides input but they do not have an insect virologist. David Grzywacz (NRI), insect virologist on R7885, has demonstrated that ICRISAT NPV is of low quality and since quality and application rates are crucial for success there is a serious concern that unless standards are very high farmers could experience field failures with NPV and lose confidence in this technology that we have proven to be effective under R7885. Dr Joshi emphasized that NGO led projects were more successful than NARC led projects which is important information in anticipation of us developing a strategy for up scaling our outputs.
- Ian Hancock, *Team leader* (Crop Diversification Project Implementation Consultancy Team, DoA) told us about implications and potential for extension of the previous project activities in the Mid and Far West regions of Nepal through his projects activities. These are key foci for PRSP 10<sup>th</sup> plan. He noted that mini-kits were a source of income for the DoA so were looked upon 'kindly'. He confirmed that in Nepal, for up-scaling activities, the NGOs / private service providers were much more conscientious than technical officers operating under DoA. District Agricultural Development Officers role is to provide technical support and are social mobilizers but that they need monitoring and in his experience the NGOs were self monitoring; driven by an incentive to continue being funded. Private service providers are expensive although they get the job done.

A workshop to raise awareness, gather further lessons and define a strategy for uptake of chickpea ICM technologies was held in Kathmandu in November 2004. This was attended by up to 80 participants from South Asian countries including Bangladesh and India to help raise awareness beyond Nepal. The participants included key figures in the agricultural planning infrastructure including the Minister of Agriculture, Hom Nath Dahal, the Honourable Member of National Planning Commission, Dr H K Upadhyaya as well as the Directors of the Department of Agriculture, Dr Shiv Sundar Shrestha, and the Nepal Agricultural Research Council, Dr R.P Sapkota and the Deputy Director of ICRISAT, Dr Dyno Keating. Also participating were the South Asian regional coordinator of CYMMIT, Dr Ortiz Ferrera and Dr Raj Gupta the secretary of the Rice Wheat Consortium of Indo Gangetic plain. The meeting was covered by various media including national papers one of which put the workshop on the front pages as detailed below (**Appendix 7**) but the meeting was also covered hourly by the evening news on 2 Nepal television stations. Presentations on scientific and livelihoods aspects of up-scaling technologies were made by 20 scientists over the course of two days and each resulted in a publication that will be published in proceedings by ICRISAT. A list of the papers is detailed in **Appendix 4** and this is currently in press for publication in May 2005 as a 120pp book (Pande et al., 2005). One of the principal outputs of the project was to synthesise lessons learned from this and other similar projects and so help devise a strategy for large scale uptake of chickpea ICM in Nepal. This paper has now been accepted for publication in the proceedings of the workshop held in Kathmandu in November 2004 and the current draft is **Appendix 5** of this report. Its salient findings were as follows.

#### *Lessons Learned.*

1. Chickpea is a crop that can compete with alternatives. It is highly profitable with the right technology and can help improve livelihoods for poor farmers.
2. If rewards are sufficient farmers will adopt and reinvest (sustainable).
3. Markets *per se* are not a limiting step for the nationwide expansion of improved chickpea production in Nepal (most chickpea consumed in Nepal is still imported) but aspects of marketing are, and need addressing. Product must have a market opportunity especially with country wide up-scaling.

4. The complementarity between government research (NARC) and extension (DoA) organisations in Nepal needs addressing, to enable joined-up extension provision and technology support.
5. Seed storage a crucial but currently low priority for both farmers and extension services and needs greater focus and investment in up-scaling management.
6. Pesticide quality and insecticide resistance need monitoring and infrastructure and policy/legislation to support alternatives needs developing.
7. Insecticide resistance reported in West (possibly associated with Cotton in neighbouring India?). This needs addressing with alternatives.
8. NPV could be used and works but there needs to be an infrastructure for backstopping quality control or production, legislation and policy.
9. Transgenic approaches may be considered and there is a precedent set in Bangladesh where this is being tested.
10. Farmers' past experience with particular management tools (e.g., familiarity with insecticides from vegetable production) often coincided with success. This could help to identify optimal sites for up-take and where to site demonstration farms (champions).
11. Skills of diagnosis and timing for applications of technology needs particular attention at farmers schools.
12. Cross infection by BGM from other species occurs (e.g., pigeon pea) therefore broad thinking required for improved management.
13. Careful skills of diagnosis need to be taught to farmers with well informed technical backstopping.
  - a. Knowledge of key life stages for successful control of insects essential.
  - b. Apparent resistance (in whole plant – i.e. of the leaves) disguises actual susceptibility of the flowers to disease.
  - c. Disease forecasting (e.g. *Calendula* (Marigold) which has high susceptibility to disease shows signs of infection before chickpea)/diagnosis
14. Technologies may be too complicated for some farmers – as indicated in 11 – care needs to be taken in farmer schools.
15. Chickpea is self-fertilising. Once farmers have a variety they can maintain their own seed stock potentially affecting the long term role of seed production SME's in up-scaling.
16. Always a need for technology inputs. We encourage low cost inputs – less financially rewarding for SMEs therefore low interest.
17. Needs to be more farmer self-help group involvement in seed multiplication and these CBOs need increasingly to take on the role of seed producers. This is an output of the final phase of the project extension (R8427/ZA0656). This works and helps ensure wider knowledge dissemination.
18. Crop diversity is valid to poverty alleviation but requires a strong focus on key technologies for each crop to ensure success of individual components
19. Suitability of crop alternatives depends on agricultural conditions and farmer acceptability - both elements need to be clear.
20. Adequate technical backstopping for new initiatives essential & often lacking.
20. Agricultural knowledge dissemination to farmers needs updating and improving Popular media such as newspapers and television gives agriculture a low priority so novel and alternative, local or traditional mechanisms need to be exploited to ensure widespread dissemination of information and knowledge.

A three-day meeting of the Rice-Wheat Consortium (RWC) for the Indo-Gangetic Plains, comprising Bangladesh, India, Pakistan and Nepal was held 6-8 Feb 2005. 115 rice and wheat specialists, policymakers, planners, representatives of donors from Bangladesh, India, Pakistan, Nepal, ACIAR of Australia, CIMMYT, IRRI, ICRISAT, CIP and AVRDC participated in the meetings. The participants reviewed the success and progress of the

consortium activities achieved during the year and adopted some recommendations. The meeting prioritized the agenda of strengthening regional cooperation in the field of research for increasing rice-wheat system productivity through crop diversification and resource conservation to ensure food and nutritional security, and improve the socio-economic conditions of a large population of the region. The meeting was attended by one member of the present project team, Dr Suresh Pande, who presented a talk to raise awareness to Bangladeshi and Indian organisations of the activities of the R7885 and enhanced links with those representatives of the relevant government agricultural science bases in Bangladesh and India established at the Kathmandu meeting were sustained and interest maintained.

### *The Policy Document.*

The Policy document is currently being finalised by project partners. A final draft is presently circulating among authors and will be completed by end April and published through ICRISAT in 2005. The plan of the document is presented in **Appendix 6**. The document has been designed to be visually attractive with informative photos; the kind of document that key individuals would keep on their desks. The document has been written in English.

The summary describes the social and economic benefits of the ICM technology proven under ZA0440 with the vision and main action points. An illustration of the potential is presented as a case study/success story that incorporates the main elements of the technology and its benefits. Specifically this section describes the experiences of farmers in Lalbandi village, Sarlahi District, where the area under chickpea was expanded by farmers from the 13 Ha from seed provided by ZA0440 to more than 100Ha. Chickpea almost completely replaced tomato as the winter crop of choice. The document also presents a vision (i.e., what could be achieved by 5 years time if the recommendations are implemented) and then describes how this could be done and what changes need to be made to ensure uptake by identifying what is in place (technical, institutional, financial, human resources, awareness, support...), what works, and what doesn't and what changes are required to the policy & institutional environment, as well as the technical constraints and support needs to implement a strategy for up-scaling.

The potential value of ICM to dramatically increase productivity of chickpea, encourage the restoration of chickpea as a major legume for winter cropping and help alleviate poverty among the rural poor of Nepal has been proven in R7885 (Pande et al., 2003 a, b & c, and Stevenson, 2004) and the mechanisms by which this can be achieved are acceptable to farmers and have been adopted by them successfully where tested – in some cases very impressively. The role played by NARC in enabling this evaluation and adoption programme has given them relevant experience and put them in a position of considerable importance in the up-scaling process. The process needs to take advantage of this but considerable movement in cooperation needs to be made between MoAC departments. The principal extension role in expanding the horizontal focus of up-scaling will be taken by others who are already equipped with the links and staff for this role. These must include the Department of Agriculture (DoA) as the principal government extension vehicle as well as NGOs and small and medium enterprises with a commercial interest in distribution of seed of improved varieties and the technologies that accompany the ICM.

The most effective tool for this process will be via the distribution of mini-kits (see **Appendix 4**) that cost NRs180/katha – a mechanism already familiar to extension staff in DoA and elsewhere thus straightforward to mobilise. However, the successful application of the technologies will require a process of familiarisation and education for farmers through farmer field schools (FFS) and so the capacity to do this needs to be built in to DoA extension

plan through workshops for training trainers before the mini-kits can be distributed widely. This is an output of the next phase (ZA0656). Overall, this strategy is straightforward but there are obstacles and there are already elements in place that could better enable or enhance chickpea ICM up-scaling and are detailed in the policy document and discussed below.

Much of the information surrounding the production constraints for chickpea have been highlighted along with the problems associated with their management. The constraints can be classified as research, extension and farmer constraints, and action will need to be taken at each of those levels to ensure an efficient, effective and sustainable technology can be put in place at a country-wide scale. The constraints include:

- Marketing (market linkages, market studies, market information)
- Changing farmers perceptions of chickpea as an income generating crop
- Changing government perceptions so that the subsidy system can equally favour pulses
- Seed multiplication and storage (formal and informal)
- Further development of the pest management technologies
- Action to improve the quality of available pesticides
- Credit (convincing credit organisations that chickpea is a creditworthy enterprise, and educating them on appropriate “chickpea credit packages”)
- Developing chickpea as part of a farming system rather than as a single commodity
- Information materials production and information dissemination (by a range of media/methods)
- Advocacy and promotion (success stories; how to best utilise the “champions” you have already got)
- How to fit the promotion of this technology within the rigid bounds of NARC and DoA – or how to complement/supplement their capacities by using NGOs, farmer organisations, private enterprise etc.

The strategic focus can be highlighted in policy support, funding, seed availability, and information dissemination with farmer feedback.

### 1. Policy Issues

*i) Enabling policy environment.* At a very senior ministry level chickpea crop enhancement along with associated R&D needs to be made a national priority within the national agricultural strategy. This has been achieved and the Minister of Agriculture Hom Nath Dahal, has agreed to make this a priority. This will facilitate the strengthening of institutional and manpower capacity for technology support along with further technology development. This action has been engaged through the presence of key senior HMG staff at the Kathmandu meeting in November 2004

*ii) Seed access enhancement.* Availability of improved varieties needs to be enhanced at an institutional level through appropriate investment of funds and manpower (e.g., enabling NARC as the principal seed source) and at a farmer level by strengthening community based seed production systems through funds and technical backstopping. Wider distribution of seed of improved varieties and technologies could be further enhanced by encouraging SMEs perhaps through financial incentives. The financial mechanisms need to be authorised at a ministry level but the request for these funds could be raised by DoA and NARC through the usual processes.

*iii) Crop Insurance:* Farmers have all but given up on chickpea using traditional methods of production and so need encouragement to invest time and interest in new approaches. Thus as mentioned in the 10<sup>th</sup> plan, a mechanism of crop insurance could provide the assurance needed for the level of commitment that will be required from farmers.

*iv) Technology support and enhancement*

a) Subsidies for some technologies may enable the most resource poor farmers to get production underway – e.g., for technologies and equipment. This needn't be costly. Hand pump sprayers can be made for as little as NRs 120 according to farmers in Sarlahi and a mini-kit for 1 Katha (=0.033Ha) costs NRs 180.

b) Some farmers suggested that rhizobium was expensive and not easily available and this needs addressing. All seed from NARC should be inoculated and then farmers encouraged to inoculate new fields with their own inoculated soil.

c) With increasing concerns about the efficacy of insecticides in areas where insecticide resistance is increasing such as Banke & Bardiya districts as well as the environmental issues, efforts need to focus on alternatives. *Hear*NPV was highly effective at reducing pod borer populations when provided to farmers with basic coaching in their application and was often more effective than Thiodan, the insecticide provided to farmers to control the insect under R7885.

*Hear*NPV is a viable alternative to chemical based pesticides and should be promoted widely. However, production of quality virus is difficult and a brief survey of various products available from India established that only one source provided material of a suitable quality for application. Production facilities need to be established in Nepal to ensure this alternative option is available to farmers and of equal importance is the need for in-country quality control. This will require capacity building through training and has been built into the forthcoming phase of the project R8427. Importation of NPV is feasible but probably local production would be cheaper. Several models of local production exist including farmer production, village production, state or extension service production and commercial private sector production, and these models need to be evaluated for adoption in Nepal. A national system of regulation for NPV would also need to be developed and legislation to allow importation would need to be understood.

Ultimately, the potential for NPV to influence agriculture in Nepal needs senior government support to enable the process. Approval for capacity building in these developing technologies is required and some expertise already exists with some individuals in NARC and the NGO FORWARD.

The potential for genetically modified chickpea testing on station under controlled conditions needs to be considered from both an ethical and practical perspective.

2) *Funding – how will it be paid for?*

National funding programs should be provided from regular agricultural budgets (some of which is donor budgets that go through national budget lines). Specifically in Nepal activities of extension providers such as NGOs, SME's or CBOs can through District Agricultural Development Funds (DADF) of the Agricultural Perspective Plan Support Programme (APPSP) access funding to finance their activities in promotion. But this needs awareness raising and assistance in drafting proposals. In Feb 2004 Guidelines were published and identify 2 sources of funds – the Local Initiative sub-Fund (LIF) and the District Extension Sub-Fund (DEF). These funds are designed to strengthen decentralised service delivery, streamline agricultural interventions in more remote areas, promote public private partnerships and provide opportunities for HMGN grass roots level line agencies, CBOs and local farmer groups to work together, and enable the government agencies to change their role from implementers to facilitators and so streamline their activities. Additionally, the National Agricultural Research and Development Fund (NARDF) has been established by HMGN in order to involve the private sector, non-government organisations, civil society and the public sector in promoting and implementing agricultural research and agricultural development activities. The object of this fund is to provide full or partial support

for proposals aimed at the overall development of the agricultural sector for the benefit of farmers and the improvement of their livelihoods. The promotion and implementation of ICM of chickpea would fall into this category. Notably the fund is for marginalised, socially excluded and disadvantaged farmers living in both hill and *terai* regions of the country.

Ultimately chickpea ICM has the potential to positively affect rural poverty and thus address one of the key facets of the 10<sup>th</sup> Plan & needs government and institutional support and commitment to obtain a share of MoAC funds to ensure success.

### 3) *Seed multiplication and distribution*

The 6 improved varieties of chickpea that are being piloted have not yet reached foundation seed stage (still at breeder stage). Avarodhi, perhaps the most impressive in farmer participatory varietal selection trials has come from India and has been tested for 3-4 years. The test results need to be submitted to the National Seed Board (NSB) so that the varieties can be approved for release.

Two main models exist for multiplication of seed and making it available to farmers; the formal and informal (community based) seed sectors – the latter being larger but less controlled.

#### *Formal Seed Sector:*

NARC stations, DoA farms, National Seed Company (NSC), private seed companies and some NGOs comprise this sector and all will contribute to seed provision. However, NARC specifically will need to play a key role in early stages of multiplication and will be the principal support and provider for seed multiplication. The seed provision model consists of Breeders seed (provided by NARC), Foundation seed (provided by NARC along with qualified Private Orgs), Certified seed (provided NARC, seed companies, farmer groups) and truthfully labelled seed provided by seed companies, CBOs and individual farmers. The informal sector comprises CBOs, farmer groups and individual farmers who provide at the farmer to farmer level.

The formal sector needs to maintain its advantage in quality and purity control over the informal sector and also its institutional accreditation. However, efforts need to be made in supply time which is perceived to be too slow for effective distribution at the right time and without a commercial incentive it is difficult to see how this could be achieved. Questions of price fixing also need to be addressed. Profits drive the informal seed sector which is thus able to provide timely delivery of good quantities of seeds because it is demand driven. However, infrastructural changes are needed to enable the development of mechanisms that address quality issues and price.

Clear roles should be assigned for each stage of seed provision. GOs (NARC, DoA, NSB, NSC) must focus on quality control, market links, source seed, dissemination, variety release, price setting, maintenance, coordination and training. NGOs can take on the role of scaling-up, formation and mobilisation of CBOs, varietal development, training, market links, technology input and supply. CBOs can expand a role in seed production and distribution, farmer to farmer training, participatory varietal development, and sell and distribute associated technologies. Private organisations and SMEs can market and sell seed and distribute and sell associated technologies and information.

### 4. *Information supply:*

Information supply is a key facet to the strategy and its importance can not be overestimated. A major component is the provision of pictorial training materials for farmers

and these have already been developed (**Appendix 8**). However, these could be further developed to enhance the success of this strategy by being location specific and need to differentiate between resource rich and resource poor farmers. Audio visual aids could be useful (see attached DVD). But enhancing electronic media for dissemination of information would also benefit the strategy and needs to be supported at a high level. Current perception is that less than 5% media attention is placed on agriculture but that agriculture occupies more than 80% of the population and accounts for almost 50% GDP. National and local TV need to be better exploited but with informative approaches to dissemination. Current perceptions of agricultural programs are that they represent the least interesting TV and perhaps national, FM and local radio are more useful. Similarly low technology local dissemination by local enthusiasts can be encouraged through village level newspapers and wall posters and PA systems in local *melas* etc.

*Feedback mechanisms:* It is equally important to ensure that communication works both ways and responsiveness to implementers and facilitators to the needs and concerns of ultimate stakeholders – the farmers – needs to be monitored continuously. This will engage farmers in developing the strategy as it expands. Initial experience of this has proved highly valuable in developing the ICM technology under R7885.

### **Contribution of Outputs to developmental impact**

Programme output: *Technologies that reduce the impact of pests; stabilise crop yields on hillsides; and are appropriate for use by the poor promoted and adopted.*

The current area of chickpea production in Nepal is about 10,000 Ha & provides only 10% of Nepal's national requirement (Pande et al., 2005) thus exploiting the available rice fallow in the western region could lead to self sufficiency in Nepal's chickpea production while increasing wealth in the main target communities of the 10<sup>th</sup> Plan. It would not be unrealistic to consider that with a focussed effort, and appropriate training of extension staff and subsequently farmers, that some 100,000 families could benefit from an introduction or reintroduction to chickpea with its concomitant ICM and potentially Nepal could become self sufficient in the crop. The previous project showed that overall farmers saw real and noticeable increases in their wealth by more than NRs20,000 Ha<sup>-1</sup> (approximately US\$400) by growing chickpea using the technologies promoted by the project. In mid western Nepal a key focus for poverty reduction efforts in Nepal, up to 38% of Kharif rice area is fallow in the winter which means with an average land holding of 1.8 Ha about 0.68Ha could potentially be planted per family. By achieving 2 tonnes Ha<sup>-1</sup>, the individual wealth of the farming families would increase by NRs13,600 (approximately US\$270) per annum. DFIDs millennium goals aim to reduce the proportion of individuals below the poverty threshold of US\$1 day<sup>-1</sup> poverty. Implementing the outputs of the forerunner project R7885 could impact significantly on poverty in rural areas addressing both the ambitions of the 10<sup>th</sup> Plan and DFID while increasing employment.

One specific objective of the present project was to raise awareness of NGOs, the private sector and Government Organisations (GOs) of these benefits of chickpea ICM and in doing so, strengthen their capacity to provide farmers with the information and support needed to embed the practise of producing high yielding chickpea or other appropriate crops in rice fallows throughout chickpea growing regions of Nepal, and to influence similar institutions in Bangladesh and India – thereby improving the livelihoods of rice & chickpea farmers in these regions. The specific outputs of this phase of the project are described below.



*1. Lessons from previous promotional phase, and the current phase, identified and documented,*

Lessons learned from the previous project and those learned from similar projects in Nepal with a goal to achieve broad uptake and impact were synthesised through discussion with policy setters, extension workers and scientists and this ensured that the policy and strategy recommendations for up-scaling of chickpea ICM in Nepal was well considered and well planned and thus ensure a positive impact on rural poor. They formed the foundation on which the policy document was based (see 3 below). The lessons learned were written as a paper for the proceedings of the Kathmandu meeting 2004 and are currently in press. Thus they have directly influenced the development of the strategy by which the project envisages up-scaling of chickpea ICM.

*2. Awareness of policy makers and implementers on the value of chickpea rehabilitation raised in the target institutions and countries,*

In the first few weeks of the project, a series of meetings with various key individuals in Nepal initiated the process of raising awareness of the forerunner projects activities. Subsequently the Kathmandu meeting was used to highlight the value of chickpea rehabilitation to the Ministers, senior civil servants, NGOs, CGIAR programme leaders and the representatives of the donor/aid community. The Minister of Agriculture, Hom Nath Dahal, after the meeting agreed to give a high priority to enabling access to technologies for farmers in the forthcoming national plan for agriculture. Successes of the previous project (R7885/ZA0440) were discussed with stakeholders and partners. Considerable interest was generated (notably at DoA/MoAC) in incorporating chickpea ICM into national strategies. Awareness of the potential of chickpea to impact on rural livelihoods was raised further through mass media processes such as TV and newspapers (see **Appendix 7** for newspaper cuttings) as well as directly to key individuals such as the minister of agriculture and the national planning commission member Dr Upadhaya. Subsequently project staff were also invited to the biannual international Rice Wheat Consortium meeting in Dacca and a presentation on the project, its activities, findings and impact was made by Dr Pande, a collaborator and key member of this project team to the Bangladeshi and Indian. These awareness raising activities have encouraged the mobilisation of HMGN institutions to strengthen their capacity to provide farmers with the information and support needed to embed the practise of producing high yielding chickpea or other appropriate crops in winter rice fallows throughout chickpea growing regions of Nepal thereby improving the livelihoods of rice & chickpea farmers in all these regions, and further to influence similar institutions in Bangladesh and India with similar potential impacts on poverty. The pay-offs include import substitution, export promotion, soil health enhancement and human and livestock nutrition. The outcome in Nepal could lead to self sufficiency in chickpea production and at least raise the percentage of production of in Nepal well above the 10% it produces presently.

*3. Strategy for wider promotion of chickpea rehabilitation developed with key policy players in Nepal,* A strategy was developed through a consultation and discussion exercise with participants at the Kathmandu meeting in November 2004 that drew from the broadest possible involvement from farmers to the Minister of Agriculture. This strategy has been synthesised into a policy paper that is a tool and guide directly for the administration of the up-scaling of chickpea ICM. It has a broad but specific client base including donors, key policy setters and extension administrators, scientists, non-government development organisations and small and medium enterprises. By providing these key individuals with this document and the up dated training information sheet (**Appendix 8**) it is now possible to enable the up-scaling of chickpea ICM – especially in the Mid and Far west and directly address rural poverty. The Mid and Far western regions are principal geographic foci under

the 10<sup>th</sup> Plan. Accelerating income and employment growth in the rural economy of Nepal – particularly the mid west and far west where the poorest live was identified by The 10<sup>th</sup> Plan (Anon, 2003) 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 rice fallows here could be exploited using chickpea production along with other pulses and vegetables to provide high yielding and high value crop options for poor farmers.

The policy document will be mailed out through ICRISAT to all relevant individuals when finally published but in the meantime drafts will be made available as PDFs as soon as the present draft is finalised.

4. *Advise target institutions (NARC/DoA) on approaches to sourcing funds to promote chickpea rehabilitation.* Stakeholders including NGOs and farmers who attended the November 2004 workshop were made aware of new funding strategies currently being implemented by Nepal's government under the guidance of the Agricultural Perspective Plan Support Programme for the decentralization of agricultural development funds to Local Initiative funds and District Extension Funds. This will be expanded upon in the final policy document.

A follow-on project *Ensuring the sustainability of an integrated crop management approach to chickpea production for poor farmers through up-scaling and far-reaching adoption in Nepal* (ZA0656) has been agreed with CPP and the principal aim of the project is to ensure that the ICM of chickpea in Nepal with its proven success and positive impact on farmers' livelihoods becomes embedded in the national agricultural strategy of Nepal. It aims to achieve this through stewardship of the adoption of the outputs of R7885 into policy and strategy through training, education and development of tools such as mini-kits and improved dissemination tools with which to promote its adoption. In addition by establishing marketing links and 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 policy (DFID 2003).

## **Biometricians Signature**

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

## **References,**

1. Anon 2003a. CBS/NPC 2003, Statistical Year Book on Nepal 2003.
2. Lok Nath Devkota, sourced 31 March 2005, <http://www.applejournal.com/nepal001.htm>
3. Subba Rao, G.V., Kumar Rao, J.V.D.K., Johansen, C., Deb, U.K., Ahmed, I., Krishna Rao, M.V., Venkataratnam, L., Hebbar, K.R., Sai, M.V.S.R. and Harris, D. (2001) Spatial distribution and quantification of rice fallows in South Asia – potential for legumes. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi Arid Tropics 316pp.
4. Pande, S., Bourai, V. and Neupane, R.K. (2003c) Wealth generation through chickpea revolution. IPM of chickpea in Nepal – 3. Information bulletin no. 66. Patancheru 502324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 36pp. ISBN 92-9066-464-9.
5. Anon, 2003b, The 10<sup>th</sup> Plan (Poverty Reduction Strategy Paper), National Planning Commission, <http://www.npc.gov.np/tenthplan/docs/Formated10Plan.pdf>
6. Pande, S, Stevenson, P.C., Neupane, R.K. and Grzywacz, D. (eds.) (2005 *in press*) Policy and strategy for increasing income and food security for poor farmers in South

- Asia through improved crop management of high yielding chickpea in rice fallows: proceedings of the International Workshop, 17-18<sup>th</sup> November 2005. 2000, Kathmandu, Nepal. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics; and Chatham, Kent ME4 4TB, UK: Natural Resources Institute.
7. Pandey, S.P., Yadav, C.R. Sah, K. Pande, S and Joshi, P.K. (2000) Legumes in Nepal. Pages 71-97 in Legumes in rice wheat cropping systems of the indo gangetic plain – constraints and opportunities (Johansen, C *et al.*, Eds. Patancheru 502 324 Andhra Pradesh, India: International Crops research Institute for the Semi-Arid Tropics and Ithaca New York, USA, Cornell, University.
  8. Johansen, C. (2001) Opportunities for increasing chickpea production in Nepal. Pages 33-47 *in* On farm IPM of chickpea in Nepal: Proceedings of the International Workshop on Planning implementation of On-Farm Chickpea IPM in Nepal 6-7 September 2000, Kathmandu, Nepal. Pande S Johansen, C. Stevenson, P.C. and Grzywacz, D ed.s) Patancheru 502 324 Andhra Pradesh, India: International Crops research Institute for the Semi-Arid Tropics and Chatham ME4 4TB, UK., Natural Resources Institute.
  9. Pande, S, Bourai, VA, Stevenson, P.C. and Neupane RK (2003b) Empowerment through enrichment. IPM of chickpea in Nepal 2. Information Bulletin No 65 Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics, 28pp ISBN 92-9066-463-0.
  10. 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. 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. 133 pp. ISBN 92-9066-438-X.
  11. Stevenson, P.C. (2001) Project Outputs, Dissemination, Adoption and promotion strategies. Pages 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.) 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. 133 pp. ISBN 92-9066-438
  12. Stevenson, P (2004) Final Technical Report on project R7885 (ZA0414) Promoting The Adoption Of Improved And Integrated Disease And Pest Management Technologies In Chickpea By Poor Farmers In Mid Hills And Hillside Cropping Systems In Nepal. CPP Final technical report
  13. Pande, S. and Narayan Rao, J. (2001) Integrated pest management of chickpea in mid hills and hillsides cropping systems of Nepal: Progress report of the ICRISAT NARC collaborative work in farmers participatory on-farm trials on promotion and adoption of improved disease and pest management technologies in chickpea in 10 villages of eight districts in Nepal, Oct 20, 2000 to April 30 – 2001. International Crops Research Institute for the Semi Arid Tropics (ICRISAT). Patancheru 502 324, Andhra Pradesh, India 48pp.
  14. Pathic, D.S., Constraints and Opportunities for sustainable chickpea production in Nepal. Pages 48-50. *in* On farm IPM of chickpea in Nepal: Proceedings of the International Workshop on Planning implementation of ON-Farm Chickpea IPM in Nepal 6-7 September 2000, Kathmandu, Nepal. Pande S Johansen, C. Stevenson, P.C. and Grzywacz, D ed.s) Patancheru 502 324 Andhra Pradesh, India: International Crops research Institute for the Semi-Arid Tropics and Chatham ME4 4TB, UK., Natural Resources Institute.

#### Abbreviations:

ADB	Asian Development Bank
APPSP	Agricultural Perspective Plan Support Programme
BGM	Botrytis Grey Mould
CABI	CAB International
CBO	Community Based Organisations
CPP	Crop Protection Programme of DfID
DEF	District Extension Sub-Fund.
DfID	Department for International Development
DoA	Department of Agriculture
FFS	Farmer Field Schools
GO	Government Organisation.
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
IPM	Integrated Pest Management
LIF	Local Initiative sub-Fund
MoAC	Ministry of Agriculture and Cooperatives
MWR	Mid-Western Region
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
NPC	National Planning Commission (Nepal)
NRI	Natural Resources Institute (UK)
NSB	National Seed Board
NSC	National Seed Company
ORP	Oil Seeds Research Program
PCI	Pesticide Control India
PRSP	Poverty Reduction Strategy Paper
10 <sup>th</sup> Plan.	Poverty Reduction Strategy Paper
PRA	Participatory Rural Appraisal
PVS	Participatory Varietal Selection
RARS	Regional Agricultural Research Station
SME	Small or Medium Enterprise

## Contacts

**PC Stevenson**, (*Project Leader*) Natural Resources Institute, University of Greenwich, Chatham Maritime, Kent, ME4 4TB, UK Tel.+44-1634-883212. Fax.+44-1634-883379. [P.c.stevenson@gre.ac.uk](mailto:P.c.stevenson@gre.ac.uk)

**S Pande**, (*Project Coordinator & Principal Scientist*) ICRISAT Asia Centre, Patancheru PO, AP 502 324, India. [S.pande@cgiar.org](mailto:S.pande@cgiar.org)

**KB Shrestha & BR Kaini**, *Joint Secretaries*, MoAC, Singha Durbar, PO Box 21401, GPO, Kathmandu, Nepal. 9771-4241215 (off) 9771-4225825 (fax) [moa@fert.wlink.com.np](mailto:moa@fert.wlink.com.np)

**HK Upadhyaya**, *Honourable Member*, National Planning Commission, Singha Durbar, PO Box 21401, Kathmandu. [hkupadhyaya@npcnepal.gov.np](mailto:hkupadhyaya@npcnepal.gov.np)

**SS Shrestha**, *Director General*, Department of Agriculture, MoAC, DoA, Harihar Bhavan, Lalitpur, 9771-5521323 (off) 9771 5524093 (fax) [shivasundar@hotmail.com](mailto:shivasundar@hotmail.com)

**RP Sapkota** *Executive Director*, NARC, PO Box 5459 Kathmandu Nepal. 9771-4256837 (off) 9771-262500 [ednarc@ntc.net.np](mailto:ednarc@ntc.net.np)

**KK Lal** *Member Secretary*, National Seed Board, Harihar Bhavan, Lalitpur, Kathmandu Nepal. [seed@sdqc.wlink.com.np](mailto:seed@sdqc.wlink.com.np)

**Tek Bahabur Thapa** (*Member secretary*) NARDF, MoAC, Singha Burbar Plaza, Kathmandu Nepal. Tel. 977-1-4229524 Fax 977-1-4431185, [tthapa@nardf.org.np](mailto:tthapa@nardf.org.np)

**J Morrenhof**, *Programme Advisor*, APP Support Programme (APPSP), Dept. Livestock, Harihar Bhavan, Lalitpur, 9771-5552957 (off) 9841214643 (mobile) [jan@daninapp.wlink.com.np](mailto:jan@daninapp.wlink.com.np)

## APPENDIX 1

### Results of Discussion Group work

The outputs of each of the 4 group discussions were presented by an individual representative volunteered by each group and the outcomes were recorded through discussion and clarification by all participants. In most cases the guidelines provided at the outset were used as that – guidelines – and it was not imperative to adhere to them rigidly. Thus some of the original questions became part of other questions and so on.

#### Group 1: Policy and funding issues

1. *What are the elements of an enabling policy environment for the scaling-up of chickpea in Nepal and in the wider region?*
  - Seed access enhancement
    - o NARC – foundation and breeder seed
    - o Certified and improved seed
    - o Import of seed until self-sufficiency
  - Revolving fund and technical backstopping for strengthening community-based seed production systems
  - Make chickpea R&D a national priority
    - o Capacity strengthening
    - o Infrastructure and facilities
    - o Manpower development
    - o Promotion of FFS approach
  - Policy support for the production of the biological pesticide NPV at local level
  - GM-chickpea testing on station under controlled conditions
  - Subsidy for prophylactic sprays for BGM control (both chemicals and equipment)
  - Micronutrient management R&D, with emphasis on B, Mo, P and Rhizobium
  - Zonation of rice fallow areas and inclusion of lowland maize fallows
  - Crop insurance (NB this is mentioned in the 10<sup>th</sup> Plan, but is not in place yet)
2. *The pay-offs for policy support to chickpea will be:*
  - Import substitution
  - Export promotion
  - Soil health
  - Human and livestock nutrition
3. *How will up-scaling countrywide be paid for (excluding direct support from major donors)?*
  - National funding should be provided from regular budget (some of which is donor money that goes through national budget lines).
  - Some components could be financed by donor projects
  - Needs **advocacy** to obtain share of NARC/DoA/NSC funding for chickpea
4. *Is there a good market for chickpea? Are there problems with processing and marketing the crop, and if so how can these problems be resolved?*
  - There is no marketing problem, as there is huge unsatisfied national demand

#### Group 2: Seed multiplication issues

1. *What different models exist for making seed available to farmers?*
  - There are two main models: the **formal** seed multiplication sector, and the **informal** (community) sector, which is much larger but characterised by less quality control.
  - The formal sector consists of:
    - o NARC Stations
    - o Farms under DoA
    - o National Seed Company (NSC)
    - o NGOs, private seed companies
    - o Agrovets
  - The informal sector consists of:
    - o Farmer groups/CBOs

- Individual farmers
- Farmer-farmer seed supply

2. *What are the stages of the model, and who are the responsible organisations at each stage?*

- Breeding/breeders seed: NARC
- Foundation seed: NARC and those Private Organisations that are qualified
- Certified seed: NARC, seed companies, farmer groups, individual farmers
- Truthfully labelled seed: Seed companies, farmer groups, individual farmers

3. *What are the advantages and disadvantages of each model?*

	<b>Advantages</b>	<b>Disadvantages</b>
<b>Formal sector</b>	<ul style="list-style-type: none"> <li>- Assured quality</li> <li>- Assured purity</li> <li>- Institutional creditation</li> </ul>	<ul style="list-style-type: none"> <li>- May not be able to supply in time</li> <li>- No commercial incentive</li> <li>- Administrative issues/price fixation</li> </ul>
<b>Informal sector</b>	<ul style="list-style-type: none"> <li>- Profit drives good delivery time and quantities</li> <li>- Demand driven</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of quality assurance</li> <li>- Lack of infrastructure to produce quality seed and sufficient quantity</li> <li>- High price</li> </ul>

4. *What are the roles of government institutions, NGOs, CBOs and private organisations in each model?*

- GOs (NARC, DoA, NSB, NSC):
  - Quality control
  - Make policy
  - Market linkage
  - Dissemination
  - Source seed
  - Price setting
  - Variety release and maintenance
  - Coordination
  - Training
- NGOs:
  - Scaling up
  - Formation and mobilisation of seed producer groups
  - Varietal development
  - Training
  - Market linkage
  - Input/technology supply
- CBOs:
  - Seed production
  - Resource persons for farmer-farmer training
  - Help in varietal development
  - Sell inputs/technology
- Private organisations:
  - Marketing seed
  - Sale of inputs/technology
  - Dissemination of information

**Note:** The 6 “improved” varieties of chickpea that are being piloted have not yet reached foundation seed stage (still at breeder seed stage). Avarodhi has come from India, and has been tested for 3-4 years. The test results need to be submitted so that the variety can be approved for release. The seed of Avarodhi from India needs to pass certain conditions before it can be accepted for marketing.

### Group 3: Information supply

1. *What types of information are needed by different stakeholders, and how can your suggestions be validated?*
  - Printed information on production technology for farmers in local language, with photographs and drawings. Needs to be **location specific**, and need to differentiate between resource-rich and **resource-poor** farmers
  - Audio visual aids
  - Electronic media: National and local TV; national, FM and “local” radio; email; networks
  - Information on post-harvest technology
    - o Grain/seed preservation
    - o Optimum time to sell grain to market
    - o Market information (where, size, prices, quality conditions...)
    - o How to set up cooperative producer and seller groups
    - o Credit information (who, where, rates, conditions...)
    - o Input suppliers (who, where, prices...)
2. *What options exist for developing and transmitting the information needed by each stakeholder?*
  - Budgetary provision should be included in all project costs for the development of a communication/dissemination strategy and its implementation
  - Should carry out information needs assessment for each stakeholder
  - Provision of funds to farmer groups for the production and promotion of seed, bio-control agents etc.
  - Training of farmers, extension agents, NGOs, private sector and researchers (need to develop training materials: e.g. manuals and modules)
  - Bridge the knowledge gap with journalists: researchers outputs are unintelligible to journalists
  - Use of **local** newspapers; wall poster; PA system in local Hat, melas etc. (need cassettes with simple messages on them)
  - Need to know the consumers preference (taste, variety, cooking qualities etc) and transmit that to producers and traders
  - Incentives, awards, certificates etc
  - Documentation of success stories for promotion (including policy-makers). Local resource-people can help with this (it was emphasised that the village “resource-person” model was working well and being absorbed into formal planning)
  - Monitoring and evaluation of information effectiveness, and modification of materials
  - Up-dating of materials
  - M&E to provide information to donors, project management and project partners about progress
  - Need to use the expertise developed in India on communication
3. *What are the advantages and disadvantages of each option?*
  - Disadvantages:
    - o Competition with other fallow crops
    - o Lack of continuous flow of technology that can be converted into new information
    - o Need to transmit information in a timely way (i.e. with due regard to season and farmers activities)

### Group 4 – Farmers experience with chickpea

#### *What worked well in farmers’ experience?*

- Technique of seed selection
- Technique of seed treatment
- Technique of seed storage
- Project recommendations for control of BGM and pod borer (although they modified the recommendation by combining the two chemicals and spraying at the same time).
- Cross visits (travelling seminars) are very effective

#### *What didn’t work well?*

- Spraying of NPV, especially mixed with milk – chemical not readily available, and expensive



- Rhizobium treatment. Farmers said that it wasn't available and that it was costly. However, NARC staff say it is available from Khumaltar, and that it is cheap from that source

*What would they like to see happen next?*

- Chickpea crop free from disease and insect
- Frequent visits from technician
- Training on cultivation technology on chickpea
- Farmers field visit to other locations (they are also prepared to host visits)

*Who should be responsible for above?*

- GO, NGO, INGO

*What should the role of the community be?*

- Being helpful to other communities/neighbouring farmers
- To give training to other communities/neighbouring farmers
- To sell seed to other communities/neighbouring farmers

*How can chickpea production and marketing be made sustainable?*

- By forming chickpea producer groups in each society
- By helping neighbour and other communities to grow chickpea

*How do they suggest that new communities are helped to adopt chickpea?*

- By demonstrating economic benefits
- Help with marketing
- Convincing others that chickpea can grow without irrigation

*What information do farmers need?*

- Effective technologies for growing chickpea, in the form of training or booklets

*Is there a good market for chickpea?*

- Yes. No problems with processing and marketing the crop at present

## APPENDIX 2.

**Lessons learned - a set of bullet points of new ideas or lessons brought out by presenters during the meeting in Nepal.**

### **Dyno Keatinge (Deputy Director ICRISAT):**

- Crop diversification was identified as a key element of development strategy by a recent CGIAR strategy meeting.
- Hidden subsidies on cereals work against legumes. Need to redress balance.
- GM chickpea with Bt for *Helicoverpa* resistance now in B/desh and should be introduced to Nepal. Need regulatory structures enabling this.

### **DS Pathik**

- High cost of cultivation and lack of systematic marketing are disincentives to chickpea production
- Need to address: Information flows, CBO/NGO partnerships, integration of DoA extension with other initiatives, high cost of the technology, poorly organised commercialisation, environmental concerns, and globalisation aspects(?).

### **MoAC Joint Sec**

- Importance of legumes were recognised by the APP, leading to the Secondary Crops Development Project, which has now morphed into the Crop Diversification Project (ADB-supported)

### **Dr Upadhyaya Hon Member National Planning Commission.**

- Need better complementarity b/w NARC and extension systems
- Need to go from 3500 farmers to a respectable proportion of the 2.8million farming families in Nepal.
- Farmers need commercially viable crops. Is chickpea one of them? Can it compete with alternatives?
- Policy is re-orienting towards commercial, income-generating crops – including non-cereal crops.

### **Uddin, Bangladesh**

- Legumes are being relegated to marginal lands in B/desh, and productivity is declining. Poor returns; therefore farmers not weeding. BUT, B/desh will need 748,000 tonnes of legumes by 2010, and they are far short of that at present.
- Soil factors (B, S, Zn and P deficiency)
- Collar rot and *Helicoverpa* main pest problems
- Chickpea production may spread to the 10,000ha of suitable land in Barind area.

### **Abu Bakr, Bangladesh**

- Prefers the extension messages to reach all clients at the same time, rather than sequentially. Helps research and extension to work together with farmers.
- Main strategy for improving yields is through varietal replacement
- Farmers are encouraged by awards

### **Tripathi, India**

- Have BGM-tolerant varieties
- 6 million ha under chickpea in India, with average yield of 850kg/ha
- BGM + *Helicoverpa* are main reasons for low yield

### **Kumar Rao**

- Farmers unaware of options for using fallows
- When made aware, and if have materials, then farmers are enthusiastic to plant legumes
- Sowing time is critical – to make best use of receding moisture
- Sowing behind the plough is best planting method

- Collar rot, Helicoverpa, birds, theft are problems. Better to combine with neighbours and plant in blocks to reduce theft and for effective spraying against pests. Requires good community cohesion
- Mo deficiency a problem. Mo can be added to seed priming water
- In Eastern India the components of dissemination included: Farmer training, seed provision, starter packs (Rhizobium, Mo, SSP) and technical backstopping for pest control
- In B/desh, key elements for chickpea production included: Seed priming (with Rhizobium and Mo), seed multiplication, training in village seed production, Phosphorus, alternatives to chickpea, PVS, further research into chickpea nutrition and pest management
- In Nepal, lessons learned are that: PVS has led to promising varieties, B and Mo are necessary for good yields, seed priming can help – especially in drier areas (may not help where there is sufficient soil moisture), pod borer/BGM control and seed production are key. Land tenancy and free grazing of animals are further constraints to be addressed
- BGM is soil, seed and air borne. Is promiscuous, so can get cross infection from variety of sources. Dense canopy encourages disease. Can have husbandry control measures (reduced plant stand, delayed planting...)

### Devkota

- Best to present farmers with a basket of choices, rather than a package
- Should analyse why some farmers **don't** adopt
- Good M&E vital to spot failure as well as success, and then need flexibility to respond
- Formal R&D organisations don't have the capacity to cover whole country. Vital that farmers take on some of the R&D functions
- Cross visits/travelling seminars are very effective in motivating farmers to consider new technology
- Market aspects have been neglected, including market linkages, market studies, market information.

### Ortiz

- Zero tillage has taken off in the Region since 1995
- Bed planting systems have good potential for diversification and mixed cropping
- PVS using mother-baby-daughter trials has been successful. "Mother" is unreplicated, multi-entry trial controlled by researchers<sup>1</sup>, but monitored by farmers, baby trials are unreplicated 2-entry trials managed by farmers. When farmers have selected favourite variety, then daughter material of preferred material is further tested by farmers.

### KD Joshi

- In addition to mother-baby trials, he used IRD for rice (Informal R&D, where small packets of seed are distributed to farmers to grow in their own way and to keep and multiply, or reject, as they feel appropriate).
- Some farmer groups are producing >100 tonnes of rice seed, and are amalgamating into cooperatives
- R&D are going on simultaneously, with the roles of each laid out clearly in a Letter of Agreement
- These participatory methods are fast and effective, and need to be institutionalised. This requires capacity building at all levels

### Ghimire

- Produce 2800kg/yr of chickpea foundation seed. This is sufficient in theory for present multiplication needs.
- However, when minikits are used for food production and not seed production, there will be a shortfall of certified seed
- In recognition of this have added the "frontline" demonstration method for pre-released varieties. In this researchers and extension staff interact directly with farmers in PVS/FFS
- However FFS has not been sustained beyond the project life (i.e. farmers lose interest once the benefit stream from the projects dries up)
- Challenges of chickpea: a) Agrovets are not dealing with/trained in appropriate seed/inputs; b) The risks associated with unregulated farmer-produced seed

---

<sup>1</sup> "Mother" trials are repeated in several locations. Data can be analysed as if each location is a replicate.

**Raj Gupta**

- One advantage of zero tillage is that can plant into near waterlogged conditions and line sowing reduces seed rate (and assists subsequent operations)
- Need simple, affordable, farmer-friendly technologies that give good productivity/profit. Is the technology being promoted by the project all of these??
- Need local champions, and need to engage and win over critics
- Travelling seminars are effective awareness raisers/motivators (but still need materials, information, training, back-up, credit...)

**Khanal**

- 3 successive steps in technical promotion: Initiation (awareness raising etc); Internalisation (training); Institutionalisation (capacity building, attitudes, processes and structures)
- Single commodity approaches (e.g. promoting chickpea on its own) don't work; need to present a set of options within a systems context

**Yubanath Lamsal**

- Agriculture has not yet found its due place and space in the media, despite it being a predominant feature of Nepali life
- Research needs to develop a media-friendly information system and a farmer-friendly dissemination system
- Need to think of separate, but integrated information flows for national (policy) and local (farmer) levels

### Appendix 3

Mini-kit cost for 1 katha-1 (336sqm)

Seed – 1.5kg	NRs	45
Rhizobium	NRs	10
Fertilizer (DAP)	NRs	40
Fungicide for BGM	NRs	25
Insecticide Pod borer	NRs	35
Plastic storage bag	NRs	10
Information leaflet	NRs	15
<b>TOTAL =</b>	<b>NRs</b>	<b>180</b>

**Appendix 5.**

#### Appendix 4.

The following 20 papers were presented at the workshop described above and are currently in press at ICRISAT in

Proceedings of a Workshop on “*Policy and strategy for increasing income and food security for poor farmers in Nepal and South Asia through improved crop management of high yielding chickpea in rice fallows*”. November 17-18, 2004, Kathmandu, Nepal. *In press*.

P.Stevenson, Pound, B and Pande S (2005) Country-wide extension of Integrated Crop Management of chickpea in Nepal: lessons learned and future approaches.

YN Ghimire, TP Pokharel, R Khadka, D Gauchan (2005) Experiences of Scaling-up programmes of Nepal Agricultural Research Council.

S Pande, J N Rao and G K Kishore (2005) Integrated Crop Management of Chickpea in Nepal: Past, Present and Future.

G. Ortiz Ferrara, M.R. Bhatta, A. Mudwari, D. Thapa, (2005) Scaling-Up Of Participatory Variety Selection In Wheat In Nepal: Cimmyt's Experience.

Raj Gupta (2005) Up-scaling Zero Tillage in 'Rice Fallow Lands' of Indo-Gangetic Plains-Some Experiences.

V D K Kumar Rao, D Harris, K D Joshi, N Khanal, C Johansen and A M Musa (2005) Promotion of *Rainfed* Rabi Cropping in Rice Fallows of Eastern India, Nepal and Bangladesh-An Overview.

KD Joshi, KP Devkota, S Gyawali, MP Tripathi & JR Witcombe (2005) Scaling up of process and outputs of participatory crop improvements (PCI) on rice in Nepal: The adoption and impacts.

P.C, Stevenson (2005) Policy and strategy for increasing income and food security for poor farmers in Nepal and South Asia through improved crop management of high yielding chickpea in rice fallows, Opening Remarks from NRI & workshop objectives

K. P. Devkota, S. Gyawali, M. P. Tripathi, K. D. Joshi, and J. R. Witcombe (2005) Lessons learned from scaling up of participatory variety selection: LI-BIRD experiences

Mohammad Jalal Uddin (2005) Prospects Of Legumes In Rice Based Cropping Systems In Bangladesh.

V.A. Bourai, S. Pande, R.K Nupane Farmers' Empowerment Soil-enrichment and Wealth Generation *through* IPM-Chickpea in Nepal

Purushottom Mainali (2005) Lessons Learned From The Experiences On The Role Of Agriculture Perspective Plan Support Programme For Funding Extension Of Agricultural Services

B. Pound (2005) Developing positive outcomes from agricultural research through livelihood studies.

BMS Basnet (2005) Roles and Responsibility of Media and Communication in Promoting Cost-Effective Farmers-Friendly Agricultural Technologies to End-Users.

R.K. Neupane, M. Joshi , N.K. Yadav and S. Pande (2005) On-farm IPM of Chickpea in Nepal – Dissemination, Adoption and Promotion 1997-2005

D. Grzywacz (2005) Alternative pest control approaches: Problems and solutions to NPV uptake in Nepal.

K.K. Lal (2005) Seed Quality Control Mechanisms in Nepal.

Nityananda Khanal, Krishna D Joshi, David Harris, JVDK Kumar Rao. (2005) Rabi cropping and promoting winter legumes in rice fallows in Nepal.

P Stevenson, S Pande, RK Neupane, CN Chaudary, J Narayana Rao & D Grzywacz (2005) The promotion of improved crop management technologies in chickpea to poor farmers in Nepal.

NP Khanal and NN Khanal (2005) Bridging the gap: Role, responsibilities and approaches in scaling up of IPM of chickpea in Nepal

## Country-wide extension of Integrated Crop Management of chickpea in Nepal: lessons learned and future approaches.

Stevenson, P.C.<sup>‡</sup>, Pound, B.<sup>‡</sup>, Pande, S.<sup>†</sup>

<sup>‡</sup>Natural Resources Institute, University of Greenwich, Kent, ME4 4TB, UK.

<sup>†</sup>ICRISAT, Patancheru PO., AP 502 324, India.

### Abstract.

This paper discusses lessons that have been learned both from discussions at the present meeting<sup>2</sup> and those distilled from experiences of project partners during the collaborative activities of NARC, ICRISAT and NRI under the Crop Protection Programme's (DfID) project to rehabilitate chickpea in Nepal (DfID R7885). Chickpea is a crop that can compete with alternatives; it is highly profitable when grown with appropriate technology and improves livelihoods for poor farmers. Markets *per se* are not a limiting step for the nationwide expansion of improved chickpea production in Nepal (most chickpea consumed in Nepal is still imported) but aspects of marketing are and need addressing to ensure trouble free expansion of chickpea production. Aspects of infrastructure also need addressing, especially the connectivity between research and extension organisations in Nepal, to enable joined-up extension services and technology support. Seed storage has too low a priority for both farmers and extension services and needs greater focus. Pesticide quality and insecticide resistance need monitoring and infrastructure and policy/legislation to support biological alternatives such as NPV needs attention. Farmers' past experience with particular management tools (e.g., familiarity with insecticides from vegetable production) often coincided with success skills of diagnosis and timing for applications of technology needs particular attention across all farmers. Because chickpea is self-fertilising farmers can produce and maintain their own seed stock negating the long term role of seed production enterprises in up-scaling. There is, however, always a need for technology inputs and seed provision for new farmers. The project also encouraged low cost inputs which are less financially rewarding for SMEs. Self help groups increasingly need to take on the role of seed producers. Agriculture holds a position of low priority in popular media such as newspapers and television so alternatives need to be exploited to ensure widespread knowledge dissemination.

### Introduction

This meeting of international researchers, HMGN institutions, NGOs and farmers has been a forum for some forthright and constructive presentations and discussions, and has provided valuable information about up-scaling successful research and development strategies for alleviating poverty through agricultural development in Nepal. Much of the information surrounding the production constraints for chickpea have been highlighted along with the problems associated with their management. The constraints can be classified as research, extension and farmer constraints, and action will need to be taken at each of those levels before an efficient, effective and sustainable technology is in place at a country-wide scale. The constraints include:

- Marketing (market linkages, market studies, market information)
- Changing farmers perceptions of chickpea as an income generating crop
- Changing government perceptions so that the subsidy system can equally favour pulses
- Seed multiplication and storage (formal and informal)
- Further development of the pest management technologies
- Action to improve the quality of available pesticides
- Credit (convincing credit organisations that chickpea is a creditworthy enterprise, and educating them on appropriate "chickpea credit packages")
- Developing chickpea as part of a farming system rather than as a single commodity
- Information materials production and information dissemination (by a range of media/methods)
- Advocacy and promotion (success stories; how to best utilise the "champions" you have already got)

---

<sup>2</sup> Workshop on "Policy and strategy for increasing income and food security for poor farmers in Nepal and South Asia through improved crop management of high yielding chickpea in rice fallows". November 17-18, 2004, Nepal.



- How to fit the promotion of this technology within the rigid bounds of NARC and DoA – or how to complement/supplement their capacities by using NGOs, farmer organisations, private enterprise etc.

We have also heard similar stories about other crops from similar systems and much about affordable and practical ways to manage constraints. Farmers themselves have provided valuable personal insight into the successes that can be achieved by following the associated technology guidelines promoted by the ICM of chickpea in Nepal project – especially where farmers use the information sheets (Appendix 1). In this paper we highlight lessons learned from these experiences that are important considerations for up-scaling.

## **Economics**

Encouraging farmers to go back to producing chickpea can be complicated by their perception that chickpea requires a high investment and that there is a lack of systematic marketing. However, the ICM of chickpea in Nepal project has shown that with a small additional investment (see Stevenson *et al.*, in these proceedings) the rewards are greatly increased to a point where production costs are effectively halved. What's more, farmers themselves reported at this meeting that marketing the crop is not a problem. Despite farmers' perceptions that markets were not a limiting step and that there was always a demand in the market, aspects of up-scaling were identified as areas needing attention suggesting that these had been neglected – such as market linkages, market studies, market information. Clearly country-wide up-scaling will require some thought with respect to markets and infrastructure. Overall, it was accepted that there is a considerable shortfall of chickpea in Nepal and the deficit of production is approaching 90% according to some observers here. Thus in the grand scheme – as perceived by farmers – there will always be a market but facilitating distribution beyond villages where chickpea is grown and storage facilities will be strategic hurdles that will need to be born in mind as the scaling-up of chickpea production takes off.

The question of whether chickpea is a commercially viable crop was also raised but this is clear from the outcome of livelihood studies undertaken as part of the present project and are detailed in Bourai *et al.*, (2005). Chickpea is a crop that can compete with alternatives since with considered and careful application of ICM chickpea out yields the alternative legumes and in terms of financial return exceeds wheat. This fits with current policy described by Dr Upadhaya, Honourable Member of the National Planning Commission, as re-orienting towards commercial, income-generating crops including non-cereal crops such as pulses. Upadhaya also highlighted the need for better complementarity between NARC and extension systems such as DoA and only then could Nepal really expect to go from the 3500 farmers touched by this project to a respectable proportion of the 2.8million farming families in Nepal.

Land tenancy and problems associated with hidden subsidies for cereals crops works against them being prioritised by farmers and the balance of subsidies and indeed emphasis in MoAC needs to be changed.

## **Management of pests and diseases and alternative approaches.**

The environmental concerns of controlling pests and diseases on chickpea with chemicals are predictable. However, the application rates promoted are extremely low especially compared with rabi alternatives such as wheat. Caution needs to be taken with quality though and some NARC back stopping to check regularly the materials being used by farmers could help in this respect. Adulterated pesticides can lead to lower efficacy and the build up of pesticide resistance in target organisms. Furthermore, it should be remembered that the efficacy of pesticides in some parts of the country are reportedly worse than in others. Notably, Thiodan the insecticide promoted by this project was often reported to be ineffective at controlling pod borer in the mid west. It is likely that this is due to local populations of pod borer arriving from nearby cotton in India that are sprayed up 3 times a week. Thus the likelihood of pesticide resistant populations of pod borer are high. Transgenic approaches to the control of *Helicoverpa* pod borer have been introduced in Bangladesh and may be an alternative route for controlling this intractable insect pest of chickpea in Nepal. However, as with other novel control strategy such as *Hear* NPV, the appropriate regulatory structures are not in place in Nepal and need to be implemented. Currently it is not possible to promote NPV to farmers since it is not sustainable in the absence of a local large scale production of the virus and no expertise for quality control or technological back stopping. Future plans to move to the use of biopesticides would benefit from

investment of time and funds into the development of an in-country expertise such as between an NGO like FORWARD and the government scientists from NARC.

BGM has a broad range of hosts and consequently cross infection from other sources was highlighted as an unforeseen pathology – notably from pigeon pea (*Cajanus cajan*) – a crop grown frequently on paddy bunds and in close proximity to chickpea. Marigolds are also grown frequently in rural gardens as an ornamental and are culturally important. The flowers are particularly susceptible to BGM and the occurrence of the hyphae spores on these flowers would normally be visible before or at the same time as chickpea and certainly be more visible. The use of marigolds as an early warning mechanism for BGM on chickpea has also been highlighted by ICRISAT (S. Pande, pers. comm.) and could thus indicate to framers when to spray Bavistin as promoted under ICM of chickpea in Nepal.

There were some reports that BGM-tolerant varieties were available in India & some hope for a natural control measure for this persistent disease. However, resistance in crops like chickpea is invariably dependent upon the production of small anti-fungal molecules called phytoalexins at the point of infection but only when fungal hyphae are invading roots (Stevenson et al., 1997) or leaves (Stevenson and Haware, 1998). The reason it is so difficult developing resistance to BGM is because the disease attacks the flowers which are not able to produce phytoalexins so chickpea plants are susceptible to disease even when the leaves and roots are apparently resistant.

It is also worth noting that farmers who had previously used their land for the production of vegetables especially tomatoes – a crop that requires inputs such as pesticides were able to adopt the ICM of chickpea very successfully and have been more likely to continue to do so after the lifetime of the project. This has been particularly so in Sarlahi district where fields of rotting tomato have been replaced by fields of chickpea that require far less investment in crop protection inputs. It is likely that previous experience of the value that management of pests and diseases has to yield and crop security is an indicator of likelihood of more successful adoption. Some participants have pointed out that the technology may be too complicated for some farmers. This may well be true where farmers do not have experience of the investment of technologies and effort into Rabi crops particularly legumes and are more likely to broadcast onto rice fallows and see what comes up. These farmers may be less likely or able to adopt a strategy such as that promoted under this project.

### **Seed production, Information flow and dissemination**

The need to address information flows was highlighted and although was addressed to some extent in the present project, CBO/NGO partnerships and the ultimate integration of DoA extension is absolutely paramount to any successful up-scaling along with improved roles for commercial organisations. Seed sellers, for example, are considered an important route for up-scaling and sustainability. This project itself has highlighted their role in the exit strategy. However, most commercial interest in seed production is associated with crops in which hybrid seed is required. Since chickpea is a self-fertilising crop, once farmers have a particular variety they can maintain their own seed stock thus negating the long term potential role of SME's. So, in theory, unless the provision of seed is associated with the provision of quality technologies and perhaps even ICM guidance the role of the commercial sector may be limited. The reality is somewhat different however. Although many farmers do reserve seed for subsequent seasons many do not and see most advantage in selling as much as possible as early as possible to secure the cash for a crop as valuable as chickpea. Thus the role of seed sellers is still important especially with a crop that requires an involved technology – the seed seller can provide the seed along with the correct technologies as well as the technology back stopping.

Alternatively self help groups or Community Based Organisations are increasingly taking on responsibility for seed production and one farmer reported a group in which investments reap financial rewards from investments that are rather like

Agriculture has not yet found its due place and space in the media, despite it being a predominant feature of Nepali life. Research needs to develop a media-friendly information system and a farmer-friendly dissemination system. There need to be separate, but integrated information flows for national (policy) and local (farmer) levels of dissemination

### **Crop diversity.**

Crop diversification, especially as part of an improvement program for legumes in rainfed Rabi cropping is considered by most development policy makers and scientists to be a key element of any national development strategy, in this case for Nepal. The Agricultural Perspective Plan Support Program (APPSP) of the Ministry of Agriculture and Cooperatives in Nepal recognises the importance of diversity particularly for legumes but also for other vegetables and this led to the successful ADB supported Crop Diversification Project in Mid and Far-West Nepal. The current phase of the present project recognises the limitations of promoting a single crop and this was indicated in the Project Memorandum. However, the ICM package is an involved technology so embedding it in the national agricultural strategy may only be possible with highly focussed efforts, i.e., by promoting it as a single crop development strategy. Otherwise, particular technologies that are crucial only for one crop in a crop diversification strategy, (e.g., pod borer control in chickpea) could become low priority as it has little relevance in the other crop alternatives such as lentil or grass pea. This in turn could lead to heightened effort for chickpea production as part of a chickpea production strategy but without emphasis on crucial but particular aspects to chickpea production leaving farmers with poor returns from chickpea. Ultimately this would lead to the same problem that farmers are facing now – low confidence in their ability to achieve good and profitable yields. High yields from chickpea are almost impossible to achieve without specific management of pod borer and other constraints. When they are managed however, few crops can yield as well as and earn as much as chickpea.

Single commodity approaches were cited as inappropriate also because it is considered important to present a set of options within a systems context. It was frequently suggested that farmers should be able to choose their route out of poverty from a range of options that they believe are more suitable to them. This is particularly so given that some farmers will want to grow different crops for personal or traditional reasons or perhaps because in some regions chickpea is less appropriate owing to climate. However, many farmers at our workshops confessed to not knowing what and to do and sought continual direction from technology exerts in their strategy to grow chickpea. Moreover, it should be remembered that this project is promoting a strategy to increase (and more than double) chickpea yields among traditional chickpea growers who used to grow the crop happily but the success of which requires the application of fairly involved technologies that we have promoted for chickpea ICM. Because they are involved or complex a concerted effort to embed this practice alone is needed to ensure farmers have a clear, tried and tested experience of all the inputs and subsequent benefits. Once this has been achieved then its role in a crop diversification approach can be considered. It is, of course, important to be able to understand why some farmers don't continue to adopt given strategies after the experience of demonstrations and farmer field schools particularly after the lifetime of a project. It is possible that the absence of the technological back-stopping and continued direction mentioned above is a problem. In which case, one particularly effective mechanism for transferring information and maintaining a good knowledge base among farmers rather than relying on that supplied by technical field visits by extension workers is through farmer cross visits or through travelling seminars involving farmers. These are also very effective in motivating farmers to consider new technology. Even the farmers at this meeting who are group leaders and largely successful at implementing involved strategies have suggested that this is an important component of sustainability.

### **India, Bangladesh & beyond.**

One emphasis of this phase of the project with respect to up-scaling is across borders and the need to help neighbouring countries achieve their own development goals through the uptake of technologies developed in this project. This is particularly so for Bangladesh where legumes are being relegated to marginal lands where they achieve poor returns and, as witnessed in Nepal, productivity is declining as a consequence. Alarmingly, Bangladesh will need 748,000 tonnes of legumes by 2010, and they are far short of that at present. There are 1000s Ha of suitable land in the Barind Tract for expansion of chickpea as well as other legumes but as with Nepal there are constraints – but, it should be noted that these are not always the same. While *Helicoverpa* pod borer is a severe constraint in both Nepal and Bangladesh, collar rot is reportedly a more serious problem than BGM or wilt. *Helicoverpa* and BGM are both the major biological constraints to chickpea production in India where yields are similar to those achieved in Nepal. Thus transferring technologies from apparently the same agricultural system in one country to another is not necessarily straight forward and detailed studies need to be undertaken before up-scaling elsewhere.

Other valuable lessons from Bangladesh are that greater impact is achieved if extension messages reach all clients at the same time, rather than sequentially.

One of the most important factors in the success of the ICM of chickpea in Nepal project was the willingness of local farm group leaders to take a lead role in adoption. This role needs to be rewarded with incentives and perhaps even direct pay but is worth it since local individuals especially educated farmers or local leaders who are known and respected by farmers likely carry more influence than government representatives. This is also important in ensuring continued adoption after a project has run its course. Also, as we found in Nepal, farmers are encouraged by awards that recognise high achievement – an approach that might successfully applied in other neighbouring countries. Successful up-scaling needs local champions, and needs to engage and win over critics. Awards should be encouraged as an additional strategy to build up incentives. It not only adds a competitive element but is also an indication that the agricultural administration is taking notice of the changes that it is encouraging.

### **Lessons from other projects**

Experiences from the Plant Sciences Research Programme of DFID's Project on rainfed Rabi cropping in rice fallows of Nepal established that farmers were largely unaware of the ways in which rice fallows could be exploited but that when these were identified to farmers they were keen to plant legumes. Time of sowing is critical to success to make the best use of receding moisture and this varies across the Terai with moisture staying longer in the East and soils drying earlier in the west. Chickpea is notable among legumes for its very deep root and adaptation to arid climate but is still highly dependent upon water at germination. This can be largely circumvented by ensuring that farmers employ seed priming as part of their seed treatment strategy if sowing in drier soils although should be avoided if soils are already moist. This can be indicated crudely by the presence of wet film around a footprint where water is squeezed out of the soil. Our strategy does suggest farmers use seed priming to enhance germination but this is far from the solution on its own.

The PSRP project also determined that sowing behind the plough is the best planting method and combining with neighbours to grow larger blocks reduces theft, edge effects and cattle grazing and helps facilitate and economise effective spraying against pests and diseases. This requires good community cohesion. An additional constraint was identified in the apparent molybdenum deficiency but this can be overcome by adding Molybdenum to seed priming water. The rainfed rabi cropping project also determined that participatory varietal selections led to promising varieties in a similar manner to the selection of Avarodhi by farmers on the ICM of chickpea in Nepal CPP project. PVS using mother-baby-daughter trials has also been successful in selection of wheat. Only 1 "Mother" is required at each site but replicated through multi-site trials controlled by researchers. Data can be analysed so that each location is a replicate, but monitoring by farmers. When farmers have selected favourite variety, then daughter material of preferred material is further tested by farmers. In rice/wheat production systems some farmer groups were reportedly producing >100 tonnes of rice seed, and were amalgamating into cooperatives suggesting that up-scaling of seed production technologies was possible.

### **Mechanisms for scaling up.**

The supply of mini-kits was sited as a tried and tested way to encourage seed production and is the principal extension tool for the Department of Agriculture. However, when mini-kits are used by farmers for food production and not seed production this could result in a shortfall of certified seed if a variety being distributed is in short supply. This would certainly be the case with Avarodhi, the variety preferred by farmers during the ICM of chickpea in Nepal project. However, the idea of using mini-kits provides an opportunity for farmers to experience the potential benefits of improved yields on a small scale and this should be the basis for self-financed uptake and their provision should be accompanied by the *caveat* that farmers must retain some of this 'gift' if they wish to continue production. This has worked very well with farmers in the Lalbandi where enough seed was provided for about 13Ha in 2001 and in 2003 farmers had sown 120 Ha. New initiatives under the Agricultural Perspective Plan Support Programme through District Agricultural Development funds such as the District Extension Fund and the Local Initiative Fund provide opportunities for Community Based Organisations and NGOs to self fund up-scaling. Other avenues for seed production need to be identified though to ensure enough certified seed is produced such as through innovative farmers. Buy back schemes are another way in which the volume of seed available to extension services can be secured and this itself provides farmers by example with experience of seed production – perhaps the most important consideration in an up scaling strategy. Currently NARC produces 2814 kg of chickpea foundation seed and this is sufficient to cover existing area but not more. In recognition of this problem, NARC

Outreach Programme has added the “frontline” demonstration method for pre-released varieties. In this process researchers and extension staff interact directly with farmers in PVS/Farmer Field School (FFS). However, FFS have not been sustained beyond the project life and farmers have a tendency to lose interest once the benefit stream from the projects dries up. The principal challenges of chickpea are the unavailability of the quality seed and the risks associated with unregulated farmer-produced seed. Furthermore, chickpea is perceived as high risk owing to recent nationwide crop failures (1997/98) so considerable efforts need to be made to redress this perception. ICM of chickpea requires knowledge which is thought beyond the interest of many farmers especially when alternatives such as wheat or lentil are available – and this is despite the fact that chickpea for yield and price per kilo is far superior to the alternative Rabi crops.

#### **Direct feedback from farmers**

One farmer from Lalbandi – Krishna Kumari Shrestha reported that she had 200kg of seed for distributing among farmers and that she was also helping other farmers with information regarding the technologies. She also confirmed that Avarodhi had been self selected by them in Participatory Varietal Selections. She also contradicted the perceptions many scientists were reporting about farmers about the high cost of investment for chickpeas. She reported that among the crops she grew which include vegetables, chickpea required the least investment. She also announced that chickpea was in fact the most successful crop in Lalbandi, Sarlahi district, that she had full faith in chickpea and that the whole village had benefited from the increased wealth it had generated.

## Appendix 6.

### Nepal chickpea policy paper

**[Character:** attractive paper with photos that politician and senior administrators as well as development scientists would keep on their desks]

**Summary:** 2 pages max.

(Social and economic benefits of the technology; vision; main action points)

**Illustration of potential:** A case study/success story that incorporates the main elements of the technology and their benefits

**Purpose of the paper:** From the project PM “a policy document that identifies obstacles to rehabilitation and expansion of ICM of hyv of chickpea, and ways of overcoming them”

**Audience:** Those in positions to make decisions about the action points below. Be specific: Perm Sec of x Ministry, Livelihoods adviser of y donor, head of z private seed company...

**Background:** 2 pages on the technology and its social and economic benefits (e.g. from the projects' Livelihoods publication). Status of adoption in Nepal. Workshop/research process that underpin the recommendations below. These will give import and credibility to the recommendations below.

**Vision:** What you feel could be achieved by 5 years time if the recommendations are implemented.

**The positives:** what is in place (technical, institutional, financial, human resources, awareness, support...)

**The obstacles:** what are the problems, and what is needed to overcome them:

- Policy environment
  - What Action; by whom
- Institutional environment
  - What Action; by whom
- Technical constraints
  - What Action; by whom
- Support requirements
  - What Action; by whom

**Overall Programme:** leadership of the chickpea initiative, and support coalition. Accountability to government, donors and farmers. Resource implications

**National Development implications:** Potential impact on poverty and food security. Return to financial investment (i.e. what does the government get out of investing its money in chickpea)

**Short technical Annex,** and references to papers/contacts.

## Commercialisation of agriculture stressed

By A Staff Reporter

KATHMANDU, Nov. 17: Long-term agricultural plan has given high priority to the commercialisation and industrialisation of agriculture for reducing poverty in the nation, said Minister for Agriculture and Co-Operatives Hom Nath Dahal Wednesday.

Dahal said that the government has initiated programmes to involve stakeholders and farmers in agricultural development areas.

He was speaking at an inaugural session of a two-day workshop on 'Policy and strategy for increasing income and food security for poor farmers in Nepal and South Asia through improved crop management for high yielding chickpea in rice fallows'.

"In this regard, the government has been developing a mechanism to bring the modern technologies within the reach of the farmers so that they could compete in

the open market with their qualitative, competitive and profitable produces," he said.

Assistant Minister for Agriculture and Co-operatives Umakanta Chaudhari said that a special provision should be made to transfer new technologies for the development of the agricultural sector.

D.S. Pathik of National Agricultural Research Council (NARC) said low cost technology should be introduced to the farmers to increase output of chickpeas.

Dr. Hari Krishna Upadhyaya, National Planning Commission member said Poverty Reduction Strategy Paper (PRSP) and the Tenth Plan have also given priority to the development of agricultural sector.

Dr. Upadhyaya said that the agricultural policy should address the constraints of the farmers. "Poverty reduction goal could be achieved by

*See AGRO, Page 7*

# 'Enhance productivity to promote agriculture'

**POST REPORT**  
KATHMANDU, Nov 17

Policy makers and exporters today said that productivity rate of agriculture should be enhanced if Nepal wants to meet its goal of poverty reduction.

"Unless agriculture is promoted, it is a distant dream to uplift the people from the line of poverty. So, it is the need of the hour to promote agriculture by managing it on a commercial scale," they said.

Minister for Agriculture and Cooperatives Hom Nath Dahal said that farmers should enhance competitiveness of their products to place them in the international market.

He was speaking at a workshop on 'Policy and strategy for increasing income and food security for farmers in Nepal and South Asia through improved crop management of high yielding chickpea in rice fallows'.

Nepal Agriculture Research Council (NARC)-ICRISAT and National Research Institute (NRI) have jointly organized the workshop.

Reacting to reckless usage of pesticide, Minister Dahal said that farmers should be made aware of harmful effects of pesticides. "At a time when demand for organic agro-goods is considerably increasing in the international market, Nepali farmers also have to try to produce such goods," he said.

Assistant Minister for Agriculture and Cooperatives Uma Kanta Chaudhary emphasized that new technology should be adopted to increase productivity.

Dr Hari Krishna Upadhyaya, a member of the National Planning Commission (NPC) said that farmers must switch to new crops that yield comparatively higher returns so as to get appropriate returns from agriculture.

D.S. Pathik, executive director of the NARC said that cash crops like chickpea could play a crucial role to improve food security for the poor farmers.

He also informed the gathering that the chickpea has remained the fifth largest crop in the country in terms of production.



## High-yielding chickpeas to increase farmers' income

By A Staff Reporter

KATHMANU, Nov. 16: The Nepal Agricultural Research Council (NARC) and the Department of Agriculture are hosting a workshop on "Increasing income and food security for poor farmers in Nepal through improved crop management of high-yielding chickpea" in Kathmandu.

The two-day workshop beginning Wednesday aims at developing a policy to promote countrywide adoption of a new crop production strategy for chickpeas.

The strategy has been successfully validated by NARC in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) India and the Natural Resources Institute of the University of Greenwich in the United Kingdom, organisers said.

The new approach to chickpea production has more than doubled the yield of those farmers involved compared to harvests they achieved using traditional practice.

It also improves reliability of this important and versatile rabi crop, which has been known to completely fail. So it will also improve food security for poor

farmers, Dr. Philip C. Stevenson of Greenwich University and consultant of the project said.

The much higher chickpea yield has increased the incomes of participating farmers and in turn increased their employment needs. Thus this strategy addresses the key facets of the government's Poverty Reduction Strategy Paper of the 10th Plan.

According to experts and farmers, the principal problems in chickpea production in Nepal are the botrytis grey mould disease, which kills flowers, preventing seed formation; fusarium disease, which makes the plants wilt, and the pod-borer – an insect which feeds on the developing seeds.

The new chickpea production strategy involves an integration of many components including improved varieties that are higher yielding, resistance to diseases and requirement of a very low application of insecticide, applied only when the insects are there, Dr Stevenson said.

Other components include better management of plant spacing, fertilizer and water supply which if too much causes a dense crop which, in turn, encourages disease.

Other simple techniques include soaking seeds overnight before planting to increase germination and plant vigour, he said.

The approach has already been successfully promoted by more than 3,500 farmers across 14 districts of the Terai. Particularly suited to dry winters, chickpea has deep roots and can flourish even on residual moisture in paddy fields after rice has been harvested.

With 400,000 hectares of paddy fields left fallow in winter in Nepal, the opportunities for increasing production are immense.

The outcome on farmers' livelihoods has also been impressive because with chickpea yields doubling, the unit production cost has been halved. Using traditional practice, it costs Rs.15 to produce a kilo of chickpea. The new technology will bring down the cost to about Rs. 8 a kilo.

Livelihood studies of the project farmers showed that this increased wealth was invested in all aspects of domestic life, notably in healthcare, education and housing with some project farmers moving from kachha to pukka houses while many reported paying off their debts.

... success could

Only tolerance

