CROP PROTECTION PROGRAMME

Extension and promotion of ecologically-based rodent management for diversified rice systems in Bangladesh

R8424 (ZA0651)

FINAL TECHNICAL REPORT

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Executive Summary

Rodent pests have been identified as a serious constraint not only with regard to agricultural production of many crops, but also to the health of people and livestock through the spread of many communicable diseases. Rodents are a problem for both rich and poor, individuals and communities, with disproportionately larger impacts on the rural and urban poor who are the least likely to possess the tools and knowledge to control rodents effectively.

This research project was based on addressing some of the constraints identified through previously funded DFID research (Crop Protection Programme: R8184 / ZA0503) which showed that rodents could be successfully and sustainably managed by rural communities in a cost-beneficial manner. Good rodent management does not need to be expensive, but it is knowledge intensive. Hence, major constraints related to widely reducing the impact of rodents on people's livelihoods include the methods whereby knowledge is disseminated and people's access to appropriate knowledge resources.

This project had one main objective: To promote strategies for research and dissemination that are required to minimise the impact of rodent pests in rice-based land-water interface cropping systems for the benefit of poor people. This project researched and developed training methods and produced materials that could be used within training programmes, with outputs of the project relating to four successfully completed activities:

- Training of NGO and DAE staff on rodent biology and management
- Training of farmers on rodent biology and management
- Production of rodent biology and training manuals
- Production of a rodent management video

Project activities were based in the district of Comilla, southeast of Dhaka. The summarised results related to satisfying these activities are presented in this report. Copies of training materials produced are available by contacting the project leader, Dr Steven Belmain (s.r.belmain@gre.ac.uk). Feedback from stakeholders who received training indicated that the training methods adopted are appropriate and could be easily scaled up with appropriate provision of resources. Knowledge was being adopted by end users, resulting in changes in human behaviour particularly with regard to improving standards of hygiene, proofing and environmental management. However, the short time frame of the project precluded monitoring longer term changes to rodent population dynamics, people's proximity to rodents and the impact of rodent management practice on people's livelihoods. Therefore, the degree to which villages that have received training are able to replicate the affects of rodent management strategies previously demonstrated would require longer term monitoring. Staff from NGOs, the DAE and farmers who were trained were able to say that their confidence was much increased, and they felt more able to manage rodent pests effectively.

Important issues and constraints remain regarding rodent pest management in Bangladesh. Regional or national rodent management training programmes can be developed, and the process for scaling up the outputs of this project are discussed.

Background

Rodent pests affect people's lives by destroying crops, transmitting diseases to people and livestock, contaminating food and water, and damaging buildings and other possessions. They are one of the major pest constraints to increased agricultural production in Bangladesh. Rice continues to be the most important crop in Bangladesh and yield gains have been shown to be the major driving force behind increasing crop diversification into higher value crops and increasing non-farm rural incomes. Although effective rodent management tools and techniques exist, their poor application and adaptation to particular agro-ecological situations often results in treatment failures, leading to apathy and widespread acceptance of rodent pests in the environment. Using rodent management tools and techniques requires a good understanding of rodent biology and their localised impacts upon people's livelihoods. This knowledge facilitates the development of cost-beneficial strategies where the input costs can be shown to lead to substantially increased food security, financial and health benefits. Rodent pests disproportionately affect the poorest people who are less likely to possess appropriate knowledge and access to proven technology.

Current rodent control practices are often based on the use of rodenticides. Misuse of these poisons is unfortunately common in many countries, which poses a threat to human and livestock health and can lead to environmental contamination and degradation. More importantly, misused rodenticides may not significantly reduce the rodent population, therefore having little impact on reducing the damage caused by rodents. When correctly used, rodenticides can be a highly effective tool. However, the cost-effectiveness and sustainability of rodenticide use in small-scale farming and rural villages are questionable. Other rodent management methods involving trapping and environmental management have been recently reappraised for use in developing countries with research focussed on improving baseline ecological knowledge about rodents and more adequately understanding the impacts of rodents on people's lives.

Funding for applied rodent research and management in developing countries has been particularly recognised by ACIAR, the EC INCO programmes and different programmes of DFID (PETRRA, CPHP, CPP). Research co-funded by the CPP and the PETRRA programme in Bangladesh since 2002 had four main objectives: 1) Understand the impact of rodents upon diversified rice-based systems of rural communities; 2) Understand the impact of existing control strategies used by small-scale farmers upon rodent population dynamics, the environment and socio-economic capital; 3) Develop new rodent control strategies through farmer participatory research; 4) Develop and disseminate policy recommendations to stakeholders involved in rodent pest control. The first phase of this project was to collect information on rodent ecology (species, habitats, breeding potential, damage caused) and on the knowledge, attitudes and practices of people in rural Bangladesh with regard to rodents. These data and information were used in the second phase to design and evaluate intervention strategies which were trialled in villages based in the Comilla region. Effective rodent management is knowledge intensive, and project activities have focussed on training individuals and communities about rodent biology, increasing awareness and demonstrating effective tools and techniques. The key findings from the first phase of this project showed that farmers recognised rodents to be a problem and do try to control them, mainly through the use of poisons. Ecological surveys showed that seven species of rodents and one shrew were prevalent, the main rodents in village habitats are mice (*Mus* spp.) and shrews (*Suncus murinus*) and the main rodent species in field crops are *B. benegalensis* and *Rattus rattus*. *B. benegalensis* moves into village habitats after each rice harvest. Village populations of rodents may be a major source for reinfestation of fields after planting. Rodent damage in field crops was shown to be patchy and often found along the edges of the field, near rodent burrows and associated with upland habitats nearby. The second phase of this research involved action research trials at the community level to evaluate the following actions:

- Intensive village trapping where the numbers of rodents caught are collated by female group leaders responsible for different sections of the villages.
- A loan system for live capture traps where farmers can borrow traps to be placed in their fields.
- Linear trap barrier systems (LTBS) which act by intercepting rodents migrating from different habitats such as villages or roads into the rice fields.
- Community trap barrier systems (CTBS) with trap crops which act by attracting rodents from a large area into an early ripening crop, thereby reducing the rodent population over entire fields.

- Demonstration of environmental management methods through redesigning food stores to reduce rodent access to food, modifying haystacks to minimise rodents using them for harbourage in the village, protecting coconut and other tree crops, improving general village hygiene and removing rodent harbourage.
- Monitoring activities to demonstrate the impact of above methods using farmer diaries and measuring changes in rodent ecology and damage levels.

The results of this research showed that rodent pests could be significantly reduced, particularly when communities worked together through intensive trapping. Farmer diaries showed that intensive trapping was cost-beneficial, saving time and money. Farmers and community members readily recognised the benefits that accrued to their families and communities once the rodent problem had been controlled, observing first-hand improvements to their livelihoods. Monitoring trials showed that the impact of rodents on people's lives was very significantly reduced (reduced contamination and loss of stored food, reduced damage to buildings, improved crop yields, reduced damage to clothes, blankets, fishing nets, baskets and other personal possessions. Although not directly measured through serological tests (we measured indirectly through environmental contamination levels), it is likely that the rodent management activities significantly reduced the risk of disease transmission by reducing the proximity of rodents to people and food/water resources.

Project Purpose

The purpose of the project was to promote strategies for research and dissemination that are required to minimise the impact of rodent pests in rice-based land-water interface cropping systems for the benefit of poor people.

Previous research and discussion with stakeholders indicated that training and training materials related to rodent research and rodent pest management were not available in Bangladesh. The DAE specifically requested for materials that they could use to help disseminate the findings of previous DFID-funded research carried out in Bangladesh (R8184 / ZA0503). Appropriate training programmes and information that were relevant and accessible to rural communities called for their development from scratch as no rodent pest management knowledge is routinely disseminated to small-scale farmers through government agencies, NGOs or the commercial sector.

Research Activities & Outputs

The project had one main objective or output:: Increase the uptake and adoption of cost-beneficial rodent management tools appropriate for small-scale farming communities in rural Bangladesh.

There were four activities related to this output:

- Training of NGO and DAE staff on rodent biology and management
- Training of farmers on rodent biology and management
- Production of rodent biology and training manuals
- Production of a rodent management video

The actions and results for each activity are detailed below.

Training of NGO and DAE staff on rodent biology and management

In order to ensure strong institutional ownership and awareness, senior staff from the DAE and NGOs were given a one-day orientation programme. This helps facilitate the training of junior staff from their organisations who are to be directly involved in training farmers so that senior staff know what their staff will be doing and understand the concepts of the training methods involved. Table 1 indicates the overall programme of the orientation programme, while Table 2 shows who attended the meeting.

Table 1 Orientation on Rodent Management Project, July 11, 2005. Venue: AID-COMILLA Training Centre, Raghupur, Comilla

Inaugural Session

Time	Activities	Presenter
10:00-10:10 am	Welcome address	Rokeya Begum Shafali
10:10-10:25 am	Objective of orientation	A.K. Azad
10:25-10:50 am	Over view of Rodent Management Project	Dr. N.Q. Kamal
10:50-11:00 am	Message from Special Guest	DG, BRRI. Additional Director, DAE, Comilla
11:00-11:10 am	Message from Chief Guest	DG,DAE
11:00-11:20 am	Message from Chairperson and closing	Director, Plant protection wing, DAE
11:20-12:00 am	Tea Break	

Technical Session 1: Chairperson: Director, Plant Protection Wing, DAE

12:00-12:45pm	Current Knowledge, Attitude and Practice of farmers	Adrian Meyer, NRI, UK Azizul Hoque, Anthropologist, Rodent Project

Technical Session 2: Chairperson: Dr. Pronob Kumar Shaha Roy, CSO, BRRI, Comilla

12:45-1:30pm	Presentation of rodent pest and ecology identified under the project	Dr. N.Q. Kamal, Director (Administration and Common Service, BRRI Md. Harun, Team Leader, Rodent Project

Lunch ----1:30-3:00pm

Technical Session 3: Chairperson: Director, Comilla Region, DAE

3:00-3:45pm	Damage/loss assessment (Field crop, store grain and house structure)	Dr. N.Q. Kamal, Director (Administration and Common Service, BRRI Nazmul Islam Kadri, Social Scientist, Rodent Project

Technical Session 4: Chairperson: Deputy Director, DAE, Comilla

3:45-4:30pm	Research related testing management	Adrian Meyer, NRI, UK Md. Harun, Shaidul, Shafiqul, Nazmul Rodent Team

Table 2 Orientation on Rodent Management Techniques. Participant list of senior officers of DAE and NGOs

#	Participant name	Designation	Organisation
1	AKM. Anwarul Islam	Additional Director	DAE, Comilla Region
2	Dewan Md. Intajul Islam	Deputy Director	DAE, Comilla
3	Mr. Abdul Hannan	Deputy Director	Plant protection Wing, DAE
4	Dr. Pronob Kumar Shaha Ray	CSO & Head	BRRI, Comilla Station
5	Md. Khorshad Alam Bhuiyan	District Training Officer	DAE, Comilla
6	Mr. Abdul Khaleque,	Crop Protection Specialist	DAE, Comilla
7	Md. Neser Uddin Rikabdar	Plant Protection Specialist	DAE, Comilla
8	Mr. A.T.M. Hafizul Islam	Horticulturist	DAE, Comilla
9	Md. Abdul Makek	UAO	DAE, Muradnagar, Comilla
10	Md. Monirul Islam	UAO	DAE, Laksham, Comilla
11	Golum Mohammad	UAO	DAE, Sadar, Comilla
12	Md. Abul Kalam Azad	UAAO	DAE, Muradnagar, Comilla
13	Md. Motahar Hossain	UAAO	DAE, Laksham, Comilla
14	Md. Robioul Haque Mazumder	UAAO	DAE, Sadar, Comilla
15	Mr. Eahatasham Rasula Haider	AEO	DAE, Sadar, Comilla
16	Md. Shamsuddin	AEO	DAE, Laksham, Comilla
17	Md. Shamsul Haque	AEO	DAE, Muradnagar, Comilla
18	Mr. Abdul Malek	Executive Director	Polli Unnayan Parishad
19	Mrs. Mahamuda Akter	Executive Director	PROTY
20	Mr. Abu Taher Roni	Chief Coordinator	Holodia
21	Md Sariful	Coordinator	Dustha-ma-o-Shishu Kollan Foundation
22	Dr. Nazira Q. Kamal	Director	BRRI, Gazipur
23	Md. Mofazzal	Scientific Officer	BRRI, Gazipur
24	Rokeya Begum Shefali	Executive Director	AID-Comilla
25	Abul Kalam Azad	Consultant	AID- Comilla
26	Najmul Islam Kadry	Social Scientist	AID- Comilla
27	Kamrul Hassan	Field trainer	AID- Comilla
28	Abu Baker	Field Trainer	AID- Comilla
29	Adrian Mayer	Rodent Expert	NRI, UK
30	Mohammad Harun	Research Officer	AID- Comilla
31	Md. Hassanul Haque	PD, Spps	DAE, Khamarbary
32	Azizul Hoque	Anthropologist	AID-COMILLA

Following on from the orientation programme for senior staff, a three day training programme was delivered to staff who would be directly involved in training farmers. This training of trainers was accomplished through a mixture of formal lectures and field visits to villages where previous project research had occurred. Table 3 outlines the training programme, and Table 4 the participants who attended.

Table 3 Curriculum on rodent management techniques for a three-day programme delivered to DAE and NRO staff. Venue: AID-COMILLA Training Centre, Raghupur, Comilla, 13-15/07/05

Day 1

Time	Topic	Materials	Facilitator/presenter
9:00AM-9:30AM	Registrations	Khata, Pen	
9:30AM-10:30AM	Introduction	Board, Marker, Paper	Harun & Nazmul
10:30AM-10:45AM	Tea Break		
10:45PM-1:00PM	General discussion on the Rodents identifying characteristics	Board, Marker, Paper, Rat specimen	Harun
	Rodent behaviour (by species)	Board, Marker, Paper, Rat specimen	Nazmul
1:00PM-2:30PM	Lunch & prayer		
2:30 PM-5:00 PM	Why control rodents / management	Board, Marker, Paper, Poster, Photos of problems	Mofajjal, Harun & Najmul

Day 2

9:00AM-9:30AM	Recapitulation		
9:30AM-12:00AM	Discussion on rodent reproductive biology	Board, Marker, Paper	Harun
	Dissection (practical session.)	Board Marker, Paper, Photos of embryo, pups, pregnant rat	Nazmul
12:00PM-2:30PM	Lunch & prayer		
2:30PM-5:00PM	Discussion about management techniques		Harun, Mofajjol & Nazmul

Day 3

9:00AM-9:30AM	Recapitulation		
9:30AM-10:00AM	Short briefing about Rodent Management Project	Board, Paper, Marker	
10:00AM-12:00PM	Field visit	Board, Marker, Paper	
12:00PM-2:45PM	Lunch & prayer		
2:45PM-3:30PM	Farmer's knowledge, attitude and practices about rodent management: an anthropological over view.	power point presentation	Azizul Hoque
3:30AM-4:30PM	Open discussion and Closing		Harun

Table 4 Training of trainers on Rodent Management Techniques. Participant list of Sub-Assistant Agricultural Officers, DAE Comilla & NGO staff

#	Participant name	Designation	Organisation
1.	Sakandar Ali	SAAO	DAE, Adarsha Sadar, Comilla
2	Md. Musfiqur Rahaman	SAAO	DAE, Adarsha Sadar, Comilla
3	Md. Mohosin	SAAO	DAE, Adarsha Sadar, Comilla
4	Md. Shamsul Alam	SAAO	DAE, Adarsha Sadar, Comilla
5	Md. Humayon Kabir	SAAO	DAE, Adarsha Sadar, Comilla
6	Md. Abdul Awaul Bhuiyan	SAAO	DAE, Adarsha Sadar, Comilla
7	Md. Hafizur Rahaman	SAAO	DAE, Laksham, Comilla
8	Abdul Wahid	SAAO	DAE, Laksham, Comilla
9	Dulal Chandra Debnath	SAAO	DAE, Laksham, Comilla
10	Md. Abdur Rahim	SAAO	DAE, Laksham, Comilla
11	Md. Lal Mia	SAAO	DAE, Muradnagor, Comilla
12	Mrs. Roksona	Field Worker	AID-Comilla
13	Mr. Beauty	Field Worker	AID-Comilla
14	Mrs. Emrul Sultana	Field Worker	AID-Comilla
15	Mr. Seuli Akter	Field Worker	AID-Comilla
16	Shema Rani	Field Worker	AID-Comilla
17	Jannatul Ferdause	Field Worker	AID-Comilla
18	Ferdause Momotaj	Field Worker	AID-Comilla
19	Mr. Golapi Akter	Field Worker	AID-Comilla
20	MD. jahangir Hossain	Field Worker	AID-Comilla
21	Protiva Rani Singha	Field Worker	PUP, Laksham,Comilla
22	Md. Anwar Hossain	Supervisor	PUP, Laksham,Comilla
23	Sujata Rani Singha	Field Worker	PUP, Laksham,Comilla
24	Abul Hossain	Program Officer	Holodia**,** Laksham,Comilla
25	Mrs. Najma Akter	Field Worker	Holodia**,** Laksham,Comilla
26	Mr.Rekha Akter	Field Worker	Holodia**,** Laksham,Comilla
27	Mrs. Laky Akter	Field Worker	PROTY, Sadar Comilla
28	Mrs. Rokeya Begum	Field Worker	PROTY, Sadar Comilla
29	Md. Bellal Hossain	Supervisor	PROTY, Sadar Comilla
30	Md. Rafique Uddin	Supervisor	Dustha-ma-o-Shishu Kollan Foundation,Muratnagar,Comilla
31	Mrs. Najma Akter	Field Worker	Dustha-ma-o-Shishu Kollan Foundation,Muratnagar,Comilla
32	Monowara Begum	Field Worker	Dustha-ma-o-Shishu Kollan Foundation,Muratnagar,Comilla

Those listed in Table 4 went on to participate in the training of farmers as described below. After completing the training of trainers and their experiences of putting the knowledge into practice by training farmers, a series of follow-up surveys were carried out using a set list of questions (Appendix 1). In follow-up, 25 trainers were asked for their feedback on the training programme, and all those surveyed stated that the training was effective and would allow them to improve the way rodents are managed in rural villages by farmers and householders. Those surveyed indicated they acquired new knowledge on management techniques (such as trapping) and had communicated their new knowledge to colleagues and farming communities. It was suggested by some that additional field and practical demonstration work would help the learning process. Constraints foreseen in widely implementing training programmes were related to the provision of training materials and the availability of rodent management tools (such as good quality kill traps). It was not known whether the recommendations would be appropriate in all rural communities across the country and some of those surveyed suggested that appropriate actions may need to be adapted under various situations (e.g. where wheat is widely grown).

Training of farmers on rodent biology and management

Project staff and staff from the DAE and NGOs who received training jointly provided training to 500 farmers. AID-Comilla, four other NGOs[1] and DAE staff responsible for each area led the training sessions together, and each session was conducted with 25 trainees over a two-day training session (Tables 5, 6 and Appendix 3). The training sessions were held in villages near one of the five involved NGO offices. The training in each village was arranged at one house, where mats were spread in the courtyard. Trainees were put at ease through initial informal discussions so that they felt they could ask questions and their particular problems with rats could be addressed. Details of the training content can be found in Table 5, and Table 6 lists the main people involved in training. Tables 7 to 26 are to be found in Appendix 3 where the names of the farmers that were trained in each session are indicated.

These formal training sessions were followed by regular monitoring visits at 2-4 week intervals whereby staff visited the village to answer questions and check on progress of any management actions taken forward in the village. These follow-up visits are an important part of the training programme to ensure that knowledge given has been understood, giving an opportunity to ask questions after the knowledge has been thought over and put into practice. Occasional follow-up should take place over a relatively long period of time (6-12 months). At the end of the project, follow-up questionnaires were carried out with 31 farmers who had received training (Appendix 1). Additionally, 11 untrained farmers (who had not attended training but lived in the same village) were also surveyed to assess whether information was being passed around among villagers.

These surveys showed that farmers overwhelmingly improved their knowledge and awareness, particularly citing that they learned about how to successfully manage rats, the importance of improving hygiene, covering cooked food, how to use traps, diseases carried by rats and the importance of communities working together to control rats. A number of farmers indicated that a longer training session would be useful including more time for practical work and demonstration. Untrained community members had all heard about the key issues discussed during the training sessions. In the short time frame of the project, it was not possible to gauge the extent to which new knowledge was being independently put into practice. There were clear village efforts to improve hygiene, proof food stores and haystacks, but no evidence was obtained regarding village-wide efforts to trap rodents. Trapping programmes would admittedly take longer for communities to start, particularly limited by the availability of traps and encouraging households to buy and set traps regularly. Future project actions should be developed that can show how the provision of rodent training changes people's proximity to rodents over a realistic monitoring period of time as well as monitoring changes in rodent population dynamics that could demonstrate the impact of the training on people's behaviour and actions with regards to rodent management.

[1] The acronyms of the NGOs are PUP, HOLODIA, PROTTOY and the Dustho-ma-o-shisho-kollan foundation

Table 5 Field based farmers training curriculum

First day

Time	Activities	Materials
10:00-10:15am	Inauguration and introducing to each other	
10:15-10:45 am	Why will you control rat?	Marker, paper
10:45-12:15am	Discussion about kill & live traps	Marker, paper, kill & live traps, food
	Tea break	
12:30-1:20 pm	Modified haystack and storehouse	Marker, paper
1:20-1:30 pm	Neat and clean system for control rat	Marker, paper
1:30-2:30 pm	Lunch break	
	break	
4:30-6:00 pm	Field work	

Second day

Time	Activities	Materials
10:00-10.30 am	Review	
10:30-11:30 am	Discussion about characteristics of rodent	Marker, paper
11:30-11:.45 am	Tea break	
11:.45-12:45 pm	Discussion about rat reproduction	Marker, paper
12:45-1:30 pm	Discussion about rat disease	Marker, paper
1:30-2:30 pm	Lunch break	
2:30-3:00 pm	Discussion about rodent project	Marker, paper
3:00-4:00 pm	video exhibition	TV & video set
4:00-4:15 pm	Valuation	

Table 6 List of the trainers involved in the farmer training on rodent management techniques

#	Name	Designation	Organisation
1	Mohammad Harun	Research Officer	AID-Comilla
2	Najmul Islam Kadry	Social Scientist	AID-Comilla
3	Dr. Pranab Kumar Saha Ray	CSO & Head	BRRI, Regional Station, Comilla
4	Dewan Md. Intajul Islam	Deputy Director	DAE, Comilla
5	Md Yousuf Islam	Additional Director	DAE, Comilla Region
6	Dr. Jashim Uddin	SSO	BARI, Comilla Station
7	ATM Hafijul Islam	Horticulturist	DAE, Comilla
8	Golam Mohammad	UAO	DAE, Sadar, Comilla
9	Md. Manirul Islam	UAO	DAE, Laksam, Comilla
10	Abdul Malek	UAO	DAE, Muradnagor, Comilla
11	Md. Robioul Haque Majumder	AAO	DAE, Sadar, Comilla
12	Md. Abdur Rahim	SAAO	DAE ,Laksam, Comilla
13	Dulal Chandra Das	SAAO	DAE ,Laksam, Comilla
14	Md .Abdul Ohid	SAAO	DAE ,Laksam, Comilla
15	Md. Hafijur Rahman	SAAO	DAE ,Laksam, Comilla
16	Md. Samsul Alom	SAAO	DAE, Sader, Comilla
17	Md. Mahsin	SAAO	DAE, Sader, Comilla
18	Md. Lal Mia	SAAO	DAE, Muradnagor, Comilla
19	Abu Baker	Field Trainer	AID-Comilla
20	Md. Kamrul Hasan	Field Trainer	AID-Comilla
21	Azizul Hoque	Anthropologist	AID-COMMILA

Production of rodent biology and training manuals

Two training manuals were produced for different purposes and aimed at different end users. A 30 page manual on Rodent Biology and Control was written in the context of providing farmers with the basic knowledge they need to manage rodent problems at the farm and household levels within rural communities. The manual describes some of the important biology of rodents and outlines how to use the various management tools available within a Bangladesh context. English and Bengali language versions were separately made so that people with limited literacy skills could read and understand the content. Therefore, farmers with some limited reading skills should be able to use this manual independently. This manual was also designed to be used within training programmes operated by NGOs or the DAE as a resource during face-to-face delivery of knowledge to end users. 500 copies were produced of English and Bengali versions. Copies of this manual were distributed to the following organisations:

1) Department of Agriculture Extension (100 copies)
2) NGOs (200 copies)
3) Farmers that received training during the project (500)

A second larger manual of 250 pages was produced to provide greater technical detail for higher education levels, aimed at staff that would be delivering rodent management training programmes as well as higher education students and staff at various institutions working in agricultural research and knowledge dissemination (universities, academies, agencies). This technical back-stopping manual was largely based on an existing publication[2] but slightly modified and edited specifically for Bangladesh/South Asia and translated into Bengali. 500 copies were produced. Copies of this manual were distributed to the following organisations:

1) Department of Agriculture Extension, 100 copies.
2) NGOs, 100 copies
3) Agriculture Universities , 50 copies
4) Public Universities (Biology Departments), 20 copies
5) Public Libraries, 30 copies
6) Research Institutes, 30 copies

Both of these manuals have been positively received and reviewed by end users and go some way to satisfying previously identified constraints in knowledge provision and rodent training resources. Follow up surveys (Appendix 1) carried out with farmers and NGO, DAE staff who had received training within this project indicated that access to training materials and lack of knowledge are important limiting factors affecting people's capacity to undertake activities relevant to rodent management. We, therefore, expect these manuals to be widely used in any national extension programme related to rodent management and further research. Electronic versions of these training materials have been provided to BRRI for inclusion in the Bangladesh Rice Knowledge Bank: http://www.knowledgebank-brri.org/ These electronic versions could be updated in the future as new knowledge is generated on rodent ecology and management.

[2] Aplin, K.A., Brown, P.R., Jacob, J., Krebs, C.J. and G.R. Singleton (2003). Field methods for rodent studies in Asia and the Indo-Pacific. ACIAR Monograph 100; ACIAR, Canberra, AU. 223 pp. (available to download via http://www.aciar.gov.au)

Production of a rodent management video

More than 40 hours of video material were collected in rural villages, which were used to produce a training video on Managing Rats in Rural Villages of Bangladesh. The video was designed as three separate parts, each approximately 20 minutes in duration, to be used as a supplement to training programmes operated by the DAE and NGOs. Each part could, therefore, be shown at the appropriate time in the training schedule. Part one is about rodent biology and their impact on people's lives. Part two is how to manage rats in field crop situations, and part three is how to manage rats in rural villages (households, food stores). Two versions of the video were made: an English version with English narration and subtitles over Bengali sections, and a fully narrated Bengali version. 500 copies of each version were produced. A storyboard of the video can be found in Appendix 2. Test audiences with farmers and DAE/NGO staff were very positive, comprehension was high, and no major changes were required in the video format. On completion, the DAE requested 100 copies and ensured copies would be sent to all their mobile video units (64 in total). Additional copies of the video have been sent to the following organisations.

1) NGOs (60 copies Bangla and 60 copies English)
2) Bangladesh Pesticide Manufacturers Association (30 Bangla and 5 English)
3) Change Initiative (India based NGO) 8 copies in Bangla, 2 copies in English
4) Bangladesh Rice Research Institute, 10 copies in English and 10 copies in Bangla
5) IRRI office in Bangladesh, 10 copies in English
6) Bangladesh Agriculture Research Institute, 10 copies in Bangla and 10 copies in English
7) Bangladesh Television, 1 copy each
8) NTV (television channel), 1 copy each
9) ATN Bangla (television channel), 1 copy each
10) RTV (television channel), 1 copy each
11) BOISHAKI Television, 1 copy each

The following national television channels will broadcast the video on their networks as follows:

1) Bangladesh Television, 10 February 2006
2) ATN Bangla, March 2006 (date will fix soon)
3) RTV, March 2006 (date will fix soon)
4) BOISHAKI Television, March 2006 (date will fix soon)

Contribution of Outputs to developmental impact

As described under research activities and outputs, 44 staff from the DAE and four NGOs were given training on rodent management using the outputs of previously funded DFID research projects. These trained trainers worked alongside project partners to help train 500 farmers from 11 different villages. The training model adopted, whereby a minimum of 25 to 50 members of a community are trained, helps maintain motivation and knowledge momentum within a community. Evidence from this project suggests that all members of a community quickly learn about what was discussed in training sessions and are able to verbally refer to the key elements of rodent management several months later. Reliance on this form of dissemination also requires the provision of written and visual information to reinforce messages and to maintain knowledge standards within communities as well as with extension staff working with communities. With this in mind, the manuals and video material produced are expected to assist end users and backstop further training programmes operated by the NGOs.

Through evidence gathered during the project from different stakeholders, we believe this dissemination model is the most suitable and sustainable for providing rodent management knowledge. Successfully managing rodents is knowledge intensive, and the approach taken allows a relatively large number of farmers to be trained quickly. The training of trainers and several people from the same community increases the sustainability of the knowledge base. However, due to the short nature of the project, there was not enough time to sufficiently monitor the uptake of the knowledge provided by measuring changes in human behaviour, the proximity of rodents, their impact on people's lives, and to rodent population dynamics. The true measure of success of the training provided is when rodent pests become less of a problem in a community, and these changes may take time to be readily observed. Staff from NGOs, the DAE and farmers who were trained were able to say that their confidence was much increased, and they felt more able to manage rodent pests more effectively. During follow up visits, there were already observable changes in community hygiene, proofing and environmental management in evidence. A longer period of monitoring the impact of the training on how people deal with their rodent pest problems would be required to demonstrate further changes in the degree to which rodents negatively impact on people's livelihoods.

Senior management at the DAE has been fully aware of the project's actions and their staff have been involved in the receipt and delivery of training knowledge and materials. We believe that continued support of the DAE will assist in more widely disseminating the appropriate knowledge for rodent management. However, there are still important issues and constraints that need to be addressed to nationalise a rodent training programme and improve on-the-ground rodent pest management.

1) Rodent management will necessarily be based on local ecological conditions. Different cropping systems and pest species will influence the recommendations to be made for rodent management. Generalised training modules will, therefore, need to be supplemented with regionally specific information. As yet, appropriate ecological data has not been collected for all the agro-ecological regions of Bangladesh. This may affect the reliability and appropriateness of training given that has been developed within one regional focus. This can be easily rectified by initiating baseline rodent surveys in different parts of the country to collect similar information that was collected in project R8184 (ZA0503).
2) DAE staff are overstretched and can not easily provide the large-scale training to rural communities with existing resources. NGOs remain better provisioned and tuned to the needs of small-scale farmers, but funding is still likely to be a problem to cover training time and materials during the scaling up of training activities. Delivery of knowledge intensive information to small-scale farming communities is likely to need continued donor support to reach a significant percentage of the population.
3) Rodent management tools, particularly good quality kill traps, need to be readily available for purchase in rural areas. This is not insurmountable as has been demonstrated by project R8190 (ZA0506).
4) With appropriate encouragement, constraints 2 and 3 could be facilitated by developing a commercial rodent pest control industry in Bangladesh. At the moment, commercial enterprises focussing on rodent pests are sectoral, immature and very limited within Bangladesh. Developing

public-private partnerships may be one way of increasing the provision of rodent management knowledge if, for example, it were to go hand-in-hand with the selling of good quality kill traps.

Appendix 1

Three different groups were surveyed using face-to-face individual discussion with the three different forms below; 1) trainers, 2) trained farmers and 3) other farmers that were not directly trained but from the villages of farmers that were trained.

The summary of findings are as presented under research activities and outputs.

FOLLOW-UP SURVEY FOR PROSPECTIVE TRAINERS – DAE AND NGO STAFF

PART 1. Effectiveness of training

1. Was the participant exposed to new information?
   - Rodent biology
   - Damage caused by rodents
   - Diseases spread by rodents
   - Rodent control methods
   - Methods for assessing effectiveness of rodent control
   - Other? …..

2. Was the information provided relevant to the participant's area of responsibility?
   - Yes, directly relevant to primary area of responsibility
   - Yes, but only to secondary area of responsibility
   - No

3. Was the training material appropriate and/or valuable?
   - Video
   - Poster
   - Leaflets

4. Could the training be improved by provision of any other kind of resource material?

5. Does the trainer now possess the confidence to conduct any of the following activities?
   - Advice for farmers on rodent control
   - Training session on rodent control
   - Development of rodent control strategy
   - Assess effectiveness of rodent control actions
   - Other activities? …..

6. Any suggestions for improvement of the training activity?
   - Content
   - Presentation
   - Materials
   - Practical activities
   - Other? …..

PART 2. Actions conducted since training

7. Has the participant carried out any relevant actions since the training?
   - Training of other organisational staff
   - Training of farmers
   - Preparation of resource materials
   - Distribution of resource materials
   - Planning of rodent control activities

- Other actions?…..

8. Are any of these activities planned for the future?
   - Training of other organisational staff
   - Training of farmers
   - Preparation of resource materials
   - Distribution of resource materials
   - Implement rodent control
   - Seek funding for rodent control project
   - Other activities? ….

9. Has the participant communicated what they learned about rodents?
   - To other staff of their organisation
   - To farmers or other individuals
   - To members of other organisations

PART 3. Limiting factors

10. What are the main factors that might limit the participant's capacity to undertake activities relevant to rodent management (PLEASE ASSIGN RANK: 1 = highest importance, 2 = next most important etc)?
   - Knowledge of rodent biology
   - Knowledge of rodent management methods
   - Access to training materials
   - Availability of appropriate tools or technology (e.g. traps)
   - Lack of confidence in ability to make good decisions
   - Access to technical support
   - Lack of specific direction from senior staff of organisation
   - Staff time
   - Access to training for staff
   - Funding to support involvement of staff
   - Other operational funding
   - Other factors? ….

FOLLOW-UP SURVEY FOR TRAINED COMMUNITY MEMBERS

PART 1. Effectiveness of training

1. Was the participant exposed to new information?
    - Rodent biology
    - Damage caused by rodents
    - Diseases spread by rodents
    - Rodent control methods
    - Methods for assessing effectiveness of rodent control
    - Other? …..

2. Was the information provided relevant to the participant's area of responsibility?
    - Yes, directly relevant to primary area of responsibility
    - Yes, but only to secondary area of responsibility
    - No

3. Was the training material appropriate and/or valuable?
    - Video
    - Poster
    - Leaflets

4. Could the training be improved by provision of any other kind of resource material?

5. Does the participant now possess the confidence to do any of the following?
    - Share information on rodents with family members
    - Share information on rodents with other community members
    - Organise and lead discussions on rodent problems and rodent control
    - Plan and carry out rodent control activities in their community
    - Assess effectiveness of rodent control actions
    - Other activities? …..

6. Any suggestions for improvement of the farmer training activity?
    - Content
    - Presentation
    - Materials
    - Practical activities
    - Other? …..

PART 2. Actions conducted since training

7. Has the participant carried out any of the following actions since the training?
    - Sharing of information
    - Sharing of resource materials
    - Completion of farmer diary
    - Rodent control activities in house area
    - Rodent control activities in field areas
    - Discussion about rodents with DAE or NGO staff
    - Organised training activities for other community members
    - Other actions?…..

8. How has information been shared since the training?
    - Casual discussions with close family members
    - Casual discussions with other village members

- Casual discussions with visitors from other villages
- Discussions with DAE or NGO staff
- Discussions with village staff member of rodent project
- Group meetings arranged to discuss rodent problems or control
- In context of prior meeting structure (e.g. IPM clubs)
- Taking part in organised training of farmers
- Sharing of resource materials
- Other activities? ….

PART 3. Limiting factors

9. What are the main factors that might limit the participant's capacity to manage rodent problems in their home or village (PLEASE ASSIGN RANK: 1 = highest importance, 2 = next most important etc)?

- Lack of knowledge of rodent biology
- Lack of knowledge of rodent management methods
- Access to training materials
- Availability of appropriate tools or technology (e.g. traps)
- Lack of confidence to try new methods
- Lack of support from wider community
- Lack of technical support from DAE, NGOs
- Cost of materials
- Other factors? ….

FOLLOW-UP SURVEY FOR UNTRAINED COMMUNITY MEMBERS

1. Is the person aware that other members of their community took part in training activity on subject of rodent management?

2. If yes, what level of knowledge or involvement do they have?
   - Heard about it but not aware of details of who, when etc.
   - Aware of details but not personally involved in any activity
   - Have become involved in new activity related to rodents since the time of training …… specifiy type of activity
     i. Trapping
     ii. Discussion group or meeting
     iii. Other ….

3. Has the person's knowledge about rodents increased since the time of the training?
   - Rodent biology
   - Problems caused by rodents
   - Diseases spread by rodents
   - Rodent control options
   - Other? ….

4. If yes, from whom did they receive the information?
   - From one of the training course participants
   - From the village staff member
   - From another member of the community
   - From a member of DAE or NGO
   - Someone else? ….

Appendix 2
Storyboard for video on rodent management in Bangladesh

Video Part 1

Music: well-recognised local Bengali song [continues and fades under beginning of presenter
Scene: panoramic of rural village behind title: Managing Rats in Rural Villages of Bangladesh
Presenter: A rural village in Bangladesh. People here work hard to grow rice and other crops to feed their families. When yields are good, the surplus is stored for later or sold in the market to help pay for other household needs. People rely on the land for their livelihoods. One of the many problems people face here is the rat. Rats destroy crops, houses, and spread diseases to people and livestock.
[scenes of village, villagers working, harvesting, storing, marketing, close up of rat, examples of rat damage]
[music fades to background village sounds]

Presenter: This is the village of Jakunipara… one of a few villages in the district of Comilla that has been involved in a research project to understand pest rodents and help villagers develop better ways to control rats in their environment. If you live in a rural village similar to Jakunipara and suffer from rats in your fields or houses, this video programme may be able to help you improve the ways in which you manage pest rodents. If you happen to work with rural communities as an extension agent, this video will help you communicate appropriate information and actions that can be taken to control rats.
[scenes of village, villagers, Harun+Shafali talking to villagers]

Presenter: There are three parts to this video. This is part one of the video which will look at the problems which rodents cause in rural agricultural communities. Part two will look at ways to control rodents in field crops, particularly to rice and vegetables, and part three will look at ways in which rodents can be controlled in village environments, including households and food stores.
[background scene with text overlay of three lines, each appearing as discussed by presenter]

Villagers: Scenes of villagers talking about rat problems they have. We have some footage here but not enough. We need two to three different people. We want to capture their frustration and exasperation, covering both field and household damage, both men and women, getting them to list out their problems.
[scene: villagers talking]

Presenter: As we have heard, rats can damage many different things. It is important to know something about the different species of rats that can be found in rural villages because they like to live in different places and cause different types of damage. Mr Harun, who works for the NGO, AID-Comilla, has been studying the ecology of rats in rural villages.
[talkover scene of Harun standing in village, lifting to Harun beginning discussion of the different rodents and their habits]

Harun: Harun videoed talking about how Bandicota likes to burrow in fields and houses, Rattus likes to climb, mainly lives up high, Mus is much smaller and lives in the village mainly in houses and haystacks, Suncus is another animal etc…. Essentially Harun is to give a brief introduction to the biology, behaviour and habits of the four main animals.
[Scene will cut to video of different rodents moving about with Harun monologue talking over, with scene occasionally snapping back to Harun]

Presenter: In addition to the rodents described by Mr Harun, there are other species found in different regions of Bangladesh that may have different habits and preferences. Where possible, expert advice should be sought to find out what is known about the rodents in your region. Dr Nazira Quraishi Kamal, the Research Director from the Bangladesh Rice Research Institute, tells us more…
[scene: Outside pictures of DAE office, BRRI office and cutting to talkover scene of Nazira being official in her office with minions, lifting to Nazira monologue]

Nazira: Expertise and knowledge on rodent management and control can be found in Bangladesh from a number of different sources. At a national level, research on rodent pests is carried out by scientists at the Bangladesh Rice Research Institute and the Bangladesh Agricultural Research Institute. Both of these organisations have recently been working together with scientists from the UK and Australia on a project based in Comilla with the NGO, AID-Comilla. Farming and community groups can also seek out advice locally from Department of Agriculture and Extension staff and NGOs working in their area. Information on specific rodent pests can then be passed on to those who need to develop management actions for their particular situation.
[scene: Nazira talking in office]

Villager: Villager giving some additional information about rodent behaviour, e.g. rats are mainly active at night. We don't always notice them because we are asleep when the rats are awake. We hear them in our houses, but don't see them so much in our crops because we are not out there at night.
[scene: Beauty or one of the other village trappers prompted to give this information to tie in with below]

Presenter: So different rats live in different places and cause different types of damage. Some rodent damage may be obvious and well-recognised by villagers. However, some types of rodent damage may not be obvious, and yet make strong reasons to control rodents. Let's look at the different problems and damages that rodents can and do cause for rural communities in Bangladesh.
[scene: panoramic of rice field with people working in flooded field, panoramic of green pond with women washing or collecting water from it]

Presenter: As we have previously heard, villagers in Comilla commonly mention damage to crops. Damage by rodents to growing rice can happen at any stage. Farmers report damage to germinating rice in seed beds, as well as at transplanting and later on during tillering. Cut tillers can be difficult to spot and it is difficult for a farmer to observe how much rodent damage may occur during the early stages of the crop. Most rodent damage in rice fields happens shortly before the rice is harvested. This is when the rice field rats cut panicles of rice and carry them into its burrows to be stored for later consumption.
[scene: panoramic rice field, farmer in seed bed, farmer transplanting, rice field close up, cut tillers close up, farmer holding cut tillers, mature rice crop, rodent burrows, opened burrows with rice in them]

Presenter: Rodent damage is a problem for many other crops as well. Farmers in Comilla notice damage to many different vegetable crops, coconuts and other fruit trees. Rats can cause significant damage to vegetables when they eat flowers or young fruits. They also damage many vegetables as they ripen. Although rats may not eat the entire fruit, it means farmers can not easily sell the damaged fruits at market.
[scene: different vegetable crops, damaged fruits ending with talkover of villager complaining about crop damage, lifting to villager monologue]

Villager: Complaint/summary about crop damage. We don't have this footage yet. I suggest this comes from a single older respected man who we get to talk specifically about rice and vegetable damage, ignoring what goes on at household level. Must be brief like a summary.
[scene: old man talking in the field]

Presenter: Rats also cause problems after food has been harvested. Rats can easily gain access to rice stored in dholas in people's homes. Rats either climb into the dhola from above or chew a hole in the dhola wall to gain access from below. Rats eat and carry away the rice while urinating and defecating on the stored rice. This loss is so important for farmers who have already invested a lot of money, time and energy into growing, harvesting, drying and storing the rice. To have this precious staple food eaten and contaminated by rats when the rice is in the farmer's food larder is a shame.
[scene: people harvesting, putting rice into dhola. Rat or mouse inside dhola, hole in dhola, close up of contaminated rice]

Presenter: Rats damage many other things inside people's homes such as clothes, blankets, fishing nets, baskets. They can also chew through wires, metal containers, kitchen utensils and furniture. Substantial structural damage to house walls and floors caused by rodent burrows can be severe,

giving rodents living inside the burrows easy access to household food stocks. Villagers can spend much time repairing their damaged houses when houses are constructed of clay bricks. Rat damage to electrical wiring can also lead to fires.
[scene: shots of items described.]

Villager: talking about rodent burrows in houses, how much time they spend repairing damage, etc.
[scene: villager talking about house damage]

Presenter: So far we have talked about rat problems that are fairly well-recognised by farmers and villagers. There are other problems caused by rodents which are not as visible. Diseases can be carried and spread by rats through their urine and faeces. These diseases can make people ill, leading to stomach problems, dysentery, and fevers. Livestock such as chickens, goats and cows are also susceptible to diseases carried by rats. Rats can easily contaminate food when it is stored and sometimes even cooked food if it has been left uncovered. Water sources such as ponds are frequented by rats and people. Diseases left behind by rats can be picked up by people when they use such water for washing or cooking. Families do not usually see that the food or water is contaminated and so often they do not associate illnesses with rats. Generally, if diseases carried by rats are identified early they can be successfully treated by commonly available antibiotics. However, prevention of rat contamination is the best cure!
[scene: shots of contaminated rice, contaminated cooked food, people eating, chickens, cows, goats, ponds, rat swimming in pond, kids swimming in pond, women washing in pond]

Presenter: In this programme we have heard about the types of problems rodents can cause in rural agricultural villages. In the next two programmes we will talk more about how to manage and control rats in field crops and in households.
[scene: general scene, fading to let credits roll when presenter stops talking. Same music as at beginning fading up while credits role]

Video Part 2

Music: Same music as used in part one **[continues and fades under beginning of presenter]**
Scene: as before with panoramic of rural village behind title: Managing Rats in Rural Villages of Bangladesh
Presenter: Rodents cause many problems for rural agricultural communities in Bangladesh. Severe rodent damage can to happen to crops growing in the field. Farmers in rural villages, such as this, the village of Jakunipara in the district of Comilla, observe that rats damage nearly all types of crops grown. In this programme we will learn about ways in which rodents can be controlled in field crops and how to lessen their impact and damage to crops.
[scenes of village, villagers working in field crops, working in rice crops, various vegetable crops, ending with scene of rat moving around in field crop]
[music fades to background village sounds]

Presenter: Rice is the main staple crop of the Comilla region. Many different vegetable crops are also grown such as cauliflower, bringal, carrot, pumpkins and gourds, chilli, potatoes, and sugar cane. Coconut trees, mango and other fruit trees are also common. Rat damage can lead to reduced yields of all these crops and also affect the quality and marketability of vegetables and fruits when fruits are partially eaten by rats. When thinking about controlling rats in field crops it is important to understand a little about where and when rodent damage occurs. It is also important to understand a bit about the rats themselves, such as where they live and when they start new families. Ms. Rokeya Begum Shafali, the Director of the NGO, AID-Comilla, will tell us more.
[scene: rice and various other crops following along with presenter list, obvious rat damaged areas of rice fields, damaged vegetables to rice, ending with talkover of Shafali, lifting to her starting monologue]

Shafali: Rats breed much more quickly than people. If plenty of food, cover and water is available, a female rat can have a new family of young rats every month, with up to ten young rats in each litter. Young rats can begin to breed when they are just 2 months old. Not all of these young rats will survive and their survival depends on whether the rats find enough food and safe places to live. But when conditions are good, this very fast rate of reproduction can allow rat populations to rapidly

increase. This means that we must try to kill a very large percentage of the rat population, otherwise the rats that survive are able to quickly breed and replace those that we killed. Because rats breed quickly, it also means that our rat control will be more effective if we target our rat killing when rat populations are low. By doing this we are able to kill a large percentage of the population with less overall effort. Indeed, every female rat killed before the main breeding season, is the same as killing 500 rats 6 months later!
[scene: Shafali monologue in office, Shafali talking to villagers in village, rats running around]

Presenter: As we have heard from Ms Shafali, rat breeding goes up when food is more abundant. The rice field rat breeds in response to the ripening stage of the rice crop. Breeding of this rat species will continue over a few months after the rice has been harvested. In the Comilla region, this is the main rodent species living in the rice fields. It is an excellent burrower and will make its home in rice field bunds, moving out into the rice fields as the water levels in the fields go down. Different rat species such as mice and the tree rat will also attack growing crops. Their burrows are smaller and more likely to be found in upland areas along the edges of rice fields.
[scene: Bandicota moving around in fields, burrows in bunds and fields, shots of rattus and mouse in upland areas, shots of mouse burrows. Harun or Nazmul should be in the scenes when burrow shots are taken. Close ups of burrows should have his hand nearby so that we can get a sense of how big the burrows are]

Presenter: Let's look at some of the actions farmers can take to manage rats in field crops more effectively. Mr. Harun from AID-Comilla will tell us more.
[scene: talkover of Harun getting ready to speak]

Harun: There are many effective rodent control actions that farmers can do to control rats in their fields. These fall into two broad categories. The first general category is killing rats and the second category is environmental management. It is important that when farmers consider doing any rodent management action that they try to work together with their neighbours and their community. Rodent control is much more effective if farmers work together than on their own. This is because rats breed very quickly so killing only a few rats is not so effective as their numbers are quickly replaced by those left behind. Rats are also very mobile and will migrate back into an area where the rats have been killed so the larger the area that has been cleared of rats, the longer lasting the effect will be.
[scene: Harun talking, intercut with scenes of village meetings, villagers talking to each other in the fields, farmers working together in fields, rats running around]

Harun: Rat poisons can work well, but they must be used with care. Care is required because rats, like humans, are mammals. And the poisons that kill rats can make humans and their animals very ill, and sometimes result in death. The best poisons are those that work without the rat noticing they are being poisoned. That way the rats keep eating the poison until they have eaten enough to kill themselves. Poisons that work too quickly only kill a few rats because most rats start to feel ill before they have eaten enough to kill themselves. Fast-acting poisons may look effective because a few dead animals will be found the next day, but most of the rats that have tried the poison survive and learn to avoid the poison. The best poisons are products such as Lanirat, rattex, and …… These poisons take a few days to work and the rats go home to die inside their burrows. With these poisons, the rats don't know they have been eating poison until it is too late as they don't feel sick soon after eating the poison.
[scene: Harun talking, walking towards market stalls selling rodenticides, packages of rodenticides.]

Presenter: The best way to use poisons to kills rats in the field is to put the poison inside active rodent burrows. Rats have many food sources available to them in the field, and by delivering the poison inside their home, they are more likely to eat it. Many rodent burrows in the field may not actually contain rats so it is important to first establish which burrows are active. This helps target poison usage where it is needed and prevents the poison being wasted. When it is decided to do a poison campaign, farmers should go to their fields the day before and close all the rodent burrows they can find in their fields. The next day farmers should place a small quantity of a slow acting poison such as Lanirat inside each burrow that has been reopened. As there is probably only one rat in each reopened burrow, only a small quantity of poison is required, equivalent to a large teaspoonful, for each burrow. Burrows should be closed again after the baits have been put inside. It is essential that this poison baiting process is repeated. This is because not all the rats in the field will

reopen their burrows each day so newly opened burrows may occur over a few days. Therefore, farmers should return to their fields after 2 or 3 days and re-bait any burrows that have been opened again. This process should be repeated until the farmer can not find any reopened burrows. When this happens it means that all the rats in his field have been killed. In the case of the rice field rat which mainly damages the ripening crop, the best time to do a poisoning campaign, as has been described, is two to three weeks prior to the onset of the ripening stage. Farmers should also monitor the water levels in their field because it is easier to poison the rats while they are still mainly confined to the bunds; before they move out into the crops. Rat damage is highest in fields that dry out early, and in seasons where the rice field is dry during the ripening stage. Crops that are close to upland areas are also more likely to be damaged because they are closer to where rodents can easily make many burrows.

[scene: detailed action footage of home delivery of poison, finding and closing burrows, checking for reopened burrows, making up small quantities of poison in little pieces of paper, baiting and rebaiting burrows, rice fields with water standing, rice fields that have dried out, rice fields close to upland areas including roadsides, village, vegetable, bush areas]

Presenter: Poisoning rats is not the only way to kill rats. Trapping can be an effective way to reduce the number of rats living in the field. Like poisoning, it is important that farmers work together, and the best results will be achieved when all farmers conduct a community campaign by trapping in their fields during the same one or two weeks. As with poisons, traps success will be higher if traps are placed near active rodent burrows. There are many different types of trap and ways that they can be used. Traps should be baited with an attractive food such as pieces of coconut, rice, banana, roasted snails, or fish. There is no particular food bait that works best so use what is commonly available. The trigger mechanism that sets off the traps should be very sensitive and traps should prevent rodents from escaping. It is important to be patient as rats may not go near traps for a few days until they get used to them. Only try moving traps to a new location if nothing is captured after 4 or 5 days and regularly replace the bait with fresh bait.

[scene: farmers setting traps in field, baiting traps, different types of baits, different types of traps, close ups of setting traps near active burrows, re-checking empty traps leaving them where they are and re-checking traps and moving them somewhere else, checking traps that have and have not caught rats, farmers looking pleased when they have caught a rat, replacing old bait with fresh bait]

Presenter: Traps can also be used in conjunction with barrier fences, called trap barrier systems or TBS for short. Trap barrier systems are not commonly used in Bangladesh but they are successfully used in other Asian countries to protect rice crops. Trials in Bangladesh have shown that a TBS set as a long line can prevent rodents migrating between different habitats by erecting the fences along habitat borders. Rice field rats commonly migrate into villages after rice has been harvested. Monsoonal flooding can also cause rats to migrate to higher ground. There is subsequent migration back into the rice fields when flood waters subside and rats can burrow in rice field bunds again. A trap barrier fence can capture rats as they move between these habitats. This method is still new. It does not appear to work in all cropping systems and may only be effective when there are high numbers of rats around before the ripening stage of the rice. We encourage farmers to experiment with it. Mr Harun will tell us how to construct a TBS.

[scene: completed TBS, shots of habitat borders – roadside to field, village to field, upland to field, flooded fields]

Harun: to describe what materials are required and to go through the construction process.

[scene: footage of this process intercut with Harun monologue describing what needs to be done to make the fence and put the traps in place]

Presenter: Environmental management is also a very important part of controlling rodents in fields. Research has shown that rat damage in rice fields is directly related to the number of active burrows found in the area. Wide field bunds and upland areas make it easy for rodents to take up residence and burrow within them. Where possible, banks of less than 30 centimetres in width and of minimal height should be constructed between rice fields as this will discourage rodents from successfully living within them. Clearing excessive weeds and fallow areas in upland areas along rice fields can also help reduce rodent activity in the area. Finally monitor for signs of rodent activity and damage before the problem gets out of hand.

[scene: rat burrows, large field bunds, small field bunds, farmers clearing weeds and bushes away from roadsides….]

Harun: Killing rats should always be done before rat populations are at their highest. It, therefore, makes good pest management practice to monitor for signs of increased rodent activity so that the rats can be controlled before the damage is done. The number of active rat burrows around fields is the best method as well as noting increasing numbers of rat footprints in the mud and the number of cut tillers. Making notes or keeping a diary over time will help you use the information to plan for when rodent control should take place. Remember that farmers and communities that work together to control rats early will have greater success in limiting rodent damage to their crops.

Presenter: In this programme we have heard about how to manage rodent pests in field crops and limit the damage rodents cause for farmers in rural agricultural villages of Bangladesh. In the final programme of this three-part series we will talk about how to manage and control rats in rural village households and food stores.
[scene: general rice field scene, fading to let credits roll when presenter stops talking. Same music as at beginning fading up while credits role]

Video Part 3

Music: Same music as used in part one **[continues and fades under beginning of presenter]**
Scene: as before with panoramic of rural village behind title: Managing Rats in Rural Villages of Bangladesh
Presenter: Rodents cause many problems for rural agricultural communities in Bangladesh. Severe rodent damage can to happen to food that has been stored at the household level, contaminating food and water and spreading diseases. Farmers in rural villages, such as this, the village of Jakunipara in the district of Comilla, observe that rats damage many personal possessions kept within their houses as well as the buildings themselves. In this programme we will learn about ways in which rodents can be controlled in village households and food stores and how to lessen their impact and damage on people's lives.
[scenes of village, housewives working, children playing in courtyard, livestock in courtyard eating from haystacks, ending with scene of rat moving around inside house]
[music fades to background village sounds]

Presenter: Rats need three things, food, water and shelter. These are provided in abundance in most rural villages of Bangladesh. Rice, the main staple crop for most Bangladeshis is stored in bins in people's houses. Many of these storage structures are not rodent proof, encouraging rats to help themselves to the stored rice, eating as much as they can. The availability of abundant food in people's houses encourages rats to breed and find places to live nearby. Often rats live in the houses themselves, by burrowing into the walls and floor of the house or making nests in the roof. There are plenty of other places rats can live in rural villages to be near their food sources, such as haystacks, trees, and pond banks. Rats can easily find drinking water where ponds are permanent features, but rats may also find water closer to home if they can get access to supplies of human drinking water stored in households or puddles of standing water near water pumps and waste water.
[scenes of food, water, shelter, rice being stored, different dhola structures, rats inside rice stores, rodent burrows in house floors, clutter in roof voids, haystacks, trees, pond banks, ponds, stored water, pumps, puddles]

Presenter: Rodents can eat large quantities of stored rice, and it can be difficult for householders to notice how much stored rice is being lost to rodents. The tell-tale evidence of rats in rice stores is mainly through the droppings they leave behind and partially eaten grains. Research trials in village rice stores have shown that loss and contamination of stored grain is generally very high in most households. Dr Nazira Quraishi Kamal, the Research Director from the Bangladesh Rice Research Institute, tells us more…
[scene: rice stores, rats in rice store, contaminated rice, damaged rice, Nazira starting her monologue]

Nazira: With the cooperation of villages in Comilla, we have been placing small baskets of rice in household grain stores. As we know exactly how much rice is in these baskets, scientific staff can

regularly monitor the baskets, weighing the basket to see how much the rats have been eating, and counting the number of droppings and damaged grains. The results were truly startling and showed that most households were losing 5 percent of their rice store to rodents over a typical storage period, and this would generally work out as more than 70 kg of stored rice lost per year for an average village household or about 800 taka worth of rice per year being lost to rats.
[scene: Nazira talking in office]

Presenter: Food that has been contaminated with rat droppings and their urine can be dangerous for humans to eat. Rats can carry many different diseases, and some of these can be found in urine or faeces. Consuming rat contaminated food and water can make people sick, causing dysentery, stomach pain, vomiting, fever, and weight loss. Rodents may additionally contaminate kitchen utensils, and pots that are used to prepare food, so it is important to store all food items safely and ensure that utensils are properly washed with clean water and stored where rodents can not walk over them.
[scene: contaminated rice, people eating, preparing food, rats climbing around in people's houses, rats climbing over kitchen pots, utensils and pots being washed and stored properly]

Presenter: Permanently excluding rats from food sources and human living areas should be a top priority for households. If rats can not access food in people's houses, they will be less likely to take up residence in that house. It is easy to modify rice storage structures so that rats and mice can not get to the stored rice. Mr Harun from AID-Comilla will tell us how this can be done.
[scenes of grain stores, women adding/taking rice out of store, rats inside grain stores]

Harun: In most rice stores rats and mice enter the store by either climbing or jumping into the rice store from above. Some rats may also chew through the wall or floor of the store, particularly when the store is close to the ground and walls of the house. We have done village trials to show that simple changes to the positioning of the store and adding rodent-proof barriers from below and above can completely eliminate rodents from rice stores. [Harun then goes on to describe the construction of the platform, and the various changes.] Other food items such as sacks of potatoes can be similarly protected by storing them up off the floor on platforms which also have baffles on the legs to prevent rodents climbing up.
[scene: Harun talking, cutting to the various scenes of store construction with Harun talking over to describe the various steps involved, scenes of completed modified stores and platforms storing sacks]

Villagers: testimonies from villagers that the new modified stores have resulted in less rodent loss and contamination of stored rice.
[scenes of interviews with villagers talking about their modified rice stores]

Presenter: Although keeping rodents out of rice stores is relatively easy, keeping them out of village houses is more difficult because rodents can get through very small gaps around doors, windows and roof eaves. Although we can not keep all rats and mice from getting inside houses, we can make it more difficult for them by frequently repairing and blocking up holes and gaps. A well maintained house with few places for rodent entry will mean less rodent damage to personal belongings kept inside the house and fewer chances for rats to eat and contaminate stored food.
[scene: rat burrows in house walls and floor, gaps around doors, windows, eaves, people repairing houses, blocking up holes and gaps]

Villager: Villager complaining about rat damage to blankets, furniture, fishing nets, items stored in houses, etc.
[scenes of rat damaged items – blankets, utensils, bedding, etc.]

Presenter: Proofing households against rodents can also be done by eliminating clutter and unnecessary items stored in houses. Rats and mice like to live in roof voids which can often be filled with many unused materials. Clutter provides excellent shelter and living space for rodents. By cleaning and tidying up these areas, it is possible to reduce the amount of harbourage provided for rodents inside the house.
[scene: shots of roof spaces and interiors with lots of clutter, households cleaning out clutter and final shots of tidy inside with less clutter and items neatly stacked]

Presenter: The outside environment around households is also used by rodents. Piles of rubbish near houses can attract rats looking for food and shelter. Leaves and other clutter should also be regularly cleaned up as rodents may temporarily take shelter on their way to different houses. Keeping the environment around houses clean and tidy will help prevent rodents finding places to live and sources of food. Haystacks for animal fodder are a permanent feature in villages where livestock are kept. These haystacks provide excellent shelter for rats and mice who often make burrows in the bottom of the stacks, where they can live all year long. Mr Harun tell us how haystacks can be simply modified to prevent rodents living in them.
[scene: outside around houses with lots of rubbish and clutter, women sweeping up leaves and removing rubbish piles, traditional haystacks and livestock eating from them, rodent burrows systems at base of haystack]

Harun: talking about the steps involved in making the platform for the haystack. This should be followed Harun talking about the haystack dismantling where no rats were found in the modified haystack and they were found in the traditional haystack.
[scene: Harun monologue describing the process intercut with video of the construction steps, followed by scenes of haystack dismantling]

Presenter: The actions just described can help prevent rodents finding food and shelter in individual households. These important activities should be combined with community-wide efforts to kill rodents in village households. Ms. Rokeya Begum Shafali, the Director of the NGO, AID-Comilla, will tell us more.
[scene: Shafali speaking to villagers]

Shafali: Demonstration trials we have run in villages have shown that intensively trapping rats with kill traps inside people's homes has been able to greatly reduce the number of rats in the village. In order for the trapping to sustainably lower the rat population, most of the households in a village need to set traps on a daily basis for at least two months. Because rats are able to move and reproduce very quickly, it is difficult for individual households acting on their own to reduce the rodent population. However, when communities work together by continuously trapping rats, everyone will receive the benefits. If a village community can continuously trap rats over several months, the numbers of captured rats should eventually decline. However, there will always be a few rats around that do no get caught or new ones that find their way into the village from outside the village boundaries.
[scene: Shafali monologue]

Village worker: My name is Beauty [or one of the other workers] and I have been helping to coordinate a community-wide rat trapping programme in the village of Jakunipara. When we first started trapping rats, we caught many rats every day, several hundred from the whole village. After several weeks of trapping every day in people's houses we would catch fewer and fewer rats. Some people in the village thought the rats were becoming too clever and would avoid the traps. But most people believed there was simply fewer rats around to be caught. They noticed fewer rats and droppings in their houses and had less damage to their rice stores and other personal belongings.
[scene: monologue]

Villager: testimony about success of rat trapping. How does the villager know that the rat trapping has worked?
[scene: monologue]

Presenter: Intensively trapping rats should eventually result in fewer rats being captured in the traps. Mr Harun tells us more…..
[scene: Harun getting ready to speak]

Harun: Successful rat trapping relies on using a sensitive trap which is placed in areas where rats are thought to be present. Some traps should be placed up high along walls or in the roof while other traps should be placed at ground level next to walls to catch the different types of rats found in villages. There is no one bait which is best for attracting rats to traps, so it is often best to use leftover food, pieces of coconut, rice, mango… whatever a family has to hand. The most important action for a community to take against their rat problem is to ensure that as many households as possible set traps on a daily basis. If the number of rats killed does not go down after several weeks of continuously setting traps, then more households must take part using more traps in the village. If the

trapping is working, after several months of continuous trapping there should be very few rats found in traps.
[scene: Harun talking, cutting to scenes of villagers baiting and setting traps, checking traps to find rats in them.]

Presenter: As Mr Harun has described, one piece of evidence that the trapping has worked should be that fewer rats are caught several months into a trapping programme. However, there are many other ways for villagers to observe that their rodent management actions have reduced the rodent problem. Fewer rats should mean less rat damage to household vegetable gardens and stored rice, and less rat damage to buildings, baskets, furniture and clothing kept in houses. Keeping an individual diary of rodent damage and the time and money needed to repair or replace damaged items can be a useful way to monitor whether the trapping is resulting in savings for individual households. Directly monitoring rodent activity can also provide proof that there are fewer rats around.
[scene: village trappers with rats, shots of vegetable gardens, rice stores, buildings, rat damage, farmer diary meetings]

Harun: As part of our demonstration trials with communities, we wanted to be able to convince villagers that the trapping was working. And we did this by measuring rodent activity with the use of metal plates covered in black soot from an oil lamp. As the rats walked over these plates that were placed in people's houses, the rats left their footprints behind on the plates. Many rats leave many footprints, while fewer rats leave fewer footprints. This was another way of showing that the continuous trapping was reducing the number of rats in the village over time.
[scene: Harun monologue intercut with scenes of tracking tile footage]

Villager: testimony giving a general optimistic point of view that they now know rats can be successfully controlled in their houses and village.
[scene: monologue]

Presenter: In this programme we have heard about how to manage rodent pests in rural village households and foods stores. We hope that this three-part series of programmes on Managing Rats in Rural Villages of Bangladesh has encouraged your understanding of rodent pests and how they can be effectively controlled. Inevitably, time and money must be spent to control rats, but when rodent control is done well, the benefits of fewer rats around always outweigh the costs.

More detailed information about rodent control is available by writing to:
Ms Rokeya Begum Shafali
Director
AID-Comilla (Association for Integrated Development – Comilla)
143 Housing Estate, Noorpur Colony
Section #3, Comilla-3500
Alternatively contact your local DAE representative or IPM farmer association.
[scene: general scene, villagers/children singing or children playing, overlaying text of AID-Comilla address, fading to let credits roll when presenter stops talking. Same music as at beginning or villagers singing fading up while credits role]

Appendix 3

Table 7 Field based farmers training with the NGO Holodia in the Upazilla of Laksham, District of Comilla. 17 to 18/09/2005

#	Name of trainees	Name of the village	Sex
1	Md. Abul bashar	Holodia	Male
2	Md. Tajul Islam	Holodia	Male
3	Md. Abdul Rashid	Holodia	Male
4	Mrs. Najma Begum	Holodia	Female
5	Mrs. Jesmine Begum	Holodia	Female
6	Md. Rajib	Holodia	Male
7	Md. Jashem Uddin	Holodia	Male
8	Mrs Aesa Begum	Holodia	Female
9	Mrs Rokeya Begum	Holodia	Female
10	Mrs. Belater Nessa	Holodia	Female
11	Mrs. Marium Begum	Holodia	Female
12	Mrs. Anwara Begum	Holodia	Female
13	Mr. Aklema Akter	Holodia	Female
14	Mrs. Fatema Begum	Holodia	Female
15	Mrs. Ijjater nessa	Holodia	Female
16	Mrs. Rena Begum (1)	Holodia	Female
17	Mrs. Parvin Begum	Holodia	Female
18	Mrs. Masuma Begum	Holodia	Female
19	Mrs. Parvin Begum (2)	Holodia	Female
20	Mrs. Halima Begum	Holodia	Female
21	Mrs. Safor Vanu	Holodia	Female
22	Mrs. Monowara Begum	Holodia	Female
23	Mrs. Sabiya Khatun	Holodia	Female
24	Mrs. Momotaj Begum	Holodia	Female
25	Syed Ahmed	Holodia	Female

Table 8 Field based farmers training with the NGO Holodia in the Upazilla of Laksham, District of Comilla. 21 to 22/09/2005

#	Name of trainees	Name of the village	Sex
1	Jahanara	South Dawlathpur	Female
2	Shajeda Akter	South Dawlathpur	Female
3	Nargise Akter	South Dawlathpur	Female
4	Salma Akter	South Dawlathpur	Female
5	Jafura Begum	South Dawlathpur	Female
6	Asiya Khatun	South Dawlathpur	Female
7	Aesha Akter	South Dawlathpur	Female
8	Nahar	South Dawlathpur	Female
9	Rofeya Begum	South Dawlathpur	Female
10	Kohinur Akter	South Dawlathpur	Female
11	Rena Begum	South Dawlathpur	Female
12	Rahela Begum	South Dawlathpur	Female
13	Samena Begum	South Dawlathpur	Female
14	Monwara Begum	South Dawlathpur	Female
15	Rahena Begum	South Dawlathpur	Female
16	Jalil Hossain	South Dawlathpur	Male
17	Abdul Matin	South Dawlathpur	Male
18	Abdur Rahim	South Dawlathpur	Male
19	Shahanaj Akter	South Dawlathpur	Female
20	Bakul	South Dawlathpur	Female
21	Rahima Begum	South Dawlathpur	Female
22	Sahanara Begum	South Dawlathpur	Female
23	Nasima Begum	South Dawlathpur	Female
24	Khalek Mia	South Dawlathpur	Male

25	Md. Bablu Mia	South Dawlathpur	Male

Table 9 Field based farmers training with the NGO Holodia in the Upazilla of Laksham in the District of Comilla. 24 to 25/09/2005

#	Name of trainees	Name of the village	Sex
1	Rahela Begum	Holodia	Female
2	Ejjater Nessa	Holodia	Female
3	Sufia Begum	Holodia	Female
4	Afroja Begum	Holodia	Female
5	Marium Begum	Holodia	Female
6	Ankurar Nessa	Holodia	Female
7	Jahera Begum	Holodia	Female
8	Mafeya Begum	Holodia	Female
9	Oheda Begum	Holodia	Female
10	Sageda Begum	Holodia	Female
11	Morsena Begum	Holodia	Female
12	Reshme Begum	Holodia	Female
13	Taslima	Holodia	Female
14	Rasheda Begum	Holodia	Female
15	Shahid Ulla	Holodia	Male
16	Aiub Ali	Holodia	Male
17	Najrul Islam	Holodia	Male
18	Monir Hossain	Holodia	Male
19	Ali nur	Holodia	Male
20	Rawsonara Begum	Holodia	Female
21	Fatema Begum	Holodia	Female
22	Maksuda Begum	Holodia	Female
23	Md. Abu Baker	Holodia	Male
24	Naher	Holodia	Female
25	Rasheda Begum	Holodia	Female

Table 10 Field based farmers training with the NGO Holodia in the Upazilla of Laksham in the District of Comilla. 26 to 27/09/2005

#	Name of trainees	Name of the village	Sex
1	Hosneara	South Dawlathpur	Female
2	Rahima Akter	South Dawlathpur	Female
3	Shanu	South Dawlathpur	Female
4	Agufa Khatun	South Dawlathpur	Female
5	Farul Akter	South Dawlathpur	Female
6	Rawsonara Akter	South Dawlathpur	Female
7	Matia Akter	South Dawlathpur	Female
8	Rusnara Begum	South Dawlathpur	Female
9	Rupia	South Dawlathpur	Female
10	Anwara Begum	South Dawlathpur	Female
11	Shahinur (1)	South Dawlathpur	Female
12	Feroja Begum	South Dawlathpur	Female
13	Khursheda	South Dawlathpur	Female
14	Ranu	South Dawlathpur	Female
15	Sahanara	South Dawlathpur	Female
16	Nasima Akter	South Dawlathpur	Female
17	Hasina Akter	South Dawlathpur	Female
18	Ayesa Akter	South Dawlathpur	Female
19	Shahinur (2)	South Dawlathpur	Female
20	Amena Begum	South Dawlathpur	Female
21	Rehana Begum	South Dawlathpur	Female
22	Jahir Hossain	South Dawlathpur	Male
23	Delwar Hossain	South Dawlathpur	Male
24	Mir. Hossain	South Dawlathpur	Male

25	Md. Jalal	South Dawlathpur	Male

Table 11 Field based farmers training with the NGO Holodia in the Upazilla of Laksham in the District of Comilla. 17 to 18/09/2005

#	Name of trainees	Name of the village	Sex
1	Shadon Bala Das	Chwck Nandi	Female
2	Reta Rani Das	Chwck Nandi	Female
3	Baby Rani Vawmick	Chwck Nandi	Female
4	Rehana Akter	Chwck Nandi	Female
5	Keron Bala Das	Chwck Nandi	Female
6	Putul Rani Das	Chwck Nandi	Female
7	Sheuli Rani Das	Chwck Nandi	Female
8	Mhafuja Begum	Chwck Nandi	Female
9	Sheta Rani	Chwck Nandi	Female
10	Josna Rani	Chwck Nandi	Female
11	Neati Rani	Chwck Nandi	Female
12	Arsona Rani	Chwck Nandi	Female
13	Hasshow Bala	Chwck Nandi	Female
14	Shelpi Rani	Chwck Nandi	Female
15	Moni Rani Das	Chwck Nandi	Female
16	Khuku Rani Vawmick	Chwck Nandi	Female
17	Sumana Rani Das	Chwck Nandi	Female
18	Shumi Akter	Chwck Nandi	Female
19	Mursheda Begum	Chwck Nandi	Female
20	Marium	Chwck Nandi	Female
21	Kajol Rekha	Chwck Nandi	Female
22	Khuki Akter	Chwck Nandi	Female
23	Fatema Akter	Chwck Nandi	Female
24	Shakina Akter	Chwck Nandi	Female
25	Mamota Rani das	Chwck Nandi	Female

Table 12 Field based farmers training with the NGO PUP in the Upazilla of Laksham in the District of Comilla. 21 to 22/09/2005

#	Name of trainees	Name of the village	Sex
1	Depaion Singha	Alyssar	Male
2	Harshowbardon Singha	Alyssar	Male
3	Manick Singha	Alyssar	Male
4	Sujan Singha	Alyssar	Male
5	Medun Singha	Alyssar	Male
6	Omulla Singha	Alyssar	Male
7	Ringkon Singha	Alyssar	Male
8	Depock Singha	Alyssar	Male
9	Pulock Singha	Alyssar	Male
10	Rupali Rani Singha	Alyssar	Female
11	Maya Rani Singha	Alyssar	Female
12	Rekha Rani Singha	Alyssar	Female
13	Geta Rani Singha	Alyssar	Female
14	Kalpona Rani Singha	Alyssar	Female
15	Monita Rani Singha	Alyssar	Female
16	Lili Rani Singha	Alyssar	Female
17	Rekha Rani Singha	Alyssar	Female
18	Kanon Rani Singha	Alyssar	Female
19	Bakul Rani Singha	Alyssar	Female
20	Mamota Rani Singha	Alyssar	Female
21	Melon Rani Singha	Alyssar	Female
22	Bani Rani Singha	Alyssar	Female
23	Onita Rani Singha	Alyssar	Female
24	Shema Rani Singha	Alyssar	Female

25	Depika Rani Singha	Alyssar	Female

Table 13 Field based farmers training with the NGO PUP in the Upazilla of Laksham in the District of Comilla. 24 to 25/09/2005

#	Name of trainees	Name of the village	Sex
1	Shamchunnahar	Chwck Nandi	Female
2	Rehana Akter	Chwck Nandi	Female
3	Mahfuja Akter	Chwck Nandi	Female
4	Ruma Akter	Chwck Nandi	Female
5	Shahida Akter	Chwck Nandi	Female
6	Minu Akter	Chwck Nandi	Female
7	Kajol Rani Das	Chwck Nandi	Female
8	Shupreya Das	Chwck Nandi	Female
9	Kajol Rani	Chwck Nandi	Female
10	Mani Akter	Chwck Nandi	Female
11	Panna Akter	Chwck Nandi	Female
12	Mrs. Macksuda Akter	Chwck Nandi	Female
13	Mrs. Manjuma Akter	Chwck Nandi	Female
14	Rujina Akter	Chwck Nandi	Female
15	Bakul Bala Das	Chwck Nandi	Female
16	Amirto lal	Chwck Nandi	Male
17	Provati Rani das	Chwck Nandi	Female
18	Mallika Das bithy	Chwck Nandi	Female
19	Bandona Rani Das	Chwck Nandi	Female
20	Rehana Akter	Chwck Nandi	Female
21	Lelu Rani das	Chwck Nandi	Female
22	Kanon Bala	Chwck Nandi	Female
23	Tahera Begum	Chwck Nandi	Female
24	Jhahanara Begum	Chwck Nandi	Female
25	Nehar Begum	Chwck Nandi	Female

Table 14 Field based farmers training with the NGO PUP in the Upazilla of Laksham in the District of Comilla. 26 to 27/09/2005

#	Name of trainees	Name of the village	Sex
1	Rina Akter	Mytherpar	Female
2	Ferdause Akter	Mytherpar	Female
3	Rasheda Akter	Mytherpar	Female
4	Nurunnahar	Mytherpar	Female
5	Salma Khatun	Mytherpar	Female
6	Fajilater Nesa	Mytherpar	Female
7	Mahfuja Begum	Mytherpar	Female
8	Jobaida Khatun	Mytherpar	Female
9	Nasima Akter	Mytherpar	Female
10	Monwara Begum	Mytherpar	Female
11	Bilkis Begum	Mytherpar	Female
12	Hosneara Begum	Mytherpar	Female
13	Jahanara Begum	Mytherpar	Female
14	Mahfuja Begum	Mytherpar	Female
15	Nehar Akter	Mytherpar	Female
16	Saleha begum	Mytherpar	Female
17	Kulsum Akter	Mytherpar	Female
18	Manowara Begum	Mytherpar	Female
19	Mursheda Begum	Mytherpar	Female
20	Upjum Begum	Mytherpar	Female
21	Rupiya Begum	Mytherpar	Female
22	Nipa Rani Singha	Alyssar	Female
23	Nasima Akter	Alyssar	Female
24	Kulsum Akter	Alyssar	Female

25	Parvin Akter	Alyssar	Female

Table 15 Field based farmers training with the NGO PROTY in the Upazilla of Sadar Comilla in the District of Comilla. 28 to 29/09/2005

#	Name of trainees	Name of the village	Sex
1	Mrs. Ramuja Begum	Sreepur	Female
2	Mrs. Halena Akter	Sreepur	Female
3	Shaheda Akter	Sreepur	Female
4	Parvin Akter	Sreepur	Female
5	Tahmina Akter	Sreepur	Female
6	Yeasmin Akter	Sreepur	Female
7	Nasima Akter (1)	Sreepur	Female
8	Nasima Akter (2)	Sreepur	Female
9	Shakho Akter	Sreepur	Female
10	Najma Akter	Sreepur	Female
11	Mamotaj Akter	Sreepur	Female
12	Khorsheda Akter	Sreepur	Female
13	Taslima Akter	Sreepur	Female
14	Peara Begum	Sreepur	Female
15	Putul akter	Sreepur	Female
16	Mafiya Begum	Sreepur	Female
17	Laky Akter	Sreepur	Female
18	Shaopna Akter	Sreepur	Female
19	Kulsum Akter	Sreepur	Female
20	Shama Akter	Sreepur	Female
21	Shahida Begum	Sreepur	Female
22	Jinnath Akter	Sreepur	Female
23	Miya Akter	Sreepur	Female
24	Nargis Akter	Sreepur	Female
25	Lili Akter	Sreepur	Female

Table 16 Field based farmers training with the NGO PROTY in the Upazilla of Sadar Comilla in the District of Comilla. 1 to 2/10/2005

#	Name of trainees	Name of the village	Sex
1	Hajara Begum	Sreepur	Female
2	Taslima Akter	Sreepur	Female
3	Nasima Akter	Sreepur	Female
4	Salina Akter	Sreepur	Female
5	Shahana Begum	Sreepur	Female
6	Ranu Begum	Sreepur	Female
7	Johura Begum	Sreepur	Female
8	Salina Begum	Sreepur	Female
9	Manowara Begum	Sreepur	Female
10	Rena Akter	Sreepur	Female
11	Ajima Begum	Sreepur	Female
12	Babe Akter	Sreepur	Female
13	Peara Begum	Sreepur	Female
14	Shema Akter	Sreepur	Female
15	Nargis Akter	Sreepur	Female
16	Bilkis Akter	Sreepur	Female
17	Jahanara Begum	Sreepur	Female
18	Aisan Begum	Sreepur	Female
19	Parvin Akter	Sreepur	Female
20	Alea Begum	Sreepur	Female
21	Shahana Begum	Sreepur	Female
22	Marium Begum	Sreepur	Female
23	Ferdause Akter	Sreepur	Female
24	Amena Khatun	Sreepur	Female

25	Afiya Khatun	Sreepur	Female

Table 17 Field based farmers training with the NGO PROTY in the Upazilla of Sadar Comilla in the District of Comilla. 8 to 9/10/2005

#	Name of trainees	Name of the village	Sex
1	Asma Begum	Suvopur	Female
2	Jahanara begum	Suvopur	Female
3	Shaheda Begum (1)	Suvopur	Female
4	Shaheda Akter (2)	Suvopur	Female
5	Rosheda Begum	Suvopur	Female
6	Amena Akter	Suvopur	Female
7	Rima Akter	Suvopur	Female
8	Hajera Akter	Suvopur	Female
9	Sahana Begum	Suvopur	Female
10	Bakul Begum	Suvopur	Female
11	Halema Begum	Suvopur	Female
12	Karful	Suvopur	Female
13	Ferdause Akter	Suvopur	Female
14	Taslima Akter (1)	Suvopur	Female
15	Manowara Akter	Suvopur	Female
16	Anwara Begum	Suvopur	Female
17	Nurjahan Begum	Suvopur	Female
18	Sahanara Begum	Suvopur	Female
19	Amena Begum	Suvopur	Female
20	Taslima Akter (2)	Suvopur	Female
21	Ruma Akter	Suvopur	Female
22	Getarani Sarker	Suvopur	Female
23	Nelufa Akter	Suvopur	Female
24	Sherin Akter	Suvopur	Female
25	Roksona Akter	Suvopur	Female

Table 18 Field based farmers training with the NGO PROTY in the Upazilla of Sadar Comilla in the District of Comilla. 12 to 13/10/2005

#	Name of trainees	Name of the village	Sex
1	Nurunnahar (Happy)	Suvopur	Female
2	Samsunnahar (Rina)	Suvopur	Female
3	Selpi Akter	Suvopur	Female
4	Salina Akter	Suvopur	Female
5	Jahanara Akter	Suvopur	Female
6	Lakkhi Rani Das	Suvopur	Female
7	Alo Rani	Suvopur	Female
8	Marium Akter	Suvopur	Female
9	Najma Akter (1)	Suvopur	Female
10	Kulsum Akter	Suvopur	Female
11	Manu Begum	Suvopur	Female
12	Khorsheda Begum	Suvopur	Female
13	Amena Begum	Suvopur	Female
14	Sumi Begum	Suvopur	Female
15	Najma Akter (2)	Suvopur	Female
16	Nipa Akter	Suvopur	Female
17	Alpona Rani Karmokar	Suvopur	Female
18	Kamona Rani Sarker	Suvopur	Female
19	Syea Rani Da	Suvopur	Female
20	Moni Rani Sarker	Suvopur	Female
21	Jharna Rani Karmokar(1)	Suvopur	Female
22	Jharna Rani Karmokar(2)	Suvopur	Female
23	Kulsum Akter	Suvopur	Female
24	Ruma Akter	Suvopur	Female

25	Archona Rani	Suvopur	Female

Table 19 Field based farmers training with the NGO Dustha-ma-o-Shishu Kollan Foundation in the Upazilla of Muradnagor in the District of Comilla. 3 to 4/10/2005

#	Name of trainees	Name of the village	Sex
1	Nawn Begum	Vubon gar	Female
2	Salina Begum	Vubon gar	Female
3	Taslima Begum	Vubon gar	Female
4	Sahinur Begum	Vubon gar	Female
5	Anwara Begum	Vubon gar	Female
6	Maksuda Akter	Vubon gar	Female
7	Mayina Akter	Vubon gar	Female
8	Momina Begum	Vubon gar	Female
9	Safiya Khatun	Vubon gar	Female
10	Nasima Begum	Vubon gar	Female
11	Rokeya Begum	Vubon gar	Female
12	Bakul	Vubon gar	Female
13	Mamotaj	Vubon gar	Female
14	Sahena	Vubon gar	Female
15	Mafeya	Vubon gar	Female
16	Rojena	Vubon gar	Female
17	Kulsum	Vubon gar	Female
18	Rawson	Vubon gar	Female
19	Arjina	Vubon gar	Female
20	Aesa	Vubon gar	Female
21	Anwara	Vubon gar	Female
22	Rakha	Vubon gar	Female
23	Romana	Vubon gar	Female
24	Marjina	Vubon gar	Female
25	Lipu	Vubon gar	Female

Table 20 Field based farmers training with the NGO Dustha-ma-o-Shishu Kollan Foundation in the Upazilla of Muradnagor in the District of Comilla. 8 to 9/10/2005

#	Name of trainees	Name of the village	Sex
1	Roksana Begum	Vubon gar	Female
2	Rejona	Vubon gar	Female
3	Serena	Vubon gar	Female
4	Hasena	Vubon gar	Female
5	Hasu	Vubon gar	Female
6	Sefali	Vubon gar	Female
7	Marium	Vubon gar	Female
8	Kulsum	Vubon gar	Female
9	Menu	Vubon gar	Female
10	Nurjahan	Vubon gar	Female
11	Salma	Vubon gar	Female
12	Amena (1)	Vubon gar	Female
13	Delwara	Vubon gar	Female
14	Saheda	Vubon gar	Female
15	Fatema	Vubon gar	Female
16	Monwara	Vubon gar	Female
17	Jesmin	Vubon gar	Female
18	Amena (2)	Vubon gar	Female
19	Serina	Vubon gar	Female
20	Momina	Vubon gar	Female
21	Helana	Vubon gar	Female
22	Suruvie	Vubon gar	Female
23	Rasheda	Vubon gar	Female
24	Parvin	Vubon gar	Female

25	Hasena	Vubon gar	Female

Table 21 Field based farmers training with the NGO Dustha-ma-o-Shishu Kollan Foundation in the Upazilla of Muradnagor in the District of Comilla. 12 to 13/10/2005

#	Name of trainees	Name of the village	Sex
1	Monwara Begum	Vubon gar (West para)	Female
2	Taslima Akter	Vubon gar (West para)	Female
3	Aesa begum	Vubon gar (West para)	Female
4	Sahena Begum	Vubon gar (West para)	Female
5	Sufeya Begum	Vubon gar (West para)	Female
6	Maksuda Akter	Vubon gar (West para)	Female
7	Asma Akter	Vubon gar (West para)	Female
8	Taslima Akter	Vubon gar (West para)	Female
9	Juma Akter	Vubon gar (West para)	Female
10	Rabia Khatun	Vubon gar (West para)	Female
11	Feroja Begum	Vubon gar (West para)	Female
12	Nurjahan Begum	Vubon gar (West para)	Female
13	Feroja Begum	Vubon gar (West para)	Female
14	Afiya Begum	Vubon gar (West para)	Female
15	Maksuda Begum	Vubon gar (West para)	Female
16	Anwara Begum	Vubon gar (West para)	Female
17	Sahinur Begum	Vubon gar (West para)	Female
18	Nasima Begum	Vubon gar (West para)	Female
19	Serena Begum	Vubon gar (West para)	Female
20	Hasina Begum	Vubon gar (West para)	Female
21	Panna Begum	Vubon gar (West para)	Female
22	Rumila Bala	Vubon gar (West para)	Female
23	Geta Rani	Vubon gar (West para)	Female
24	Kalpona Rani	Vubon gar (West para)	Female
25	Maloti Rani	Vubon gar (West para)	Female

Table 22 Field based farmers training with the NGO Dustha-ma-o-Shishu Kollan Foundation in the Upazilla of Muradnagor in the District of Comilla. 15 to 16/10/2005

#	Name of trainees	Name of the village	Sex
1	Mamotaj Begum	Vubon gar	Female
2	Tahera Begum	Vubon gar	Female
3	Jahanara Begum	Vubon gar	Female
4	Senowara Begum	Vubon gar	Female
5	Vanu Bebe	Vubon gar	Female
6	Momena Begum	Vubon gar	Female
7	Rokeya Begum	Vubon gar	Female
8	Anwara Begum	Vubon gar	Female
9	Rojina Akter	Vubon gar	Female
10	Rina Akter	Vubon gar	Female
11	Lipi Akter	Vubon gar	Female
12	Serina Akter	Vubon gar	Female
13	Parul Akter	Vubon gar	Female
14	Anwara Begum	Vubon gar	Female
15	Rubi Begum	Vubon gar	Female
16	Jahanara Begum	Vubon gar	Female
17	Hajera Begum	Vubon gar	Female
18	Sreety Rani	Vubon gar	Female
19	Manju Rani	Vubon gar	Female
20	Sreena Akter	Vubon gar	Female
21	Rena Rani	Vubon gar	Female
22	Hasena Begum	Vubon gar	Female
23	Bechittra Rani	Vubon gar	Female
24	Mamotaj Begum	Vubon gar	Female

25	Rawsonara Begum	Vubon gar	Female

Table 23 Field based farmers training with the NGO AID-Comilla in the Upazilla of Sadar Comilla in the District of Comilla. 28 to 29/9/2005

#	Name of trainees	Name of the village	Sex
1	Nasima Begum	Anandapur	Female
2	Johura Begum	Anandapur	Female
3	Sageda Begum	Anandapur	Female
4	Rokeya Akter	Anandapur	Female
5	Jahida Begum	Anandapur	Female
6	Razzaber Nesa	Anandapur	Female
7	Bilkis Akter	Anandapur	Female
8	Ajufa Begum	Anandapur	Female
9	Amena Begum	Anandapur	Female
10	Morsheda Begum	Anandapur	Female
11	Sahena Begum	Anandapur	Female
12	Amena Akter	Anandapur	Female
13	Asima Begum	Anandapur	Female
14	Jarina Begum	Anandapur	Female
15	Panna Akter	Anandapur	Female
16	Nurjahan Begum	Anandapur	Female
17	Nelufa Begum	Anandapur	Female
18	Rupia Begum	Anandapur	Female
19	Khorsheda Begum	Anandapur	Female
20	Kulsum Begum	Anandapur	Female
21	MorshedaBegum	Anandapur	Female
22	Khorsheda Begum	Anandapur	Female
23	Asiya Begum	Anandapur	Female
24	Parija Begum	Anandapur	Female
25	Marium Begum	Anandapur	Female

Table 24 Field based farmers training with the NGO AID-Comilla in the Upazilla of Sadar Comilla in the District of Comilla. 17 to 18/9/2005

#	Name of trainees	Name of the village	Sex
1	Amena Begum	Anandapur	Female
2	Kohinur Akter (Tuhin)	Anandapur	Female
3	Jahanara Begum (1)	Anandapur	Female
4	Safali Begum	Anandapur	Female
5	Jaheda Akter	Anandapur	Female
6	Morsheda Akter	Anandapur	Female
7	Rahima Akter	Anandapur	Female
8	Rahela	Anandapur	Female
9	Bakul	Anandapur	Female
10	Sufeya	Anandapur	Female
11	Alea Ershad	Anandapur	Female
12	Amena Begum (Akhi)	Anandapur	Female
13	Marium	Anandapur	Female
14	Sultana Begum	Anandapur	Female
15	Sahena Akter	Anandapur	Female
16	Rahela Begum	Anandapur	Female
17	Razzabir Nesa	Anandapur	Female
18	Saju Begum	Anandapur	Female
19	Josna Begum	Anandapur	Female
20	Belatennesa	Anandapur	Female
21	Josna (1)	Anandapur	Female
22	Rasheda Begum	Anandapur	Female
23	Anu Begum	Anandapur	Female
24	Safiya Begum	Anandapur	Female

25	Rasheda	Anandapur	Female

Table 25 Field based farmers training with the NGO AID-Comilla in the Upazilla of Sadar Comilla in the District of Comilla. 17 to 18/10/2005

#	Name of trainees	Name of the village	Sex
1	Monwara Begum	Sahapur	Female
2	Jahera Khatun	Sahapur	Female
3	Rawsonara Begum	Sahapur	Female
4	Tajnehar	Sahapur	Female
5	Fatema Begum	Sahapur	Female
6	Mafiya Khatun	Sahapur	Female
7	Sajeda Khatun	Sahapur	Female
8	Manju Begum	Sahapur	Female
9	Nasrin Akter	Sahapur	Female
10	Asiya Khatun	Sahapur	Female
11	Rabiya Khatun	Sahapur	Female
12	Rahima Khatun	Sahapur	Female
13	Nurnnihar Begum	Sahapur	Female
14	Ferdause Akter	Sahapur	Female
15	Subarna Akter	Sahapur	Female
16	Karfular Nesa	Sahapur	Female
17	Johura begum	Sahapur	Female
18	Anwara Begum	Sahapur	Female
19	Vanu Bebe	Sahapur	Female
20	Najma Akter	Sahapur	Female
21	Parul Akter	Sahapur	Female
22	Saheda Akter	Sahapur	Female
23	Salma Akter	Sahapur	Female
24	Parul	Sahapur	Female
25	Miya Begum	Sahapur	Female

Table 26 Field based farmers training with the NGO AID-Comilla in the Upazilla of Sadar Comilla in the District of Comilla. 15 to 16/10/2005

#	Name of trainees	Name of the village	Sex
1	Fulsira Begum	Sahapur	Female
2	Alea Begum(1)	Sahapur	Female
3	Rawsonara Begum	Sahapur	Female
4	Nasima Begum	Sahapur	Female
5	Hanufa Begum	Sahapur	Female
6	Alea Begum(2)	Sahapur	Female
7	Najmul Nahar	Sahapur	Female
8	Ambiya Khatun	Sahapur	Female
9	Rehana Akter	Sahapur	Female
10	Shafiya khatun	Sahapur	Female
11	Peara Begum	Sahapur	Female
12	Sarmin Akter	Sahapur	Female
13	Anwara Begum	Sahapur	Female
14	Menuyara Begum	Sahapur	Female
15	Nurjahan	Sahapur	Female
16	Alea Begum(3)	Sahapur	Female
17	Roheya Begum	Sahapur	Female
18	Saleha Begum	Sahapur	Female
19	Abida Khatun	Sahapur	Female
20	Asiya Khatun	Sahapur	Female
21	Fulmati	Sahapur	Female
22	Rubi	Sahapur	Female
23	Lutfurnahar	Sahapur	Female
24	Rokeya	Sahapur	Female
25	Monwara Begum	Sahapur	Female