Chapter 3
Study Methodology

The field studies were performed to explore in more depth previous indications that pollination problems were indeed a major factor in declining productivity in mountain agriculture, and to assess the extent and distribution of the problems before making suggestions and implementing trials to improve the situation. The surveys focused on the extent of apple productivity and pollination problems, the factors causing inadequate pollination, and farmers' management practices.

Apples are a leading cash crop in several hill and mountain areas of the HKH region, but for the purposes of this study we focused on those valleys where apple farming has been a dominant factor in the economy and which are quoted as successful examples of agricultural diversification.

Information was collected during semi-structured interviews and using a well-structured, pre-tested survey questionnaire on various factors related to apple pollination and productivity. The overall process included selecting the valleys, forming field study teams in each country, developing the survey questionnaire, carrying out pilot testing with sample farmers, and finally conducting the detailed surveys. The steps are described in more detail below.

Selection of Apple Valleys

The first step was the selection of appropriate apple valleys (study sites). The main criteria for site selection were (i) apples are a very important crop for the farmers, (ii) farmers are experiencing productivity problems, (iii) farmers are trying to improve productivity by various ways and means, (iv) inadequate pollination may be a factor contributing towards low productivity, and (v) there was a partner institution willing and interested to carry out the survey in the area. Keeping these criteria in mind and through meetings with farmers and local leaders, government officers, and agricultural extension workers, we selected the following areas to conduct case studies to identify pollination-related productivity problems.

- The Shimla Hills, Kullu Valley, and Kinnaur Valley in Himachal Pradesh, India
- Maoxian Valley of Aba Prefecture in Sichuan Province, China
- Thimphu and Paro Valleys in Bhutan
- Kalat, Killa Saifullah, Loralai, Mastung, Pishin, Quetta, and Ziarat Valleys in Balochistan Province, Pakistan
- Jumla Valley in Nepal

Parameters for the Household Surveys

A representative sample of farmers (with different size landholdings, different wealth rankings, and so on) from different villages were selected for the household surveys. The parameters covered included general information on physiographic and climatic conditions, including changes that farmers might have observed during recent years and their impact on agriculture in general and on apple crops in particular, information on the arable land per household, general information about agriculture, the kinds of crops that farmers grow separately and in association with apples, and the importance of apples in the household economy. Apple productivity issues including increasing or decreasing trends were given special attention.

Most of the questions concerned pollination issues. They included whether farmers knew about pollination and its role in apple productivity, how they knew about it, and who told them about it; what the role of pollinizer varieties is in apple pollination, how they effect apple productivity, and what the proportion of pollinizer varieties was in the farmers' orchard; and whether farmers knew about pollinators and their importance. Questions on pollinators included whether there were natural insects visiting apple flowers, whether these were sufficient to pollinate the apple crop, and whether their number and diversity was changing and how (whether there were similar insect populations on the apple flowers as a few years to a few decades ago). The role of prevailing weather conditions in pollination was also considered, for example whether rain, humidity, hailstorms, high or low temperatures, or frost were affecting apple pollination and fruit set, and whether farmers were taking measures to save their crop. Farmers were also asked whether they kept honeybees for pollination; whether commercial beekeepers rented honeybee colonies for apple pollination; and whether alternative practices were used like hand pollination. Finally farmers were questioned about their use of pesticides on apple crops, including which pesticides they used and how many times in a year, and whether they knew the impact of these pesticides on natural insect pollinators. The pilot questionnaire was first tested with a small sample of farmers and revised before being finalised. The English version of the survey form is shown in Annex II. It was translated into Chinese and Nepali for use by the researchers in China and Nepal. In all countries, the questions themselves were asked verbally of farmers in their own language.

In addition to the household surveys, information was sought in some areas in interviews with key informants including agricultural scientists, extension workers, lead farmers, local leaders, and government officers.

The surveys were carried out in India and China in 1998/99, in Pakistan in 1999/2000, and in Bhutan and Nepal in 2000.

The Informants

India

In India, the surveys were conducted in collaboration with Dr Y.S. Parmar University of Horticulture and Forestry in the Shimla, Kulju and Kinnaur Districts in Himachal Pradesh. A total of 209 households were interviewed in 76 villages in the 3 districts, and discussions were held with a further 50 key informants in 24 of the villages (Table 3.1).

China

In China, the surveys were conducted in collaboration with the Chengdu Institute of Biology, in Maoxian County in Aba Prefecture of Sichuan Province. A total of 100 households were interviewed in 6 villages. A further 15 key informants (4 scientists of the Chengdu Institute of Biology, the Governor of Maoxian County, 5 commercial beekeepers, and 5 lead farmers) were interviewed during the field visits (Table 3.2).

Pakistan

In Pakistan, the surveys were conducted in collaboration with the National Aridland Development and Research Institute (NADRI) in seven apple-growing valleys in Balochistan. A total of 76 households were interviewed in 32 villages. A further 24 key informants (1 professional from a local NGO, 1 from NADRI, 4 scientists from the Department of Agriculture, Balochistan, 1 beekeeper, and 17 farmers) were interviewed during the field visits (Table 3.3).

Bhutan

In Bhutan, the surveys were conducted in collaboration with a local lead farmer. A total of 85 households were interviewed in 13 villages in the two main apple-growing valleys, Thimphu and Paro, and discussions held with a further 12 key informants including scientists from the Research, Extension and Irrigation Division (REID) of the Ministry of Agriculture and lead farmers (Table 3.4).

Nepal

In Nepal, the survey was conducted in collaboration with a local NGO, the Surya Social Service Society (4S). A total of 60 households were interviewed in 10 villages in Jumla Valley in western Nepal and discussions held with a further 5 key informants (Table 3.5).

Table 3.1: Study area, households surveyed, and key informants in Himachal Pradesh, India

Area	Household survey			Key informants	
	Number of villages	Altitude range masl	Number of HH interviewed	Number of villages	Number of people
Shimla Hills	21	1800 - 2300	52	8	20
Kullu Valley	41	1600 - 2200	130	13	25
Kinnaur Valley	14	2500 - 3200	27	3	5
Total	76		209	24	50

Table 3.2: Study area, households surveyed, and key informants in Maoxian County, China

Area	Household survey			Key informants	
	Villages	Altitude masl	Number of HH interviewed	Number of villages	Number of people
Maoxian County	Suangma	1850	9	6	15
	Mati*	1670	18		
	Dagou Fengyi	1720	13		
	Jingzhou	1670	17		
	Zhongqu	1530	29		
	Jincu Nanxin	1500	14		
Total	6		100		15
* Mati lies in the Hujiang river valley, the other villages in the Minjiang river valley					

Table 3.3: Study area, households surveyed, and key informants in Balochistan, Pakistan

Area	Household survey			Key informants	
	Number of villages	Altitude masl	Number of HH interviewed	Number of villages	Number of people
Kalat Valley	6 villages (Chori Mougachi, Gome, Mugnalazi, Khadra, Zard Abdulla, and Kalat)	2054	8	5	24
Killa Saifullah Valley	2 villages (Argus and Killa Saifullah)	1550	10		
Loralai Valley	3 villages (Sanjavi, Kasbi Khacha, and Loralai)	1433	6		
Mastung Valley	6 villages (Ganjdoor, Sharifabad, Killa Syed Aleem, Kid Kocha, Prinagabad, and Monza Qamat)	NA	16		
Pishin Valley	5 villages (Balozai, Killa Abdulla, Cercal Shabzada, Killi Khatar, and Cercal Shahjhan)	1572	13		
Quetta Valley	8 villages (Hanna, Kuchi Lak, Killi Jeao, Killi Habib, Killi Sardar, Burhnar, Killi Kachi, and Thakh Jani)	1676	14		
Ziarat Valley	2 villages (Manna and Ziarat)	2400	9		
Total	32		76	5	24

Table 3.4: Study area, households surveyed, and key informants in Thimphu and Paro Valleys of Bhutan

Area	Household survey			Key informants	
	Number of villages	Altitude range masl	Number of HH interviewed	Number of villages	Number of people
Thimphu Valley	Five villages (Semtokha, Tshlimaphey, Depsi Babesa, Gamchi Babesa, and Sherbithang)	2300-2400	44	2	12
Paro Valley	Eight villages (Dugyey Dingkher, Lholey Neyphug, Neyphug Shaba, Lholy Shaba, Shap Bara, Shap Shungker, Shap Shengu, and Shap Shelngo)	2200-2400	41		
Total	13		85	2	12

Table 3.5: Study area, households surveyed, and key informants in Jumla Valley, Nepal

Area	Household survey			Key informants	
	Number of villages	Altitude range (masl)	Number of HH interviewed	Number of villages	Number of people
Jumla Valley	10 villages (Mahat Gaon, Talium, Hanku, Patmara, Dillichaur, Patarasi, Gajyangkot, Depal, Kartik Swami, and Chandan Nath)	2150-2600	Between 3 and 14 per village	3	5
Total	10		60	3	5

Processing the Information

Data were analysed using simple means and percentages, no special statistical methods or tests were employed. Where surveys were carried out in different villages or areas, overall averages

were calculated from the averages for each village/area without weighting for numbers of respondents. The mean and standard error about the mean were calculated for parameters such as family size, apple orchard area, apple yield, income from apples, and number of sprays of pesticides per household. The standard error values are not shown for simplicity of data presentation. Farmers' and households' responses to questions like climate change, its impact on pollination, the number of farmers keeping honeybees or renting honeybees for apple pollination, the type of pollinizer varieties planted, pollinizer proportion, and the number of farmers carrying out hand pollination were calculated as percentages.