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Enterprise-based Transformation of Hill Agriculture

A Case Study of Vegetable Growing Farmers in Garampani Area, Nainital District, India

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International Centre for Integrated Mountain Development
Kathmandu, Nepal

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Preface

Development experiences in most of the mountain areas of the Hindu Kush-Himalayan Region, over the past decades, have shown that the prevailing predominant mode of their economies – subsistence agriculture – is becoming increasingly unsustainable both economically and ecologically. Diversification of economic activities into products and services, for which these areas offer a comparative advantage, through enterprise-based production for the market is considered necessary for sustaining livelihoods and alleviating the poverty of the rapidly increasing population. It is in this context that ICIMOD established a programme on Development of Micro-enterprises in Mountain Areas with the objectives of identifying constraints and opportunities and developing policy, programme, and training guidelines for enterprise development in hill and mountain areas of the HKH region. As part of this programme, the Centre has commissioned a number of studies in different countries and areas of the HKH region with a view to documenting experiences of development and functioning of enterprises covering different aspects such as comparative advantage of products, processes, and factors in enterprise development, technology, credit, marketing, and development of entrepreneurial skills as well policies and programmes by government and non-government agencies for promotion of enterprises.

The present paper 'Enterprise-based Transformation of Hill Agriculture', by K.N. Badhani, is one in this series of studies. It is being published with the hope that it will be found useful by those engaged in research and development, policy-making, programme formulation, and implementation for the promotion of enterprises, as well as by the present and potential entrepreneurs in their respective activities.

T. S. Papola
Head
Mountain Enterprises and Infrastructure Division

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K.N. Badhani

Abstract

The farmers of Garampani area of Nainital District in the Central Indian Himalayas have developed specialised skills in cultivating off-season vegetable crops. The present study was conducted to identify the factors and circumstances leading to the switch over by farmers from subsistence to commercial crops, the process of change and adoption, economic impact of change, and its replicability factor.

The study suggests that the existence of a primary market at Nainital was the main factor that induced the farmers from the proximate villages to adopt vegetable farming, and gradually this process of transformation diffused to other villages. Many socioeconomic and behavioural factors influenced the pace and extent of adoption. Markets developed almost autonomously with the increase in the volume of production.

Currently, vegetables are grown in 63 per cent of the area under cultivation. It has increased the farmers' income 2.72 times and direct employment 2.69 times. It has rectified, to a great extent, the unequal distribution of workloads among males and females and checked the rate of migration. However, vegetable growers of the Garampani area are facing many difficulties and need scientific consultation and assistance to resolve them.

Experiences from the Garampani area suggest that the sustainability of mountain agriculture can be ensured by adopting off-season vegetable crops. However, this would need a scientific plan of action in order to maintain a balance among farming, animal husbandry, and natural resources.

Contents

Chapter 1
Introduction: The Study and the Study Area

Development can be defined as a process of all round socioeconomic transformation in a society bringing about a progressive improvement in the well-being of its members. Among the factors that determine development, entrepreneurship is observed to play a key role as its initiator and catalyst. The success of entrepreneurial activity, which is generated by the innovative and risk-taking capacities of individuals, depends, to a great extent, on a favourable environment, but the most essential factor for it is the presence of a high degree of achievement motivation among individuals (McClelland 1976). An entrepreneur who initiates a process of change in society is almost always likely to face resistance, and such 'resistance' depends on the nature, magnitude, and pace of the change. Any economic development programme calling for drastic, unfamiliar, and rapid change in society is unlikely to yield success, because it gives little time to prepare for and absorb such a change. Change is brought about successfully, in an entrepreneurial context, when it involves a logical progression from the status quo to a more profitable set of practices with the same resource base and similar inputs. Therefore, the first logical activity in terms of mountain enterprise development is non-traditional agriculture which includes vegetable and fruit farming and off-farm activities related to agriculture (ICIMOD 1996). Farmers cultivating traditional food grains in mountain regions can be more easily motivated to enter enterprises based on non-traditional agriculture than on other activities. Development of industrial entrepreneurship in these regions is possible only after the development of entrepreneurial abilities and culture through farm entrepreneurship.

However, it is very difficult to initiate the process of entrepreneurial development in mountain regions due to fewer opportunities and high risks associated with both natural and market forces. Inadequacy of basic infrastructure, high costs, and underdeveloped markets, together with other geoclimatic impediments, limit entrepreneurial development in these areas. However, certain comparative advantages are also available to these regions, particularly in terms of biodiversity and climate, which make it possible to grow some varieties of flora during seasons when it is not possible to grow them in the plains. Thus, there are good prospects in the mountains for cultivation of off-season vegetables and fruits that may elicit appreciable market demands. But the economies of mountain areas have traditionally been dominated by food-centred subsistence farming which is becoming both ecologically and economically unsustainable (ICIMOD 1996). Fortunately, self-motivated farmers in many areas have begun to recognise their comparative advantages and take advantage of marketing opportunities through cultivation of cash crops such as vegetables, fruits, etc. The valuable experiences of these farmers provide an opportunity to understand the process of transformation under the very restrictive conditions of mountain economies from subsistence farming into market-oriented agriculture. Other mountain regions can also derive benefits by implementing similar transformation processes. Garampani in Uttar Pradesh, India, is one place where transformation from conventional farming into market-oriented agriculture has taken place, thus making it a good study area.

Objectives of the Study

The objectives of the study are to examine the following.

i. The factors and circumstances that lead to the switch-over fromsubsistence to commercial crop cultivation by farmers
ii. The process of change, its initiators, and adoption by farmers at large
iii. The differential pace and extent of adoption by different groups of farmers, categorised by holding size, socioeconomic characteristics, and education
iv. Initiative and role of women in affecting the change
v. Marketing arrangements, their evolution, and present set-up
vi. Comparative income before and after the change and among adopters and non-adopters
vii. Role of external agents, the state, cooperative agencies, etc
viii. Replicability of the process and its conditions

Garampani: The Area of Study

Garampani is a small town in the Nainital district of Uttar Pradesh. It is situated in the Lesser Himalayan Belt of the Indian Central Himalayas, or Uttarakhand (Figures 1.1 and 1.2). It is about 28km from Nainital on the Nainital-Almora-Ranikhet motor road. Garampani town is well linked with Haldwani, a foothill town and market centre, and Nainital, Almora, and Ranikhet, the famous hill stations (Figure 1.3). This strategic location provides the town with good market access.

The villages adjacent to Garampani town are inhabited by poor and marginal farmers. Traditionally, they cultivated food grains (wheat, rice, course millet *[madua]*), but over the years the cropping pattern has changed. Along ,with farming practices that preserve their traditional biodiversity, the farmers of this area have started to grow vegetable crops which have become their main source of income. The main vegetable crops in this area are capsicum, tomatoes, french beans, cauliflowers, radishes, chillies, potatoes, peas, and so on. Capsicum and tomatoes are supplied to all the main cities of middle northern India, Calcutta, and Assam. The market-oriented farming of vegetables has brought about manifold increases in the income levels of farmers in this area.

Vegetable Fields

Different villages in this area are situated from 1,000 to 2,500masl. These villages have varying climates, soil structure, and surrounding vegetation; therefore, their crop-mix is also diversified. But one thing is common among all these villages, i.e., they have adopted one or other

Figure 1.1: Location of the Study Area

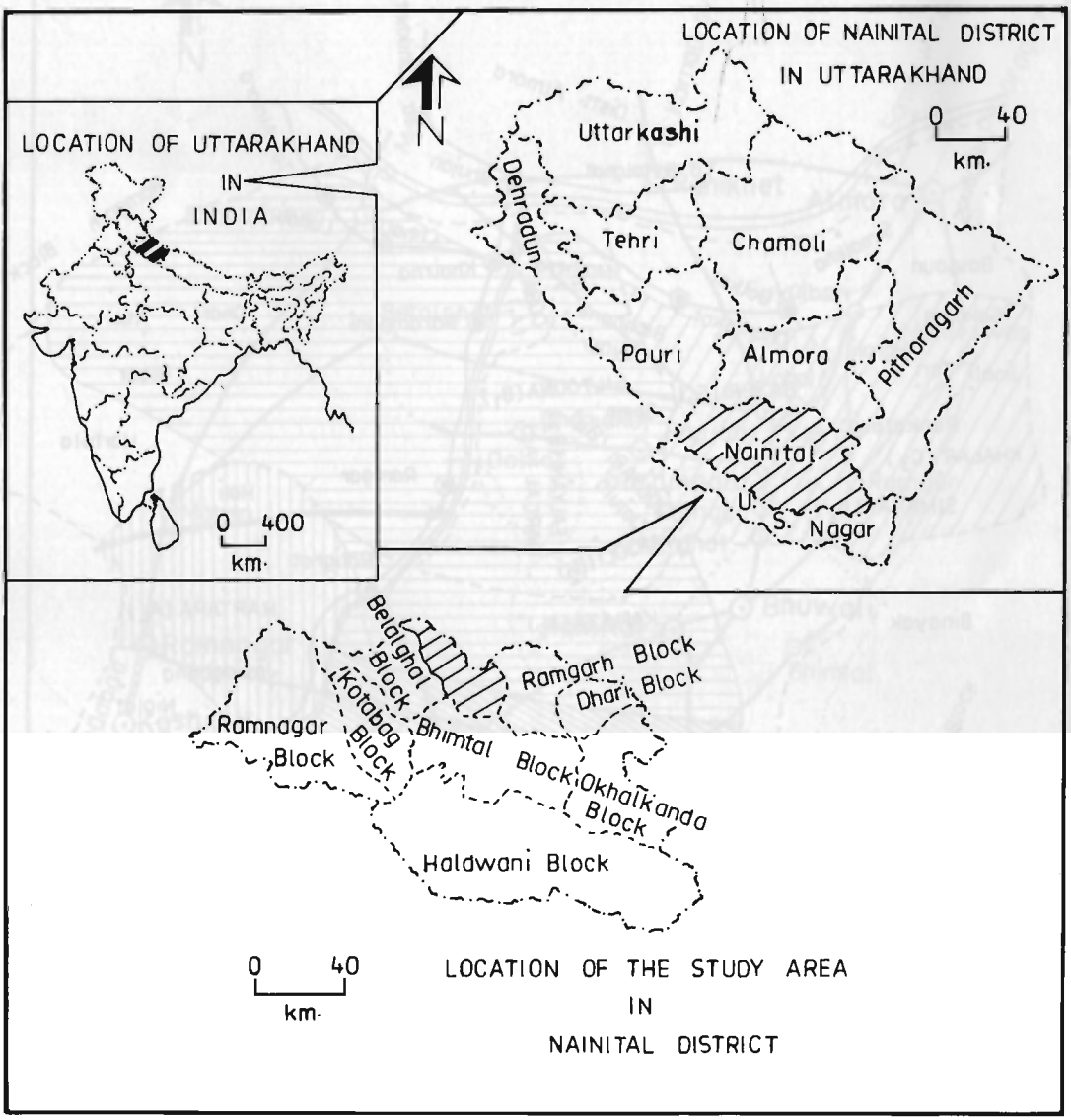


Figure 1.2: Location of the Sample Villages

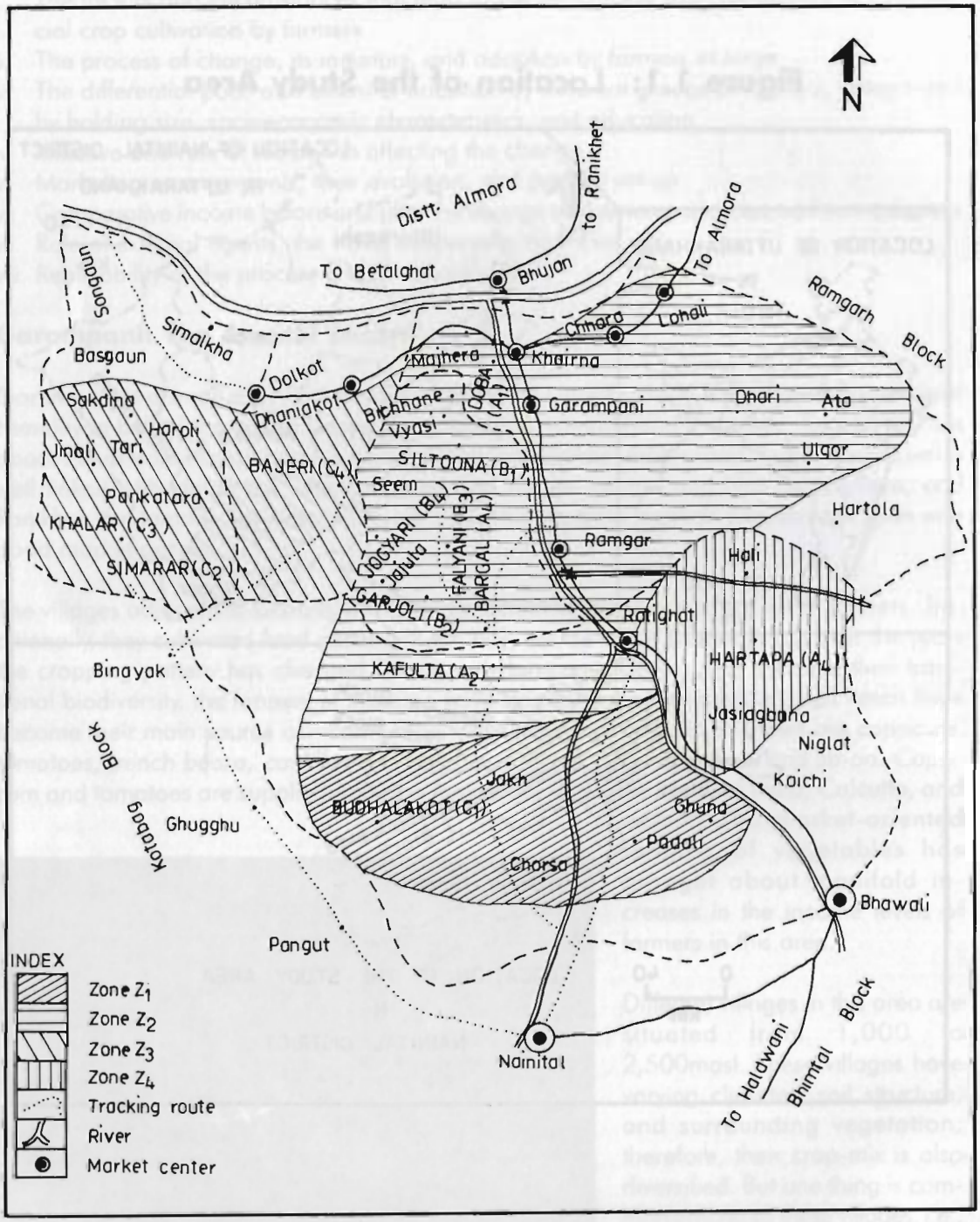
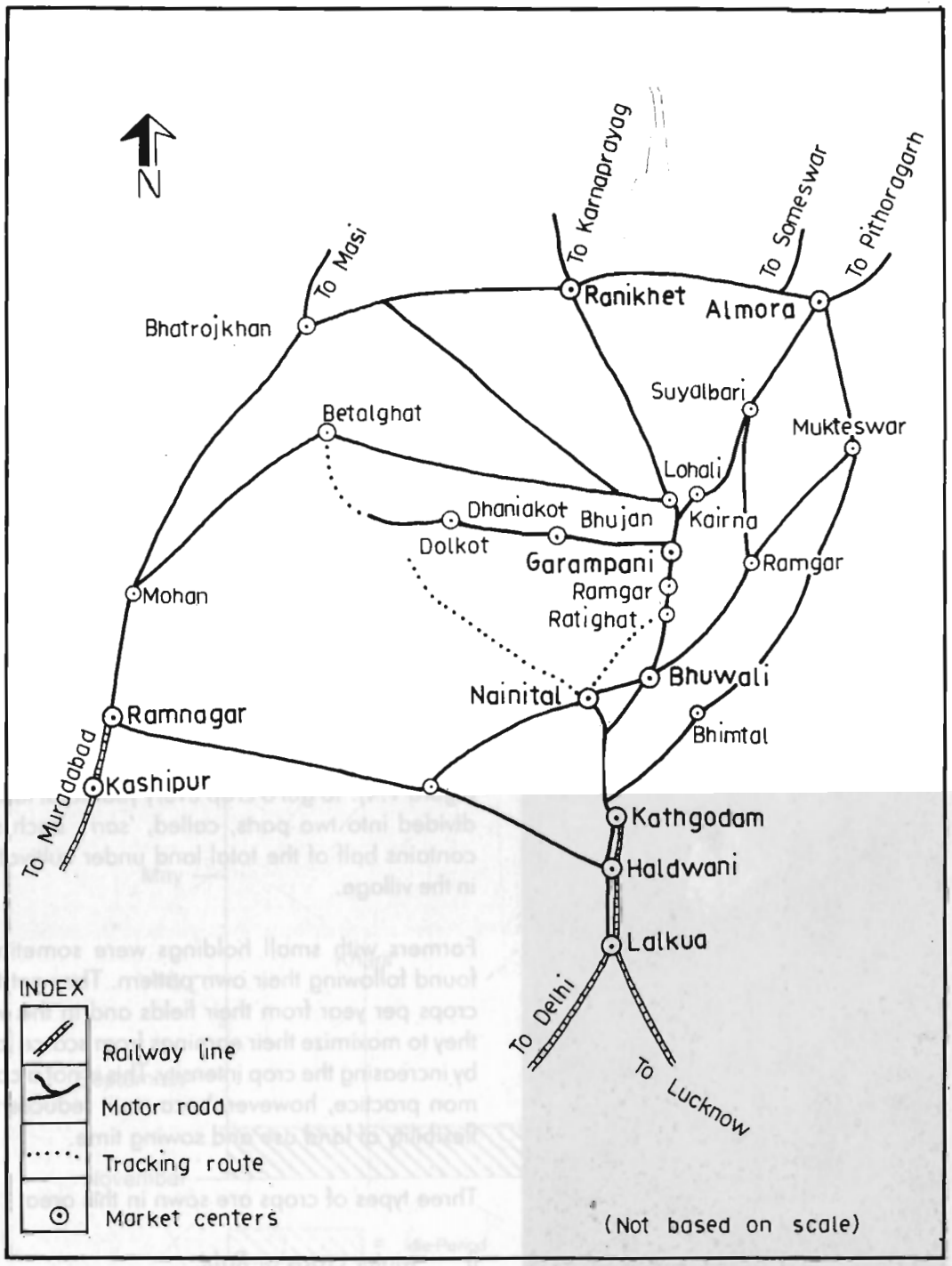


Figure 1.3 : Transport Network around Garampani



vegetable crop as their economic base. The present study does not attempt to correlate the crop-mix with climatic variables. Rather, this study attempts to identify the factors contributing to farm entrepreneurship that led to the transformation from conventional food-centred farming to market-oriented vegetable farming in this region and the economic implications of this transformation.

A *Madua* Field

Two types of land are found in the hill regions: (i) *shera* (*talaon*) or irrigated land and (ii) *uprar* (*upraon*) or unirrigated land. Both types of land are found in the Garampani area. In the present study we have taken into consideration only unirrigated land because of the following reasons.

i) The quality of vegetable crops grown on irrigated lands is very low.
ii) The level of productivity of cereals on irrigated land is satisfactory.

The main problem in hill regions is to make farming on unirrigated land economic. This is also the main focus of the present study.

A Paddy Field

Crop Rotation and Cropping Mix

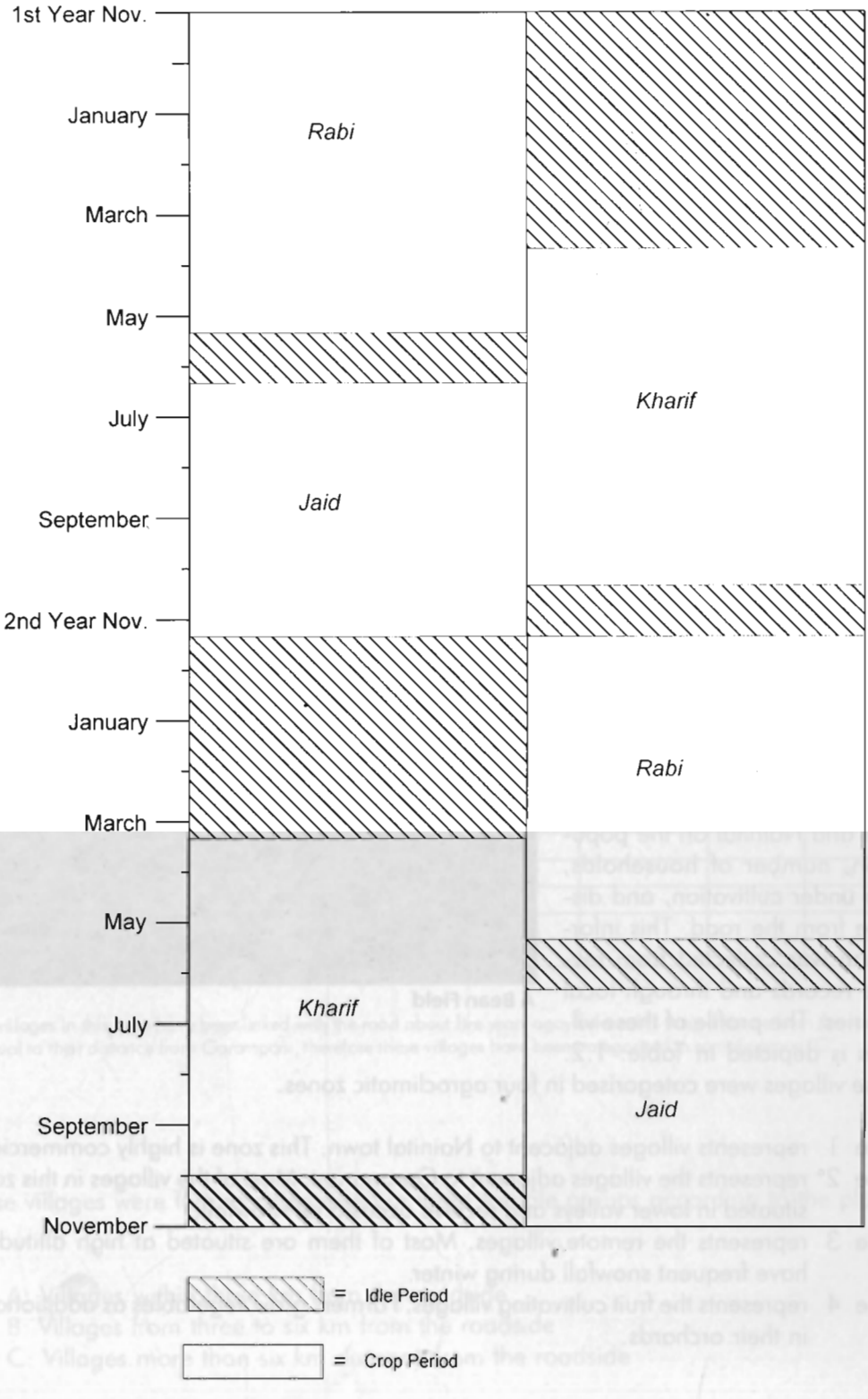
The crop cycle period in this area is two years. During this period, three crops are grown (see Figure 1.4). To get a crop every year total land is divided into two parts, called, '*sari*'. Each *sari* contains half of the total land under cultivation in the village.

Farmers with small holdings were sometimes found following their own pattern. They get two crops per year from their fields and in this way they to maximize their earnings from scarce land by increasing the crop intensity. This is not a common practice, however, because it reduces the flexibility of land use and sowing time.

Three types of crops are sown in this area:

i) winter crops or *Rabi*,
ii) early summer crops or *Kharif*, and
iii) late summer crops or *Jaid*.

Figure 1.4 : The Crop Cycle



The different conventional and commercial crops sown in this area during these crop seasons are given in Table 1.1.

Table 1.1: Different Crops Sown in the Garampani Area

Crop Season	Nature of the Crop	Main Crop	Joint Crops	Sowing Time	Harvesting Time
1. *Rabi*	Conventional	(i) Wheat	Masoor, Mustard	Nov	May
	Commercial	(i) Peas	Mustard, Spinach Coriander	Nov	Mar-Apr
2. *Kharif*	Conventional	(i) Paddy	-	Mar	Sept-Oct
	Commercial	(i) Capsicum	Radish	Nov/Mar*	Jun-Sept
		(ii) Tomatoes	Radish, Paddy	Nov/Mar*	Jun-Aug
		(iii) Beans	-	Mar	Jun-Jul
		(iv) Chillies	-	Nov/Mar*	Sept
3. *Jaid*	Conventional	(i) *Madua*	*Urd, Gahat, Lobia, Chua*	Jun-Jul	Nov
	Commercial	(i) Soyabeans	*Chua*	Jun-Jul	Nov
		(ii) Cauliflower	-	Jun-Jul	Jul-Aug
		(iii) Potatoes	Radish	Aug	Oct-Nov
		(iv) Beans	Radish	Jul	Aug-Sept

** Seeds are sown in the nursery in November and transplanted in the fields during March.*

Methodology : Sample and Data Collection

During the primary survey, a total of 30 villages was identified that were growing vegetable crops in this area. Information was collected from Garampani town and Nainital on the population, number of households, area under cultivation, and distance from the road. This information was collected from revenue records and through local inquiries. The profile of these villages is depicted in Table: 1.2. These villages were categorised in four agroclimatic zones.

A Bean Field

Zone 1 represents villages adjacent to Nainital town. This zone is highly commercialised.

Zone 2 represents the villages adjacent to Garampani. Most of the villages in this zone are situated in lower valleys and receive occasional snowfall.

Zone 3 represents the remote villages. Most of them are situated at high altitudes and have frequent snowfall during winter.

Zone 4 represents the fruit cultivating villages. Farmers grow vegetables as additional crops in their orchards.

Table: 1.2: Profile of the Vegetable Growing Villages in the Garampani Area

Agro-Climatic Zone	Name of Village	Total holding in hectares	Population (1991)	Number of Families	Distance from Road (km)	Distance from Garampani (km)	Distance from Nainital (km)	Sample Group
Z_1	1. Budhalakot	121.568	329	50	7	12	7	C
	2. Jakh	49.200	379	58	3	8	6	A
	3. Chwarsa	27.850	409	61	4	9	7	B
	4. Pandli	49.950	388	54	2	7	6	A
	Total	**248.568**	**1505**	**223**	**-**			
Z_2	1. Kafulta	115.350	536	81	3	6	8	A
	2. Bargal	80.115	270	44	3	6	11	A
	3. Garjoli	41.331	182	31	5	6	13	B
	4. Jajula	36.258	174	28	7	8	15	C
	5. Falyani	11.750	71	13	6	7	14	B
	6. Jogyari	4.800	95	20	6	7	15	B
	7. Siltoona	79.550	513	86	5	6	15	B
	8. Seem	31.085	327	57	4	5	17	B
	9. Darmani	7.875	101	12	4	4	17	B
	10. Vyasi	4.955	144	19	3	3	18	B
	11. Doba	5.261	132	21	2	2	20	A
	12.Lohali	19.707	305	52	5	10	26	B
	13. Dhari	3.488	95	20	4	8	25	B
	Total	**441.525**	**2945**	**484**	**-**	**-**	**-**	
Z_3*	1. Bajeri	72.841	373	61	2	8	19	C
	2. Simarar	79.095	136	44	3	10	16	C
	3. Basot	13.224	82	14	2	10	17	C
	4. Palari	59.050	56	10	2	11	17	C
	5. Songau	59.007	107	20	2	12	18	C
	6. Pan-Katara	22.079	232	34	5	13	16	C
	7. Khalar	39.075	197	73	6	13	15	C
	8. Tari-Jainoli	49.950	510	97	5	15	17	C
	9. Sakdeena	10.705	109	32	6	15	18	C
	Total	**410.026**	**1802**	**385**	**-**	**-**	**-**	
Z_4	1. Hartapa	41.075	575	93	3	7	16	A
	2. Hali	239.075	618	88	7	11	20	C
	Total	**280.150**	**1193**	**181**	**-**	**-**	**-**	
	Grand Total	**1380.269**	**7445**	**1273**	**-**	**-**	**-**	

Source : Revenue Records and Survey

All the villages in this zone have been linked with the road about five years ago, before this their distance from the road was equal to their distance from Garampani, therefore these villages have been categorised in sample group 'C'.

All these villages were further categorised in three sample groups according to the plan of study.

Group A: Villages within three km from the roadside
Group B: Villages from three to six km from the roadside
Group C: Villages more than six km distance from the roadside

Cauliflowers in an Orchard

Villages in zone 'Z_3' have been linked with the road for the last four to five years; before this, they had no motor road facility up to Garampani. Therefore, these villages were included in Group 'C'.

Apart from these 30 villages, other villages in this region are also cultivating vegetable crops in varying quantities, so we have adjusted our estimates with a premium for omission of 10 per cent. Population data were available for 1991. The current population figure was estimated based on a 22 per cent growth rate of the population over the last decade in Uttarakhand. During the sample survey, it was found that the total land holdings could not be used for cultivation because of a number of reasons (e.g., unsuitability of land for cultivation, land used for horticulture, etc). The land under actual cultivation in different zones has been estimated on the basis of this survey (Table 1.3). Similarly, the population in the working age group (14-60) has also been estimated on the basis of the same survey. Some macro-estimates for the sample space are given in (Table 1.4).

Table: 1.3: Estimates of the Land under Actual Cultivation

Zone	Total Holding Area (ha)	Percentage of Land under Actual Cultivation	Land under Actual Cultivation (ha)
Z_1	248.57	80.36	199.75
Z_2	441.53	72.90	321.88
Z_3	410.03	66.71	273.53
Z_4	280.15	72.00	201.71
Total	1380.28	72.22	996.87

Source: Estimates are based on the sample survey.

Table: 1.4: Some Macro-Estimates of the Sample Space

	Particulars	Recorded	Adjustment*	Estimate
1.	Total landholding (ha)	1380.28	138.02	1518.30
2.	Area under cultivation (ha)	996.87	99.69	1096.56
3.	Population (on 1.4.1997)	7445	1826	9271
4.	Population in working age group, i.e., 14-60 (63%)	-	-	5840
5.	Number of households	1273	127	1400
6.	Average holding size (ha)	-	-	1.084
7.	Average size of cultivated area	-	-	0.783

** Adjusted for omission allowance of 10 per cent, for details, please refer to the text.*

B. The Sample

According to the plan, four villages from each of the sample groups were selected randomly. Each village was given a particular code. The sample villages are as follow.

Sample Group	Village Code	Village
A	A^1	Doba
	A^2	Kafulta
	A^3	Bargal
	A^4	Hartapa
B	B^1	Siltoona
	B^2	Gargoli
	B^3	Falyani
	B^4	Jogyari
C	C^1	Budhalakot
	C^2	Simarar
	C^3	Khalar
	C^4	Bajeri

Locations of sample villages in the study area are given shown in Figure 1.3.

A total of seven survey rounds was conducted. Questionnaires were prepared for the first four rounds of the survey, while three rounds were based on unstructured interviews. The techniques used for data collection and analyses are given in Annex 1.

Chapter 2
The Transformation Process and Its Determinants

About 70-80 years ago, the farmers in this area used to practise seasonal migration. They held land in *Bhabar*[*] as well as in the hills. During winter, they used to cultivate crops in *Bhabar* and in the hills during summer. In both places they used to cultivate traditional food grains. But this practice was difficult to maintain, so the farmers decided to settle permanently in one place. The farmers who decided to settle in the hills did so mainly because of the hygienic environment in this area in comparison to *Bhabar* at that time.[**]

This permanent settlement, however, reduced their economic opportunities and the farmers found the yield of conventional crops from their fields inadequate for their subsistance. Nainital had developed as the summer capital of U.P. (Uttar Pradesh, then the United Provinces) and a hill resort by that time. The enterprising farmers of adjacent villages (Zone 1 of our study area) took the opportunity to cultivate and supply vegetables to Nainital. The entrepreneurial leaders of that time are not alive today but farmers in that zone recall that the transformation was not instant. Certain socially active and highly innovative farmers began to grow vegetables on a very small scale and, encouraged by the preliminary success, enlarged the scale of production. Other farmers from the same village, and other villages as well, were inspired by their success and introduced vegetable cultivation.

The Process of Entrepreneurial Innovation

During the initial phase of entrepreneurship, farmers adopted *kharif* (summer) vegetables. But the process of entrepreneurship did not stop there. The farmers collected seeds of cash crops from different places and tested them. Some crops succeeded while others failed. Table 2.1 gives the period of adoption of different, successful commercial crops in this area. Some new crops did not succeed for one reason or another: the zone-wise distribution of failed crops is as follows:

Table : 2.1: The Period of Adoption of Different Commercial Crops in Garampani Area

Crop	Period of Adoption
Capsicum	About 70 years ago
Tomatoes	About 70 years ago
Potatoes	About 70 years ago
Chillies	About 50 years ago
Beans	About 40 years ago
Peas	About 25 years ago
Soyabeans	About 18 years ago
Peas (improved varieties)	About 12 years ago
Cauliflower	About 10 years ago

[*] *The foothills of the Himalayas*
[**] *Malaria was endemic in Bhabar*

Z_1 - sunflower, carrots,
Z_2 - apples, potatoes, sunflowers, carrots, cabbages,
Z_3 - apples, and
Z_4 - apples

Of late, farmers have been adopting improved hybrid varieties of different vegetables (particularly of tomatoes, beans, and peas). Enterprising farmers have also attempted innovations in agricultural techniques and marketing to some extent. Use of chemical fertilizers, fungicides, and insecticides has become popular in the area (particularly in zones Z_1, Z_2, and Z_4). Micro-irrigation facilities have been developed by the farmers at individual and community levels with or without government assistance. Consignments to external markets (wholesale markets) have also become a common practice. In a recent development, a few enterprising farmers have been experimenting with spray-needles for irrigation and poly-houses for seedling cultivation.

Behavioural Factors in Entrepreneurial Innovations

The explorative observations of the survey suggested that only a few farmers initiate the process of entrepreneurial innovation and others follow suit. Certain behavioural characteristics are common to those innovative farmers; they are information seeking, achievement oriented, have a risk taking attitude, and possess the skill to identify opportunities (See Box 1). Innovative leadership is more likely to be found among the types of farmers listed below.

Box 1 : An Enterprising Farmer

During the survey, we found that only a few farmers had entrepreneurial attitudes and skills. They were information seeking, innovative, and creative; and derived full benefits from opportunities. Most of the other farmers just followed their example. About two decades back, Ram Datt Pandey of Hartapa village observed that the yield of wheat in one of his fields was 1.75 qt, 2.50 qt., and 2.00 qt. for three consecutive years. In the fourth year, he decided to grow peas in the same field. Despite a mild loss because of hail, he realised Rs 1,800 by selling the peas from that field. The market price of wheat was Rs 150 per qt. at that time and he was able to purchase 12 qt. of wheat from the proceeds of the sale. He is about 60 years old and has an Eighth grade education. He takes a very deep interest in new agricultural techniques and varieties of seeds. He sent for capsicum seeds from M. Super Co. of Pune about 15 years back and cauliflower seeds from Hazipur, Bihar, about 10 years back. He has established a very good system of micro-irrigation in his fields; he is the only person in this area using spray-needles for irrigation. He has also established a small poly-house for floriculture with the help of a company - Agro-Plantice Ltd. Last year, he sold the flowers worth Rs 6,000 to that company from this single poly-house. Ram Datt Pandey is deriving maximum benefits from the research institutions working in this locality. He often visits them for consultation. Naturally he receives a substantial amount of information. During our visit we found that he was the only person who appreciated the role of the Horticulture Department in providing necessary inputs. This may be because he has derived benefit from their services.

i) Educated and socially active
ii) Having large holdings (farmers with small holdings generally do not like to take risks)
iii) Having an additional occupation (e.g., school teachers)
iv) Having exposure to external society (such as ex-army men and migrants who have returned to their village)

Diffusion of Innovation and Resistance to Change

The process of agricultural transformation in Garampani area, like other processes of social change, was not free from resistance. During its initial phase, older people resisted the process due to their emotional attachment to conventional crops. Women resisted it because vegetable crops do not yield fodder like conventional crops. People also opposed vegetable crops because of the high risks associated with these crops and the amount of labour required. The labour requirement was quite high at that time because Nainital was the only market available and one had to travel on foot to Nainital to sell the vegetables. Irrigation facilities were also not so developed, therefore much time was needed, both for irrigation and for marketing. The pace of transformation was therefore quite slow. Kafulta village adopted this process 10 years after its adoption by Budhalakot village and Bargal, Garijoli, and Falyani, and Khalar adopted it 20 years later. Other villages adopted this process when the dealers' market had developed locally (i.e., 30-40 years ago). In this way the transformation process diffused from the villages in proximity to Nainital town to remote villages. Table 4.2 highlights this process.

The share of vegetable crops in total crop mix was quite low during the initial phase of transformation. It grew slowly with the development of infrastructure (particularly transport and micro-irrigation) and markets, and changes in the attitudes of farmers concerning vegetable crops.

The Role of Women in the Transformation Process

During the initial transformation phase, women generally opposed it because vegetable farming reduced the amount of fodder available; but soon they changed their minds. Women played a very important role in diffusion of the ideas and techniques. When a girl from a vegetable-cultivating village married into a family from a non-cultivating village she brought with her the idea, experiences, and techniques of vegetable cultivation. Seeds and seedlings were also exchanged in these relationships. However, the dominance of men in decision-making limited the effectiveness of this process. The transformation process virtually started only after the men became convinced of its desirability.

The Role of Institutional Efforts in Transformation

During the initial phase of transformation, the British Indian Government encouraged vegetable farming in this area. The seeds were distributed through the Revenue Department and a market was established at Nainital. During recent years, the State Horticulture Department has also played a role despite all its limitations and the inefficiencies as a public sector agency. Credit for introducing many new crops and varieties, such as soyabean, *Arcle* and *Ajad*

varieties of peas, and hybrid varieties of tomatoes; chemical fertilizers; fungicides; insecticides; and spray machines, goes to this Department. But as farmers' needs increased the Department was unable to meet their requirements.

The State Government through different departments also helped to develop micro-irrigation facilities. The Nainital District Cooperative Bank played a role by providing credit to vegetable growers. However, co-operative marketing did not succeed in this area.

Determinants of Transformation and Level of Commercialisation

The existence of a market in Nainital was the basic factor that led to the process of agricultural transformation in this area. Therefore, to a great extent, when a village began the process of commercialisation, the level of adoption in different villages depended on the distance from Nainital. For example, the level of commercialisation in Zone 1 is higher than in Zone 2, although Zone 2 is close to the local market. Tables 2.2 and 2.3 show the time and level of commercialisation in different sample villages.

Table: 2.2: The Transformation Process and Its Determinants

Village Code	Name of Village	Dist. from NTL	Year/Duration of Commercialisation	First Commercial Crops	Inspiring Villages
Z_1/C_1	Budhalakot	6	70 Years	Capsicum	First Village
Z_2/A_2	Kafulta	8	60 Years	Capsicum, Tomatoes	Jakh, Budhalakot
Z_2/A_3	Bargal	11	50-60 Years	-do-	-do-
Z_2/B_2	Garjoli	13	50 Years	-do-	-do-
Z_2/B_3	Falyani	14	50 Years	-do-	-do-
Z_2/B_4	Jogyari	17	20 Years	-do-	-do-
Z_2/B_1	Siltona	15	40 Years	-do-	Bargal, Garjoli
Z_2/A_1	Doba	18	25-30 Years	Tomatoes	-do-
Z_4/A_4	Hartapa	16	25 Years	-do-	Bargal, Garjoli, Siltona
Z_3/C_4	Bajeri	18	15-16 Years	-do-	-do-
Z_3/C_2	Simarar	16	15-16 Years	-do-	-do-
Z_3/C_3	Khalar	15	40-50 Years	Potatoes	Bargal, Garjoli

The factors affecting the transformation process and level of commercialisation are listed below.

(1) Proximity to the Market

In villages that are close to markets (Nainital and local markets), the transformation process began earlier and the present level of commercialisation is higher than in villages in remote areas.

Table: 2.3: Comparative Study of Crop Structure and Level of Commercialisation

Village	Attributes						*RABI*		*KHARIF*		*JAID*		Average
Code	Distance from Road (km)	Distance from Local Market (km)	Distance from NTL (km)	Altitude Code	Dominant Caste Code	Conso-lidation	Crop	% of area	Crop	% of area	Crop	% of area	% of area
A_1	1.50	1.50	18	C	C	No	(1) Peas	60%	(1) Capsicum	50%	(1) Soyabeans	20%	
									(2) Tomatoes	20%	(2) Cauliflower	50%	
											(3) Beans	20%	
								60%		70%		90%	73
A_2	3	6	8	B	C	No	(1) Peas	30%	(1) Capsicum	50%	(1) Soyabeans	50%	
									(2) Tomatoes	30%	(2) Cauliflower	30%	
											(3) Beans	10%	
								30%		80%		90%	67
A_3	3	6	11	B	C	No	(1) Peas	53%	(1) Capsicum	65%	(1) Soyabeans	50%	
									(2) Tomatoes	20%	(2) Cauliflower	32%	
											(3) Beans	10%	
								53%		85%		92%	77
A_4	3	4	16	A	B/C	Yes	(1) Peas	80%	(1) Capsicum	50%	(1) Soyabeans	60%	
									(2) Tomatoes	50%			80%
								80%		100%		60%	
B_1	5	6	15	B	CD	No	(1) Peas	33%	(1) Capsicum	33%	(1) Soyabeans	40%	
									(2) Tomatoes	15%	(2) Cauliflower	30%	
											(3) Beans	10%	
								33%		48%		80%	54
B_2	5	6	13	B	BC	No	(1) Peas	50%	(1) Capsicum	35%	(1) Soyabeans	33%	
									(2) Tomatoes	35%	(2) Cauliflower	25%	
											(3) Beans	17%	
								50%		70%		75%	65
B_3	6	7	14	B	B/D	No	(1) Peas	23%	(1) Capsicum	50%	(1) Soyabeans	40%	
									(2) Tomatoes	17%	(2) Cauliflower	30%	
											(3) Beans	5%	
								23%		67%		75%	55
B_4	6	7	15	B	CDE	No	(1) Peas	40%	(1) Capsicum	30%	(1) Soyabeans	20%	
									(2) Tomatoes	15%	(2) Cauliflower	40%	
											(3) Beans	10%	
								40%		45%		70%	52

Table 2.3 Cont.....

Village Code	Attributes						RABI		KHARIF		JAID		Average % of area
	Distance from Road (km)	Distance from Local Market (km)	Distance from NTL (km)	Altitude Code	Dominant Caste Code	Conso-lidation	Crop	% of area	Crop	% of area	Crop	% of area	
C_1	7	7	7	A	BC	No	(1) Peas	80%	(1) Capsicum	70%	(1) Soyabeans	34%	
									(2) Tomatoes	30%	(2) Cauliflower	33%	
											(3) Beans	33%	
								80%		100%		100%	93
C_2	3*	10	16	A	B	No	(1) Peas	25%	(1) Capsicum	33%	(1) Soyabeans	35%	
									(2) Tomatoes	33%	(2) Cauliflower	25%	
											(3) Beans	10%	
								25%		66%		70%	54
C_3	6*	13	15	A	BC	No	(1) Peas	36%	(1) Capsicum	30%	(1) Soyabeans	5%	
									(2) Tomatoes	40%	(2) Cauliflower	5%	
											(3) Beans	20%	
											(4) Potatoes	50%	
								36%		70%		80%	62
C_4	2*	8	19	B	CD	No	(1) Peas	14%	(1) Capsicum	25%	(1) Soyabeans	22%	
									(2) Tomatoes	25%	(2) Cauliflower	18%	
								14%		50%		40%	35

Notes on Table 2.3

1. Altitude Codes

High Altitude; identified by frequent snowfall during winter and oak forest cover
Medium Altitude; identified by occasional snowfall during winter and pine forest cover
Low Altitude Valleys

Predominant Caste Codes

Brahmin(s) (Purohit or non-cultivators)
Brahmin(s) (Cultivators)
Rajput(s)
Shilpkar(s) (Craftsmen or Scheduled Castes) and Scheduled Tribes

Percentage of area shows the share of land under cultivation of a particular crop to the total land under cultivation in that particular crop season (which is 1/2 of the total cultivated land under the 'sari' system).

Distance from Nainital (NTL) is based on trekking routes.

(2) *Availability of Water Resources*

Most vegetable crops such as capsicum, chillies, tomatoes, cauliflowers, and potatoes require micro-irrigation in order to survive during the summer months. Water is essential for this purpose. Some villages, e.g., Siltoona, began the process rather late, perhaps because of the shortage of water.

On the other hand, the availability of water also had a negative impact on vegetable farming. The villages with irrigated land in Kosya Valley produce wheat and rice in large quantities. Until recently these villages did not attempt to grow vegetables because they were satisfied with high yields of conventional crops on their land and they had no subsistence problems. However, now they have started to grow tomatoes, potatoes, and cauliflowers during the late summer crop season and onions and potatoes during winter crop season.

(3) *Caste and Occupational Structure*

Caste and occupational structure have also affected the level of commercialisation to a considerable extent. *Brahmin*(s) do not cultivate their own farms. In villages where they constitute the majority (e.g., Majhera, only one km from Garampani) only conventional crops are grown. Lower castes (*Shilpkar*) earn their living mainly from handicrafts and do not give much importance to farming. Therefore, the villages in which they form the majority are less commercialised. The highest rate of commercialisation was observed in villages where peasant *Brahmin*(s) and *Rajput(s)* made up the bulk of the population.

(4) *Consolidated Land Holdings*

A high degree of commercialisation was observed in villages with consolidated holdings or *Chakbandi*[1] (e.g., village A_4 in Z_4 zone).

(5) *Availability of Transport*

Although the transformation process has been successful even in remote villages such as Khalar (See Box 2), the level of commercialisation is positively associated with availability of transport. Villages in zone Z_3 increased their vegetable crops after a motorable road was built.

(6) *Size of Land Holdings and Cultivated Area*

It was found that farmers with large holdings were prepared to take more risks, therefore they adopted commercial crops before farmers with small holdings. However, due to labour and other resource constraints, the level of commercialisation is actually low among farmers with large areas of cultivated land.

Land reform and consolidation have not taken place in this area. Most of the consolidated holdings are new settlements (no more than 100 years old).

Box 2 : Role of Infrastructure

Khalar village is situated at a high altitude and is about 13 km from Garampani and about 15 km from Nainital. Before the construction of Khairna-Betalghat link road about five years ago, the nearest motorable road from this village was in Garampani only. However, this did not discourage the farmers of Khalar village from adopting vegetable crops. Inspired by the experiences of Bargal, Garjoli, and other villages in Zone Z_2, the farmers from this village started to grow vegetables about 50 years ago. Being at a high altitude, the yield of potatoes is high; therefore, in the beginning, the farmers adopted potatoes as a commercial crop. Chilli was the second commercial crop adopted by farmers in this village, because it is sold after drying out and does not involve much labour in local transportation. However, 15-20 years ago farmers also started to grow tomatoes and capsicum. They took all the trouble and risk to transport these vegetables from their village to Garampani or Bhujan, walking all the way on difficult hilly tracks and crossing the Koshi River. "Many people lost their horses, and even their lives", says the Headman. The new motor road and new collection centre at Dolkot reduced the cost, time, and risk in transportation considerably. Dolkot is abouts six km from Khalar. About eight years ago, the level of commercialisation was about 10-15 per cent, but now commercial crops are sown on 58.6 per cent of total area under cultivation.

(7) Family Size

Low levels of commercialisation were observed among farmers with large families. This could be because such families need more food security.

(8) Availability of and Gender Composition of Labour

Cultivation of vegetable crops is more labour intensive than staple crop cultivation. The female labour requirements are almost similar for both crop systems but vegetable crops need more male labour for transport and marketing. Therefore, a high degree of commercialisation was observed among families with more male workers.

(9) Education

It has been indicated earlier that more entrepreneurial attitude is found among educated farmers. Therefore, a high rate of commercialisation was found among the educated families. Similarly the farmers having exposure to external society (e.g., ex-armymen, ex-migrants, etc) have adopted commercial crops to a large extent.

Statistical Significance of the Factors Influencing the Level of Commercialisation

The following model was tested using Multi-Variate Regression Analysis:

$$LCOM = CONSTANT + b_1\,DSMR + b_2\,DSNT + b_3\,DSLM + b_4\,HSZE + b_5\,CULT + b_6\,VFSZ + b_7\,NMLE + b_8\,NFLE + b_9\,EDCN + b_{10}\,DSWS$$

where;

LCOM = Level of Commercialisation
DSMR = Distance from motorable road
DSNT = Distance from Nainital
DSLM = Distance from local market
HSZE = Holding size
CULT = Size of area cultivated
VFSZ = Size of family in the village
NMLE = Number of male workers
NFLE = Number of female workers
EDCN = Educational level of the head of the family
DSWS = Average distance of fields from water sources

Data collected through Survey 4 were used for this model.

The results of the analysis are given in Table 2.4. 'Distance from Nainital' was found to be the most influential and significant factor. 'Distance from water source' was also found to be marginally significant. 'Distance from motorable road' shows inconsistent results (positive sign) which may be because of the new motorable road passing through zone Z_3, the impact of which has not yet been fully reflected in crop mixes. The statistical significance of other factors could not be proved. However, 'number of male workers', 'family size', 'size of area' cultivated, 'distance from local market', and 'education level of the head of the family' also influence the level of commercialisation.

Table: 2.4: Determinants of the Level of Commercialisation - Multivariate Regression Analysis

DEP VAR: LCOM N: 60 MULTIPLE R: 0.662 SQUARED MULTIPLE R: 0.438 ADJUSTED SQUARED MULTIPLE R: 0.323 STANDARD ERROR OF ESTIMATE: 17.229

Variable	Coefficient	STD Error	STD Coef Tolerance	T	P (2 Tail)
CONSTANT	87.879	15.903	0.000	5.526	0.000
DSMR	3.711	1.685	0.313 0.5691241	2.202	0.032
DSNT	-2.073	0.741	-0.349 0.7350948	-2.797	0.007
DSLM	-1.014	1.044	-0.133 0.6134794	-0.971	0.336
HSZE	-0.017	0.085	-0.074 0.0812526	-0.197	0.845
CULT	-0.109	0.151	-0.286 0.0729204	-0.722	0.474
VFSZ	-1.080	1.162	-0.281 0.1258659	-0.929	0.357
NMLE	3.266	2.558	0.282 0.2353279	1.277	0.208
NFLE	0.331	2.761	0.025 0.2668065	0.120	0.905
EDCN	0.760	0.643	0.143 0.7824583	1.183	0.243
DSWS	-0.004	0.002	-0.217 0.8028613	-1.817	0.075

Importance of Behavioural Factors

The situational factors included in the above model could explain only 32.3 per cent variability in the level of commercialisation. But entrepreneurship is not a function based only on

ANALYSIS OF VARIANCE

Source	Sum-of-Squares	DF	Mean-Square	F-Ratio	P
REGRESSION	11320.766	10	1132.077	3.814	0.001
RESIDUAL	14545.167	49	296.840		

situational factors, behavioural factors are rather more important determinants of entrepreneurship. The results of the above model highlight the need to include the behavioural factors in the analysis in order to have a better understanding of farmers' behaviour concerning adoption of new crops.

Chapter 3
Evolution of Market and Present Marketing Practices

As we have discussed earlier, the market was the main force behind agricultural transformation in this area. This gives us a good opportunity to study the interplay between marketing and the production system and the process of their evolution—almost without external assistance, particularly in the hill region where lack of marketing facilities is considered the biggest obstacle to entrepreneurial development. About 60-70 years ago, when this process started, Nainital was the only market available in which vegetables were in demand. The production of vegetables was limited to only a few villages adjacent to Nainital. About 40-50 years ago when the Haldwani-Ranikhet-Almora motor road became a popular highway linking Kumaon with the plains, Garampani began to develop as a highway station. Local shopkeepers in Garampani started to purchase vegetables from farmers, first to supply local restaurants and later on to supply external markets. Gradually, a dealers' market at Garampani developed and it inspired more villages in zones Z_3 and Z_4 to grow vegetables by providing them with a secure market without the constraints of local demand.

The vegetable market at Garampani developed gradually. Until recently, it was quite non-competitive. The number of vegetable dealers at Garampani was low and the farmers had to sell their vegetables at prices dictated by them. But now the situation has changed. Increasing numbers of dealers are entering the market and they have started to procure the produce at local level at different locations along the main roads. Farmers have also begun to consign their produce directly to external markets. In the following section an attempt has been made to analyse and evaluate the marketing practices, marketing options, and competitive opportunities and threats together with recent developments in the vegetable market at Garampani.

Local Marketing Practices

(1) Collection of Vegetables

Vegetables are harvested when they become mature and marketable. Tomatoes, however, are collected when they are still green and sold in the local market. These are ripened in the stores before consigning them to external markets.

(2) Local Transportation

The vegetable growing villages are from two to seven km distance from the motorable road, therefore the transportation of vegetables from the village to the road is one of the biggest problems for vegetable growers. They carry the vegetables manually or by horse (mule). Manual transportation is more popular in the villages near Garampani, whereas mules are essential for transportation of vegetables from remote villages (Table 3.1).

A road was constructed about five years ago linking the villages in zone Z_3, and this has reduced the time and effort required for transportation considerably. Before the construction of the road, the farmers from this zone had to carry their vegetables to Garampani or Bhujan crossing the River Koshi, risking their lives and covering a distance of from 13-21km.

Women Going to Market

(3) Marketing Options

Apart from selling their produce to local dealers, the farmers also supply it to markets in the region such as Nainital, Almora, Bhowali, and Haldwani (See Figure 1.3). With the expansion in volume, more and more farmers are selling their vegetables to external markets, particularly to the one in Haldwani. The characteristics of these options in terms of risk, return, and labour involvement, and their adoption by farmers, will be discussed further in this paper.

Table: 3.1 : Means of Transportation

Sample Group	Means of Transportation		
	Horses (Mules)	Manually	Both
A	3 (15)	8 (40)	9 (45)
B	13 (65)	2 (10)	5 (25)
C	12 (60)	-	8 (40)
Total	28 (47)	10 (17)	22 (37)

(Figures in parentheses give the percentage of the sample size)

Transporting Goods to Market

(4)Credit-based Marketing System

Cultivation of vegetables is seasonal in nature and the produce cannot be stored. Therefore, farmers have no flow of income during the off-season and the problem of financing consumption needs arises. Because of a lack of savings, they have to depend on local traders for credit on goods for their day-to-day consumption. The traders charge higher than normal prices for these goods. Later, against this

credit, farmers have to surrender their vegetable produce to the same traders at very low prices. According to a survey carried out in 1988, 89 per cent of the farmers were selling their produce through this system and 51 per cent were heavily dependent on it. The average cost of this credit was 60 per cent per annum (Badhani and Saksena 1990). The situation has improved now. The market is more competitive from the buyers' side and more marketing options are available to farmers. Expansion in the volume of vegetables grown has also resulted in increases in the income and savings of farmers. The farmers still receive credit from traders but the price differential is not so exploitative. More dealers have emerged in various locations (Table 3.3) and more markets are also being used by farmers (Table 3.4). As a result, price differences between the local market and other centres have also decreased (Table 3.5). In the present study, it was found that 62 per cent of farmers are still using the credit-based marketing system (Table 3.2), but most of them are not heavily dependent on it as they are selling their produce in external markets either regularly or occasionally (Tables 3.7 and 3.8). Only eight per cent of farmers sell their entire produce to local dealers. The prices of vegetables at the Haldwani market is 25 per cent higher than the local price level, but, in 1988, it was 50-60 per cent higher (Badhani and Saksena 1990: 15).

A Collection Centre

(5) Collection Centres

Untill recently, Garampani was the only centre in this locality in which vegetables were purchased by dealers. About a decade ago there were 10-12 vegetable dealers in the Garampani area. With expansion in the volume of production, more and more dealers entered the market and began to procure vegetables at local level and from different places on the motorable road such as Ratighat, Ramgar, Chhara, Lohali, Bhujan, and so on. Dhanikot and Dolkot were emerging as important collection centres on the new motorable road in zone Z_3 (See Figure 1.2). About 39 dealers were engaged in vegetable marketing in these different centres (Table 3.3) and their average annual turnover was about Rs 4.5 *lakh*[2].

New collection centres closer to production areas mean that the time, efforts, and cost of transportation decrease considerably and greater production is encouraged. For example, the distance of Khalar village from Garampani is 19 km, but, after the construction of the road and development of Dolkot as a collection centre, the farmers from this village only have to travel six km to sell their vegetables. Because of the road and new collection centre the level of commercialisation in zone Z_3 has increased from about 10 to 50.27 per cent within the last eight years.

2 One *lakh* is a 100,000. There are 42.50 Indian rupees to the US dollars.

Table: 3.2: Number of Farmers Using a Credit-based Marketing System
(Sample size in each Village = 5)

Village	Number of Farmers	Percentage
A_1	2	40
A_2	4	80
A_3	4	80
A_4	4	80
Total A	14	70
B_1	1	20
B_2	5	100
B_3	2	40
B_4	5	100
Total B	13	65
C_1	1	20
C_2	2	40
C_3	2	40
C_4	5	100
Total C	10	50
Total	37	62

Table: 3.3: Different Collection Centres and Number of Dealers

S.No.	Place	Number of Dealers
1.	Ratighat	4
2.	Ramgar	4
3.	Garampani: Upper	4
4.	Garampani: Middle	4
5.	Garampani: Lower	5
6.	Khairna: Upper	4
7.	Khairna: Lower	3
8.	Bhujan	4
9.	Chhara-Lohali	3
10.	Dhanikot	2
11.	Dolkot	2
Total		39

Table: 3.4: Different Market Options and Their Distance from Garampani (by motorable road)

S.No.	Market	Distance from Garampani (Km)
1.	Local	0
2.	Haldwani	56
3.	Nainital	29
4.	Almora	33
5.	Bhowali	18
6.	Ramnagar	111

Table 3.5: Average Prices of Vegetable Crops in 1996-97 (Rs Per Kg)

Crop	Market Options					
	Local	Haldwani	Nainital	Almora	Bhowali	Ramnagar
1. Peas	6.00	7.50	8.00	7.00	6.50	-
2. Capsicum	5.50	7.00	7.50	7.50	6.00	-
3. Tomatoes	3.08	5.81	4.63	5.60	4.35	-
4. Chillies	-	-	-	-	-	40.00
5. Soyabeans	9.10	10.00	-	-	-	-
6. Cauliflower	4.40	6.40	7.75	5.80	4.80	-
7. Beans	4.90	5.43	5.25	6.25	4.00	-
8. Potatoes	5.00	8.00	12.00	-	-	-

Table 3.6: Index of Market Yield [Base: Local Market]
(Based on Average Prices During 1996-97)

Crop	Market Options				
	Local	Haldwani	Nainital	Almora	Bhowali
Peas	100	118	133	108	88
Capsicum	100	105	116	117	106
Tomatoes	100	80	137	144	125
Beans	100	91	86	106	71
Cauliflower	100	133	157	109	91
Average Index	100	105.4	125.8	116.8	96.2
Average C.R. of Market	0.49	0.53	0.59	0.52	0.58
Risk Index	100	108	120	106	118

(6) Packaging

Vegetables are packed before consignment to external markets. Farmers use wooden cases for tomatoes and jute bags for other vegetables. However, the wooden casing is very costly. The cost of wooden cases is about Rs 12 and the capacity is about 7.5kg for tomatoes, thus the farmers have to bear the cost of Rs 1.60 per kg for packaging. The farmers take their produce to Nainital, Almora, and Bhowali and bring back their packing materials. But, packing materials are not brought back from Haldwani market.

Local dealers use baskets made of *arhar* bushes. These baskets are woven by craftsmen who visit Garampani from Lucknow every year during the marketing season. They themselves procure the raw materials for this purpose. These baskets normally contain 10-12kg tomatoes or capsicum and cost Rs six to eight rupees per basket. *Arhar* baskets are not in sufficient supply and dealers still need to use wooden cases.

Weaving Arhar-Baskets - Packing Material

(7) Grading

No grading is carried out by the farmers. However, some dealers separate the superior and inferior grades of vegetables after collection.

(8) Marketing of Soyabeans and Chillies

Apart from green vegetables, soyabeans and chillies are also important commercial crops in this region. Soyabeans fall under the support-price system of the government and they are

Table: 3.7: Main Market Choice: Village-wise Distribution
(Sample Size in each Village = 5)

Village	Number of Farmers		
	Local	Haldwani	Nainital
A_1	5	-	-
A_2	2	3	-
A_3	-	5	-
A_4	-	5	-
B_1	-	5	-
B_2	1	4	-
B_3	3	2	-
B_4	5	-	-
C_1	2	1	2
C_2	5	-	-
C_3	5	-	-
C_4	5	-	-
Total	33	25	2
Percentage	55	42	3

procured by cooperative societies at a fixed price. Farmers also sell soyabeans to local dealers or to the Haldwani market if higher prices are offered. The main market for chillies is in Ramnagar. Farmers sell their produce either directly to the market or to local dealers.

Different Marketing Options: Risk, Returns and Choice

As discussed earlier, farmers have at least five marketing options. They may either sell their own vegetables to local dealers or they may consign them to other markets, e.g., Haldwani, Nainital, Almora, and Bhowali. Chillies are also supplied to the Ramnagar market. In this section an attempt has been made to analyse the nature of demand, labour involvement, return, risk associated with these different marketing options, and rationality of farmers' market choices.

(1) Nature of Demand

The vegetables are in demand locally in Nainital, Almora, and Bhowali. A large number of tourists visit these hill stations every year, particularly in summer. Therefore, there is quite a demand for vegetables during this season. However, due to the small size of local demand, the prices of vegetables decrease very sharply with an increase in supply. There are no such constraints in the Haldwani market and in local markets because vegetables are in demand here as further consignments to external markets.

(2) Time Involved

Farmers have to go to Nainital, Almora, and Bhowali markets to sell their produce: these towns lie at a distance of 29, 33, and 18km respectively from Garampani by motorable road (Table 3.4). Nainital can be also approached by the trekking route. However, vegetables are sent to Haldwani market directly through agents. Therefore marketing in Nainital, Almora, and Bhowali markets is more time consuming and labour intensive than for Haldwani and the local markets.

(3) Price Differences and Returns

The most important consideration in the choice of market is financial returns. Therefore, this study has attempted a comparative analysis of relative price differences in different markets. It should be noted, however, that the prices prevailing in different markets cannot be compared directly because of the differences in marketing costs involved, therefore the following methodology has been used for analysis.

i) The average price of different vegetable crops for the last year (during the marketing season in Garampani) in different markets was obtained from the farmers (Table 3.5).
ii) Ex-farm value of different crops from different villages for different markets was determined as follows:
iii) Ex-farm value=Market Price-Marketing Costs.
iv) Average ex-farm values of different crops for different markets were calculated.
v) These ex-farm values of different crops were expressed in the form of index numbers for different markets taking the local market as the base (Table 3.6).
vi) The Index of Market Yield was worked out by averaging the Index Numbers of five major vegetable crops.

Table 3.6 shows that the prices in Haldwani, Nainital, and Almora are higher than the prices in local markets by 5.4, 25.8, and 16.8 per cent respectively. The price in Bhowali market is lower than the local market by 3.8 per cent.

Table: 3.8: Market Choice (Sample Group-wise Distribution)

(Sample size in each group = 20)

Sample Group	Frequency	MARKETS				
		Local	Hal.	Ntl.	Bhl.	Alm.
A	Frequently	7 (35)	13 (65)	-	-	-
	Occasionally	7 (35)	3 (15)	5 (25)	4 (20)	1 (5)
	Total	14 (70)	16 (80)	5 (25)	4 (20)	1 (5)
B	Frequently	9 (45)	11 (55)	-	-	-
	Occasionally	10 (50)	6 (30)	3 (15)	2 (10)	-
	Total	19 (95)	17 (85)	3 (15)	2 (10)	-
C	Frequently	17 (85)	1 (5)	2 (10)	-	-
	Occasionally	-	10 (50)	8 (40)	-	-
	Total	17 (85)	11 (55)	10 (50)	-	-
Total	Frequently	33 (55)	25 (42)	2 (3)	-	-
	Occasionally	17 (28)	19 (32)	16 (27)	6 (10)	1 (1.6)
	Total	50 (83)	44 (73)	18 (30)	6 (10)	1 (1.6)

(Figures in parentheses give the percentage of the sample size)
Hal = Haldwani
Ntl. = Nainital
Bhl. = Bhowali
Alm. = Almora

(4) Risk and Uncertainty

Attempts have also been made to measure the risk associated with different market options. The following methodology was used for this purpose.

i) The maximum and minimum prices of different vegetables in different markets over the last year were obtained from respondents.

ii) The coefficient of range was worked out for different vegetables in different markets.
iii) The average coefficient of range for different markets was calculated and expressed in terms of an Index Number, i.e., Risk Index (Table 3.6).

The table shows that the yield in external markets is higher but, at the same time, so is the risk involved in comparison to local markets. External markets also involve uncertainties that the above index cannot measure. Respondents said that the prices in Nainital, Almora, and Bhowali and, to some extent, in Haldwani fluctuate very sharply even within a day. This makes these markets more risky.

(5) Choice of Market

Choice of market depends on all of the above factors, i.e., risk, returns, and labour involvement. Limited demand, high risk and uncertainty, and higher labour involvement make Nainital, Almora, and Bhowali less attractive. These markets provide only occasional outlets. Only farmers in zone Z_1 adopt Nainital as a regular market for their vegetable produce.

In 1988, only five per cent of farmers were selling their vegetables in Haldwani (Badhani and Saksena 1997), but a decade later 73 per cent of farmers are doing so and 42 per cent of farmers have adopted Haldwani as the regular market (Table 3.7 and 3.8). As a result of this process, the price differential between Haldwani and local markets has narrowed considerably.

Competitive Opportunities and Threats

Until recently, there was no problem of external competition for the off-season vegetable growers of Garampani but now the vegetable markets are becoming more and more competitive because of the following reasons.

i) With advancement in the means of transportation, the vegetable markets have become national/international instead of local or regional.
ii) Other mountain regions have also started to grow off-season vegetables. Himachal Pradesh particularly is becoming an important off-season vegetable growing region.
iii) With agronomical advancement it has become possible to grow many varieties of vegetables in the plains during the months in which it was not possible to grow them previously.

Table 3.9 shows the marketing seasons for different vegetables in the Himachal Pradesh main competitor region where vegetables are grown in the same seasons as in Garampani. It is seen that Himachal Pradesh is the main competitor for the Garampani area in the vegetable market. The vegetable dealers in Garampani are coping with this competition through a geographical segmentation strategy, as they are supplying their vegetables to eastern markets to avoid the competition from Himachal Pradesh (Table 3.10).

Table 3.9 also shows that the tomato market is under heavy pressure from competition. Tomatoes are available in the Himalayan *terai* and plains up to the first heavy monsoon rain in late June. Gujarat, Maharastra, Andhra Pradesh, and Karnataka have started to grow

Table: 3.9: Competitive Producers of Different Vegetables

S.N.	Vegetable Crops	Marketing	Main Competitors	Other Competitors
1.	Peas	Mar-Apr		Early March: Himalayan *Terai*
2.	Capsicum	Jun-Sept	Himachal Pradesh	May-June: Himalayan *Terai*
3.	Tomatoes	Jun-Aug	Himachal Pradesh	June: Himalayan *Terai*
				July: Maharastra southern India
				August: Punjab
4.	Cauliflower	Jul-Aug	Himachal Pradesh	-
5.	Beans	Jun-Sept	Himalayan *Terai*	-

Table: 3.10: Main Marketing Destinations for the Dealers

S.No.	Market	Vegetable Produce
1.	Haldwani	All, mostly lower grade
2.	Lucknow	Tomatoes, Capsicum, Peas, Cauliflower
3.	Agra	Capsicum, Tomatoes, Peas, Cauliflower
4.	Kanpur	-do-
5.	Sitapur	Tomatoes, Capsicum
6.	Gorakhapur	Tomatoes, Capsicum
7.	Calcutta	Capsicum
8.	Tejpur, Assam	Tomatoes
9.	Delhi	Cauliflower, Capsicum

tomatoes in this season and they reach the markets by the second half of July. The mountain regions cannot withstand this competition because of differences in productivity. The safe period for the tomato cultivators of mountain regions is the first half of July (15-20 days). During this period, the tomato growers of Garampani have to face competition from Himachal Pradesh. Furthermore, the tomatoes from Garampani (ripened in stores) cannot fetch as high a price as the naturally ripened tomatoes of Himachal Pradesh. During the survey, the respondents said that they had not received reasonable prices for tomatoes over the previous three to four years. During our visit to Haldwani in July, we found that tomatoes were selling for Rs 3.30 per kg. and the net saving to farmers (ex-farm) was negative by Rs -0.47. Therefore, the share of tomatoes in the crop mix is declining sharply, and they are being replaced by capsicum. There is a need for quality improvement as well as for market intelligence and agronomical research to determine the viability and most remunerative time period for tomato cultivation in mountain regions in view of the new competitive environment.

Institutional Efforts in Marketing

(1) Cooperative Marketing

U.P. Cooperative Fruit, Vegetable and Drug Marketing Federation-FRUITFED has been working for about a decade. Its headquarters are in Haldwani. It sponsored an auction hall in

Haldwani and tried to procure vegetables from Garampani through Garampani Vegetable and Fruit Marketing Cooperative Society and Almora District Fruit and Vegetable Marketing Cooperative Society with little success. However, these cooperative societies are doing well in the marketing of soyabeans. Green vegetables are highly perishable commodities and marketing them requires very prompt action, which is hard to come by from the cooperative societies in U.P. working in the bureaucratic environment under the tight control of their sponsoring government department.

Delhi Milk Cooperative Federation — Mother Dairy has also been working over the last four years in marketing vegetables and fruits, particularly capsicum, beans, and peaches, through its subsidiary organization — Fruit and Vegetable Growers' Association, Ratighat, Nainital District. The Federation is following the 'elite' target strategy for marketing. It purchases only superior grade vegetables and markets them in Delhi. It tries to cater to the high-value and export market and realises considerably higher prices for the farmers than the local price levels. But it has not been able to succeed so far in selling its idea to farmers, so its volume of operations is very low. On the day of our visit the Association could only collect four quintals of capsicum.

(2) Market Samiti, Haldwani

Haldwani market is regulated by a Market *Samiti* (committee). One of its sub-markets was proposed for Garampani. A building for this purpose was constructed, but the market was not established. Now, this building has been transferred to the Revenue Department.

Many government-sponsored farmer welfare programmes – such as crop-insurance schemes, hand pump schemes, village road construction schemes, etc are executed by the market *samiti*. But most of these schemes are not in tune with the needs of the farmers in mountain regions. In the absence of any organization of their own, farmers are often cheated when they market their produce through agents (See Box 3).

Box 3: Loss in Marketing through Agents

The District Horticulture Officer of Nainital came across three interesting incidences during his visit to the fruit growing belt of the District. In Ghuna village, a farmer consigned a few cases (a case contains about 16-17 kg) of apricots to the Haldwani market after spending Rs 50 per case for packaging, transportation, and marketing. He received a statement of sales from his commission agent of Rs 25 per case. Another farmer in Pyura village also consigned apricots in the same way and received a statement of sales of Rs 75 per case. A third farmer in the same village consigned apricots directly to Ajadpur market through his agent, a transporter. He had to spend a little more, about Rs 60 per case, and realised a gross sale of Rs 135 per case. Although the prices of vegatables and fruits fluctuate considerably, the possibility of commission agents deceiving farmers cannot be ruled out. No one represents the farmer at the market to verify that the farmer is being paid in accordance with the sale of his produce. It is not possible for the farmer to go himself to the market every time. Therefore, *"the farmers will have to form an interest group and will have to make an arrangement to send one of its members in rotation to represent them in the market; only then will the farmers be able to realise reasonable prices,"* said the District Horticulture Officer. *Contributed by District Horticulture Officer, Nainital*

[3] In the context of this paper horticulture refers to commercial vegetable and fruit farming and is not understood within the strict definition of horticulture, i.e., gardening.

Chapter 4
Economic Analysis of Production Costs and Returns

One of the main objectives of the present study is to evaluate the impact of commercialisation of agriculture on the economic well-being of the farmers in this area. For this purpose, detailed costs and production data were collected through a questionnaire. This chapter presents a comparative study of cost of production, productivity, returns, and risks associated with different conventional and commercial crops on the basis of the above data. Attempts have also been made to estimate the total production of vegetables, their value, and impact of commercialisation on per capita income of farmers.

Table 4.1 presents a comparative view of the per hectare cost of cultivation, arrived at using the methodology discussed in Annex 1. The Table gives a detailed analysis of input and labour costs and their components. It also gives the break-up of labour mix, i.e., male and female, ploughman, and ordinary labour. The average wage rates are presented in Table 4.2.

It is interesting to note that a large proportion of labour input, particularly for commercial crops, is counted as ordinary labour. Commercial (vegetable) crops require a lot of labour inputs, particularly for plantation, irrigation, weeding, and collection of vegetables. Conventionally, these activities were performed by women. But, in view of the intense labour requirements, it is not possible for women alone to perform all these tasks, so men also contribute. Similarly, women also participate in marketing activities which were conventionally performed by men. Therefore, almost all the activities in the field as well as in the market, except for ploughing, are performed jointly by men and women. But women mostly carry out the tasks of weeding and manuring. The impact of commercialisation on total labour requirement, labour mix, and labour burdens of men and women has been analysed in Chapter 5.

For computation of prime cost of cultivation, all the inputs, except for organic manure, have been valued at market prices. But, since organic manure does not have a market price, its fair value has been estimated on the basis of the opinion survey of five experienced and educated farmers.

Table 4.3 presents a comparative study of the productivity and economic returns of different crops and risks associated with them. In order to look into the economic effects of commercialisation from different dimensions, different measurements of economic returns have been used in the analysis.

Market prices of different crops are required for evaluation of their economic value and returns. For this purpose, the selling price realised by farmers has been used in the case of commercial crops, while the purchasing price paid by them has been used in the case of cereals. However, market prices for different optional markets cannot be compared at par

Table 4.1: Comparative Study of the Average Cost of Cultivation of Different Crops per ha

S.N.	ITEM		WINTER CROPS		EARLY SUMMER CROPS				LATE SUMMER CROPS				
			Wheat	Peas	Paddy	Capsicum	Tomatoes	Chillies	Madua	Soyabean	Beans	Cauliflower	Potatoes
(A)	Average Output (kg)		1324	5236	1746	10437	8335	1235	1345	1710	6220	11931	10050
(B)	Inputs	(1) Seedlings											
		(i) Quantity (kg/No. of plants)	123	49	99	45732	25171	65867	17	86	41	72453	1112
		(ii) Rate	9.5	27	9.6	0.28	0.15	0.04	5	11.5	55	0.07	14.5
		Cost	1167	1323	950	12805	3776	2635	85	989	2255	5072	16124
		(2) Manure											
		(i) Quantity (kg)	771	915	599	983	1020	1647	264	289	410	1482	1287
		(ii) Rate	5	5	5	7.5	5	5	5	5	5	7.5	5
		Cost	3855	4575	2995	7373	5100	8235	1322	1445	2050	11,115	6,432
		(3) Urea											
		(i) Quantity (kg)	82	91	-	101	44	-	-	-	-	139	-
		(ii) Rate	4.5	4.5	-	4.5	4.5	-	-	-	-	4.5	-
		Cost	371	408	-	456	198	-	-	-	-	624	-
		(4) D.A.P.				-							
		(i) Quantity (kg)	82	132	-	74	103	49	-	-	103	117	87
		(ii) Rate	10	10	-	10	10	10	-	-	10	10	10
		Cost	820	1320	-	740	1030	490	-	-	1030	1170	870
		(5) Fungicides Cost (Rs)	-	2779	-	2351	2907	1976	-	-	1853	2940	-
	Total Cost of Inputs (Rs)		6213	9085	3945	23725	13011	1336	1407	2434	5159	20921	23426
(C)	Labour (hours)												
		(1) Ploughing – Ploughman	161	220	212	188	189	198	166	141	135	176	183
		(2) Plantation – Oridinary	9	85	10	375	319	370	11	82	60	407	395
		(3) Irrigation – Common	-	-	-	3419	3726	2265	-	-	-	2149	889
		(4) Weeding – Woman	-	474	786	1428	1507	1145	231	378	442	942	593
		(5) Manuring – Woman	193	124	132	208	162	132	102	82	31	350	165
		(6) Spraying Fungicides – Man	-	69	-	77	74	49	-	-	83	49	-
		(7) Harvesting & Processing – Ordinary	388	1026	427	847	613	1475	269	326	983	369	922
		Ploughman	128	-	79	-	-	-	90	156	-	-	-
		Woman	-	-	-	-	-	-	-	-	-	-	-
		Total Labour											
		Man	-	69	-	77	74	49	-	-	83	49	-
		Woman	193	598	918	1636	1669	1277	333	460	473	1292	758
		Ploughman	289	220	291	188	189	198	256	297	135	176	183
		Ordinary	397	1111	437	4641	4658	4110	280	408	1043	2925	2206
	Total Farm Labour Hours		879	1998	1646	6542	6590	5634	869	1165	1734	4442	3147

Table: 4.2: Average Wage Rates

	(Rs Per Hour)
Men	6.25
Women	5.92
Ploughmen	17.67
Horsemen	12.50
Ordinary	6.08

because of the differences in marketing costs involved with these options. Therefore, prices in all markets were converted into ex-farm value of crops by deducting the marketing costs from the prices (as discussed in Chapter 3). This was done for all marketing options and sample villages for each crop. Table 4.4 shows the average ex-farm value of different crops for different villages and their average. This average was used as a base for evaluation of economic value of crops in Table 4.3.

The following concepts of the economic returns have been used in the analysis.

1. Gross Monetary Return, computed as:

   total ex-farm value of crops
   - total out-of-packet costs + value of joint crops + value of joint products (fodder etc).

2. Value-Added or Factor Income, computed as:

   gross monetary return
   - imputed cost of self-owned physical inputs

   Factor income (or value-added) realised per labour hour has been computed as follows:

$$\text{V.A. per labour hour} = \frac{\textit{V.A. per ha}}{\textit{Labour hours required per ha}}$$

3. Net Profit, computed as:

   value added - imputed rent of land - imputed cost of total labour.

It is interesting to note that even the most popular vegetable crop from this area, i.e., capsicum, shows a net loss. It is evident from this fact that net gain or loss is not the basic consideration for crop decisions by farmers, and they do not evaluate their own labour at market wage rate. Farmers accept a crop if it provides them with good monetary returns and generates a high factor income, though it may involve a great deal of labour, provided a satisfactory return to their labour is being realised. Table 4.3 shows that potatoes generate the highest factor income followed by cauliflowers and capsicum. However, potatoes can be cultivated only at high altitudes under dryland farming conditions in the mountains. Capsicum is the most popular early summer crop in the area. Cauliflower had recently entered into the crop mix and was increasingly gaining popularity among late summer crops.

A Seasonal Index of Factor Income was developed to show how a farmer can increase his income by growing a vegetable crop instead of the conventional food grain during a particu-

Table: 4.3: Comparative Study of Returns from Different Conventional and Vegetable Crops

per ha

	WINTER CROPS		EARLY SUMMER CROPS						LATE SUMMER CROPS		
	Wheat	Peas	Paddy	Capsicum	Tomatoes	Chillies	Madua	Soyabean	Beans	Cauliflower	Potatoes
Average Output (kg)	1324	5236	1746	10437	8335	1235	1345	1710	6220	11931	10050
Ex-Farm Value (Rs Per kg)	5.05	5.55	4.40	5.01	2.35	36.14	4.00	8.63	3.91	4.58	7.18
Total Ex-Farm Value (Rs)	6686	29060	7684	52289	19587	44633	5380	14757	24320	54644	72159
Total Out of Pocket Expenses (Rs)	1191	5830	-	3547	4135	2471	-	-	5138	7270	16994
Value of Joint Crops (Rs)	1186	4541	-	4613	9880	-	1198	1328	1208	-	4118
Value of Joint Product (Rs)	4942	-	4942	-	-	-	5930	2471	-	-	-
Imputed Cost of Own Labour in marketing (Rs)	-	2625	-	5225	4175	619	-	855	3125	5963	5038
Equivalent monetary returns (Rs)	11623	30396	12626	58580	29507	42781	12508	19411	23515	53337	64321
Imputed Cost of Self-owned Inputs (Rs)	5022	4575	3945	20178	8876	10872	1407	2434	2050	13651	6432
Value Added (Factor Income) (Rs)	6601	25821	8681	38402	20631	31909	11101	16977	21465	39686	57889
Seasonal Index of Factor Income	100	391	100	442	238	368	100	153	193	357	521
Imputed Rent of Land (Rs)	1648	1648	1648	1648	1648	1648	1648	1648	1648	1648	1648
Ex-farm Labour Requirement (Hours)	879	1998	1646	6542	6590	5634	869	1165	1734	4442	3147
Labour Requirement in Marketing (Hours)	-	210	-	418	334	50	-	69	250	477	403
Total Labour Requirement (Hours)	879	2208	1646	6960	6924	5684	869	1234	1984	4919	3550
Imputed Cost of Labour (Rs)	8727	17019	12942	46743	45989	36973	7941	11010	15036	34636	25988
Net Gain or Loss (Rs)	- 3774	7154	-5909	-9989	-25358	-6712	1512	4319	7504	5050	30253
Value-Added Per Farm Labour Hours (Rs)	7.51	11.69	5.27	5.52	2.98	5.61	12.77	13.76	10.81	8.07	16.31
COR of Output	0.49	0.58	0.48	0.62	0.67	0.40	0.35	0.50	0.54	0.70	0.29
COR of Market Price	-	0.46	-	0.43	0.61	0.78	-	0.06	0.57	0.43	0.16
Risk Index	0.49	0.82	0.48	0.83	0.91	0.86	0.35	0.54	0.85	0.86	0.43

Table: 4.4: Average Ex-Farm Value of Different Crops for Different Villages (Year 1996-97)

Crop Groups	Crops	Village												
		A_1	A_2	A_3	A_4	B_1	B_2	B_3	B_4	C_1	C_2	C_3	C_4	Average
(A) Winter	a) Wheat	4.80	4.80	4.80	4.80	5.20	5.10	5.10	5.10	4.80	5.35	5.50	5.30	5.05
	b) Peas	5.26	5.64	5.54	5.84	5.45	5.37	5.00	4.90	5.53	6.60	6.64	4.84	5.55
(B) Early Summer Crops	a) Paddy	4.09	4.09	4.09	4.09	4.59	4.46	4.46	4.46	4.09	4.78	4.96	4.71	4.40
	b) Capsicum	5.71	5.38	5.25	4.96	4.76	4.84	5.18	4.92	5.12	5.07	4.47	4.50	5.01
	c) Tomatoes	2.93	2.53	3.03	2.15	2.25	2.31	2.87	2.58	2.39	1.46	1.77	1.93	2.35
	d) Chillies	-	-	-	-	-	-	-	-	-	-	36.14	-	36.14
(C) Late Summer Crops	a) *Madua*	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
	b) Soyabean	8.95	9.30	8.70	-	8.70	8.50	8.30	8.60	-	8.40	8.47	8.38	8.63
	c) Beans	4.60	4.08	4.10	4.16	-	-	-	-	3.52	3.30	3.74	3.80	3.91
	d) Cauliflower	4.61	4.67	4.51	-	4.50	4.58	4.32	3.90	5.52	-	-	-	4.58
	e) Potatoes	-	-	-	-	-	-	-	-	7.89	-	6.47	-	7.18

lar crop reason. The index number was calculated as follows:

$$\text{Seasonal Index of Factor Income} = \frac{\text{V.A. of the crop}}{\textit{V.A. of conventional crop grown during the relevant crop season}}$$

Table 4.3 shows that a farmer can increase his income 3.91 times by growing peas instead of wheat. Similarly, he can increase his income 4.42 times by growing capsicum instead of paddy and 3.57 times by growing cauliflower instead of *madua* (a coarse millet).

Risk Index

An attempt has also been made to evaluate the risk associated with the cultivation and marketing of different crops. Although the variance is considered the best measurement of risk, it requires observations over a fairly large number of years, and this has not been possible. Therefore, we have used the 'Coefficient of Range (COR)' of output and market prices as a proxi-measurement of risk. The overall coefficient of range or 'Risk Index' has been determined as follows:

$$\text{Risk Index} = \frac{(1+C_1)(1+C_2) - (1-C_1)(1-C_2)}{(1+C_1)(1+C_2) + (1-C_1)(1-C_2)}$$

where, C_1 = COR of output and
C_2 = COR of market price

The respondents were asked to estimate the crop yield of their reference field under most favourable and most unfavourable conditions on the basis of their experiences. These estimates were used for the computation of COR of outputs. It was computed separately for all 12 villages and averaged. Information was also collected from respondents regarding the highest and lowest market prices of different commercial crops in different markets during the previous marketing season. This information was used for computation of the COR of market prices. In reference to each commercial crop, the COR of market price was calculated for all the market options and averaged. The COR of market price for cereals was assumed to be zero.

Table 4.3 shows that tomato cultivation is most risky, followed by chillies, cauliflower, beans, capsicum, and peas. Potatoes are the safest commercial crop. Soyabeans, although risky from the point of view of output, have a low overall risk due to a safe market (soyabeans are sold under the support pricing system). Almost all the vegetable crops, except for potatoes, are more risky than conventional crops.

Rationale of Present Crop Mix

The basic difference between an entrepreneur and a conventional farmer is that the decisions of an entrepreneurial farmer are not taken on the basis of conventions or rule of thumb, although he attempts to maximise his returns and to minimise his risks. The behaviour of an

Box 4: Differences in the Perceptions of 'Promoters' and 'Growers'

Keshawanand Badhani, a school teacher and farmer from Siltoonawas village, was filled with wonder when he found that the soyabean yield was very high in his field. In 1979, he had sent for soyabean seeds from Bhabar. He was the first farmer to grow this crop in the Garampani area. Many farmers in the same year asked him for seeds. Next year, the State Agriculture Department began a programme to promote soyabean farming and very soon it became a popular late summer crop in this area. Farmers found this crop several times more profitable than *madua* (coarse millet), the conventional late summer crop.

Many government agencies and NGOs are trying to popularise soyabean cultivation in mountain regions because, one, it is a good source of vegetable protein and, two, it also enriches the soil through nitrogen-fixing. But, after 15 years of cultivating soyabeans, many farmers in the Garampani area have developed a negative attitude towards this crop because of the following reasons.

i) It reduces the water retaining capacity of the soil,
ii) It has increased the problem of white grubs (*Kurmula*),
iii) The yield of this crop decreases very sharply with repetitive cultivation

Because of these observations, farmers have reduced the share of soyabeans in their crop mixes. Now it is sown on less than 20 per cent of the area under cultivation during the late summer crop season.

The scientists from the Vivekanand Laboratory of Hill Agriculture, Almora, do not completely rule out the above-mentioned observations. However, they note that the reasons may be different. Diseases such as charcolrot or yellow mosain may be responsible for diminishing the yield and excessive nitrogen in the soil or a high rate of soil erosion may cause symptoms such as drought (i.e., reduced water retaining capacity), according to a senior scientist. These are only hypotheses, the actual reasons can only be ascertained after research. However, immediate attention should be given to this situation.

entrepreneurial farmer cannot be explained with the help of the simple two-factor portfolio theory, because, not only does he have to find an optimum trade-off between the absolute returns and risks of a particular crop, he also has to consider the inter-crop linkage and the linkages between crop mix and extra-farm activities. In this section, we will try to understand how the farmers in Garampani area are making decisions about their crop mixes.

As explained earlier, farmers are not trying to maximise their net gains, but they are trying to maximise their factor incomes. This is because they do not evaluate their own labour at market wage rates, which has otherwise almost zero opportunity cost. But at the same time they want to assure a reasonable return for their labour (i.e., value-added per labour hour). That is why crops generating a higher factor income per hour are more popular among farmers in their respective zones of cultivation, e.g., cauliflower and capsicum in zone one and two and chillies and potatoes in zone three

Risk is another factor affecting the crop mix. Tomatoes, once a very popular vegetable crop in this area, are losing their popularity because of high risk (particularly in marketing) and low returns (due to increased competition and packaging costs). Chillies can also be grown in all the zones, but farmers near the market prefer to cultivate green vegetables (capsicum) as they perceive a high marketing risk with chillies.

A careful analysis of the risk and return matrices of different vegetables suggests that the farmers give more weightage to the marketing risk than to the production risk. This is because the production risk is systematic and unidirectional, while the marketing risk is unsystematic. For example, if weather conditions are unfavourable during a particular crop season, they will affect more or less all the crops for that season adversely. Therefore, if a farmer cultivating peas has to bear a loss, the one growing wheat would not be in any better position. The crop mix decision has only a limited role in minimising risks in the case of such systematic risk. On the other hand, the unsystematic marketing risk can be avoided by a change in crop mix. For example, if the market prices of peas become unfavourable it would hardly have any affect on wheat growers. Because of these reasons, the crops with high marketing risks are less popular (e.g., chillies, tomatoes, and beans).

Farmers also evaluate the impact of a particular crop on the fertility of soil and yields of other crops. Although scientists advocate that soyabean increases the fertility of the land through nitrogen-fixing with the help of bacteria, after 15 years' experience in cultivating this crop, farmers have observed that soyabean reduces the water carrying capacity of the soil. They also feel that this crop is associated with the increasing problem of *Kurmula* (white grub), a very harmful pest in this area. Farmers have also experienced a very rapid decline in the productivity of soyabean when it is cultivated on the same land repeatedly. Therefore, they have developed a negative attitude towards this crop. Soyabean, which had once become the most popular late summer crop, is losing its share in the crop mix (see Box 4).

Farmers in this region have not completely discontinued the cultivation of food crops because of the following reasons.

i) Food crops provide them with conventional food, fodder, and other valuable joint products that are not generally available in the market.

ii) Commercial crops are more risky, in terms of both the production risk and market risk, than conventional crops. A share of conventional crops in the crop mix provides farmers with some protection against such risks.

iii) Commercial crops require a lot of labour and good quality organic manure and some water for micro-irrigation. Farmers have to grow conventional crops due to scarcity of these inputs.

iv) Farmers are mainly dependent for food grains on the Public Distribution System (PDS) which is not very reliable and efficient. Therefore, conventional crops provide them with protection against food scarcity.

v) Some lands are not suitable for vegetable growing and only conventional food grains can be grown on these marginal lands.

vi) Farmers have traditional attachment to food crops.

Macro-estimates of Production and Income

In order to evaluate the overall impact of commercialisation of agriculture in this area, estimates of the total production of different crops and income realised by farmers from their cultivation were made using the methodology given below.

i) The total area under cultivation in different zones was estimated.
ii) Assuming that the *'sari'* (part cultivated – part fallow) system is being followed, the total land under cultivation is divided into two parts, each part is equal to the total land under cultivation during a particular crop season.
iii) The proportion of land being cultivated with different crops during a particular crop season was estimated separately for all zones.
iv) Areas cultivated with different crops in different zones were arrived at on the basis of the estimated area in different crop seasons and the proportion of the area cultivated with a particular crop during that season. The total area cultivated with different crops was also calculated (Table 4.5).
v) Total production of different crops in the study area was estimated on the basis of area cultivated and productivity. The production estimates were revised by a 10 per cent omission allowance.
vi) Ex-farm Value (per kg) of different crops and Factor Income (per kg) realised by farmers were calculated from the data given in Table 3.3. Using these figures, the total ex-farm value of different crops cultivated in the area under study and the factor income generated by them were estimated (Table 4.6).
vii) The total factor income from the same land without commercialisation was also estimated using the same methodology as above, assuming that the total area cultivated during different crop seasons would have been used to grow conventional food grains if commercial crops had not been grown. These estimates have been presented in Table 4.7.

Table 4.6 shows that the total agricultural income of farmers in the area under study is Rs 356 *lakh*(s) out of which Rs 306 *lakh*(s) were earned by selling vegetable crops. Thus, farmers in the area derive 86 per cent of their agricultural income (excluding income from horticulture and animal husbandry) from vegetable crops. The estimated population as on 1st April 1997 was 9,271 and per capita agricultural income after commercialisation was Rs 3,840.

Table 4.7 shows that if there were no commercialisation of agriculture, the total factor income of farmers would have been only Rs 131 *lakh*(s) and, therefore, per capita agricultural income without commercialisation would have been only Rs 1,413 (Table 4.8). So, the per capita agricultural income of farmers in this area has increased 2.72 times through commercialisation.

Table: 4.5: Cultivated Area under Different Crops

	Agroclimatic Zones								TOTAL	
Zone	Z_1		Z_2		Z_3		Z_4			
Area (ha)	248.57		441.53		410.03		280.15		1380.28	
Area under actual cultivation (ha)	199.75		321.88		273.53		201.71		996.87	
Crops	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)
(A) *Rabi* (Winter)										
(1) Peas	80	79.90	45	72.42	28	38.29	40	40.34	46	230.95
(2) Wheat	20	19.98	55	88.52	72	98.47	60	60.52	54	267.49
Total	100	99.88	100	160.94	100	136.76	100	100.86	100	498.44
(B) *Kharif* (Early Summer Crops)										
(1) Capsicum	70	69.92	34	54.72	30	41.03	25	25.21	38	190.88
(2) Tomatoes	30	29.96	22	35.41	33	45.13	25	25.22	27	135.72
(3) Chillies	-	-	8	12.88	12	16.41	-	-	6	29.29
(4) Paddy	-	-	36	57.93	25	34.19	50	50.43	29	142.55
Total	100	99.88	100	160.94	100	136.76	100	100.86	100	498.44
(C) *Jaid* (Late Summer Crops)										
(1) Soyabean	-	-	40	48.28	14	19.15	20	20.17	18	87.60
(2) Beans	33	32.96	10	16.09	19	25.98	35	35.30	22	110.33
(3) Cauliflower	34	33.96	24	54.72	-	-	-	-	18	88.68
(4) Potatoes	33	32.96	-	-	17	23.25	14	14.12	14	70.33
(5) *Madua*	-	-	26	41.85	50	68.38	31	31.27	28	141.50
Total	100	99.88	100	160.94	100	136.76	100	100.86	100	498.44

Table: 4.6: Macro-Estimates of Return From Different Crops in Garampani Area

CROP	Area under cultivation (ha)	Productivity (kg/ha)	Production (Tonnes)	Revised* Production Estimate (Tonnes)	Ex-Farm Value (*lakh* Rs)	Factor Income (*lakh* Rs)
(A) Commercial						
1. Peas	230.95	5236	1209	1330	74	66
2. Capsicum	190.88	10437	1992	2191	110	73
3. Tomatoes	135.72	8335	1131	1244	29	31
4. Chillies	29.29	1235	36	40	14	10
5. Soyabean	87.60	1710	150	165	14	16
6. Beans	110.33	6220	686	755	30	26
7. Cauliflower	88.68	11931	1058	1164	53	39
8. Potatoes	70.33	10050	707	778	56	45
Total (A)	943.78	-	6969	7667	380	306
(B) Cereals						
1. Wheat	267.49	1324	354	390	20	19
2. Paddy	142.55	1746	249	274	10	14
3. *Madua*	141.50	1345	190	209	8	17
Total (B)	551.54	-	793	873	38	50
Grand Total	1495.32	-	7762	8540	418	356

** The production estimates are revised by a 10 per cent omission allowance.*

Table: 4.7: Macro-Estimates of Return From Different Crops in Garampani Area without Commercialisation

Crop	Area Under Cultivation (ha)	Revised Estimate of Production (Tonnes)	Factor Income (*lakh* Rs)
(1) Wheat	498.44	660	33
(2) Paddy	498.44	870	43
(3) *Madua*	498.44	670	55
Total	1495.32	2200	131

Table 4.8: Vegetable Farming in Garampani Area
Some Macro Estimates

1.	Area under cultivation of the vegetable crops (ha)	1038
2.	No. of families	1400
3.	Level of commercialisation (weighted average)	63%
4.	Total vegetable grown (in tonnes)	7667
5.	Ex-farm market value of vegetable crops (*lakh* Rs)	380
6.	Income generated through vegetable crops (*lakh* Rs)	306
7.	Per family ex-farm value of vegetable crops (Rs)	27,100
8.	Per capita annual income generated through vegetable crops (Rs)	3,301
9.	Present per capita annual income (Rs) (Excluding income from horti-culture and animal husbandry)	3,840
10.	Per capita income under conventional cropping system (Rs)	1,413
11.	Increase in per capita income due to vegetable crops	2.72 times

Chapter 5
Labour Use and Its Gender Composition

As indicated in Chapter 4, cultivation of vegetable crops is more labour intensive than conventional crops. The Seasonal Labour Requirement Index (Table 5.1) shows that the cultivation of peas requires 2.51 times more labour than wheat; capsicum requires 4.23 times more labour than paddy; and cauliflower requires 5.66 times more labour than *madua* (coarse millet). Total labour requirement is highest for capsicum (6,960 hours/ha) and lowest for *madua* (869 hours/ha). Average labour intensity over the time period is highest for tomatoes (1,385 hours/ha/month) and lowest for wheat (110 hours/ha/month). Further, the distribution of labour requirements over the cultivation period is uneven and skewed. Therefore, the actual intensity of labour requirement during the time period when important farm activities are performed is very high. The conventional division of labour under which most of the farm activities were performed by women is no longer practicable and now almost all the farm activities are performed by males and females jointly. The commercialisation of agriculture has changed both the requirement and the composition of labour. This chapter attempts to evaluate the impact of commercialisation of agriculture on total labour requirements and level of employment and its composition. The methodology used has been described below.

i) Although the involvement of male and female labour in different agricultural activities depends on gender composition of the family together with many other social, economic, behavioural, and situational factors and it may differ from family to family, attempts have been made to make a general analysis of the composition of labour. Five experienced and educated farmers from different villages were asked to make an estimate of the involvement of male and female labour (in terms of percentages) in different activities in cultivating different crops. These estimates were averaged and on that basis

Table: 5.1: Labour Requirement and Labour Intensity for Different Crops

Crop Season	Crop	Total Labour Requirement (hours/ha)	Seasonal Labour Requirement Index	Period of Cultivation (months)	Average Labour Intensity (hours/ month/ha)
Winter	Wheat	879	100	8	110
	Peas	1998	251	6	333
Early Summer	Paddy	1646	100	7	235
	Capsicum	6542	423	7	934
	Tomatoes	6590	421	5	1318
	Chillies	5635	345	7	805
Late Summer	Madua	869	100	5	174
	Soyabean	1165	142	5	233
	Beans	1734	228	3	578
	Cauliflower	4442	566	3	1481
	Potatoes	3147	409	4	787

Table: 5.2: Total Labour Requirements for Different Crops and Their Gender Composition (Hours/ha)

Crops		Total Labour Hours	Male Labour	Female Labour	Female-Male Labour Ratio
A: After Commercialisation					
1.	Wheat	879	395	484	1.14
2.	Peas	1998	829	1169	1.41
3.	Paddy	1646	604	1042	1.73
4.	Capsicum	6542	3378	3164	0.96
5.	Tomatoes	6590	3295	3295	1.00
6.	Chillies	5634	2272	3362	1.48
7.	**Madua**	869	253	616	2.43
8.	Soyabean	1165	460	705	1.53
9.	Beans	1734	747	987	1.32
10.	Cauliflower	4442	2290	2152	0.94
11.	Potatoes	3147	1830	1317	0.72
B: Before Commercialisation (Conventional Division of Labour)					
1.	Wheat	879	298	581	1.95
2.	Paddy	1646	222	1424	6.41
3.	**Madua**	869	177	692	3.91

Table: 5.3: Macro Estimates of Employment after Commercialisation

Crops	Area under Cultivation (ha)	Labour Required (Hours Per ha)	Total Labour Requirement (thousand hours)		
			Male	Female	Total
(A) Commercial Crops					
1) Peas	230.95	1998	215	246	461
2) Capsicum	190.88	6542	636	612	1248
3) Tomatoes	135.72	6590	447	447	894
4) Chillies	29.29	5634	66	99	165
5) Soyabean	87.66	1165	40	62	102
6) Beans	110.33	1734	82	109	191
7) Cauliflower	88.68	4442	203	191	394
8) Potatoes	70.33	3147	128	93	221
Total (A)	**943.78**	**-**	**1817**	**1859**	**3676**
(B) Cereals					
1) Wheat	267.49	879	106	129	235
2) Paddy	142.55	1646	86	149	235
3) *Madua*	141.50	869	36	87	123
Total (B)	**551.54**	**-**	**228**	**365**	**593**
Grand Total	**1495.32**	**-**	**2161**	**2390**	**4551**
Omission Allowance			216	239	455
Total Estimated Employment			2377	2629	5006

Table: 5.4: Estimate of Employment without Commercialisation

Crops	Area under Cultivation (ha)	Labour Requirement (Hours/ha)	Total Labour Requirement (thousand hours)		
			Male	Female	Total
(1) Wheat	498.44	879	149	289	438
(2) Paddy	498.44	1646	110	710	820
(3) *Madua*	498.44	869	88	345	433
Total	1495.32	-	347	1344	1691
Omission Allowance 10%			35	134	169
Total Estimated Employment			382	1478	1860

the total per hectare labour requirement for cultivation of different crops has been divided in male and female labour components. Table 5.2 shows the composition of male and female labour under both the new and the conventional division of labour.

ii) The total labour requirement in the study area or the total employment generated by different crops and its male and female composition have been estimated by multiplying the area under cultivation with per hectare labour requirements. Total employment generated under the new crop mix has been estimated and adjusted for a 10 per cent omission allowance. The results are shown in Table 5.3.

iii) The total employment and its gender composition under the conventional crop mix has also been estimated using the same methodology. The results have been shown in Table 5.4.

Impact of Commercialisation on Total Direct Employment

The total direct employment generated in the study area under the new crop mix is 5006,000 hours (Table 5.3), while total direct employment under the conventional crop mix was 1,860,000 hours Therefore, the new crop mix has increased the employment opportunities by 2.69 times. The results of the sample survey (Table 5.5) shows that 61 per cent of the total population is under the working age-group (i.e., 14-60 years), therefore, the estimated number of agricultural workers in the area is 5,655[4], and per worker employment availability is 885 hours per year.

Impact on Gender Composition of Labour

Table 5.2 shows the ratio of female and male labour required for cultivation of different crops before and after commercialisation (i.e., under conventional and new division of labour). Conventional crops, in general, (except wheat) require a very large amount of female labour in comparison to male labour. Although the involvement of female labour is still more than male labour in many commercial crops, the level of disparity is not so high. Some commercial crops, such as capsicum, cauliflower, and potatoes, involve more male labour than female labour.

[4] *Some of them, particularly school going children in the age-group of from 14-20, may not be full-time workers but they also participate in agricultural activities after school hours*

Table: 5.5: Summary of the Findings of the Survey and Estimates on Employment and Its Gender Composition

1.	Increase in employment due to commercialisation	
	i) Male	6.22 times
	ii) Female	1.78 times
	iii) Total	2.69 times
2.	Total available employment in agriculture in the area under study (thousand hours)	2377
	i) Male	2629
	ii) Female	5006
	iii) Total	
3.	Total population of the area (estimated on 1.4 1997)	9271
4.	Population under the effective working age-group of 14-16 years:	
	i) Percentage (based on sample survey)	61%
	ii) Total	5655
5.	Gender composition of the workers	
	i) Male-female ratio [based on sample survey]	1:0.96
	ii) Male workers (51%)	2884
	iii) Female workers (49%)	2771
6.	Annual workload of workers in agriculture (hours)	
	i) Male	824
	ii) Female	949
	iii) Average	885
7.	Total available employment under the conventional crop mix and division of labour ('000 hours)	382
	i) Male	1478
	ii) Female	1860
	iii) Total	
8.	Annual workload under the conventional crop mix and division of labour	132
	i) Male	533
	ii) Female	329
	iii) Average	665

The total male employment under the conventional crop mix and division of labour was 382,000 hours, while under the new crop mix and division of labour, it is 2,377,000 hours Therefore, male employment in agriculture has increased 6.22 times due to commercialisation and change in division of labour.

The total female employment under the conventional crop mix and division of labour was 1,478,000 hours while, under the new crop mix and division of labour, it is 2,629,000 hours Therefore, women's work load in agriculture has increased 1.78 times due to commercialisation. The results of the sample survey show that the ratio of male to female workers is 1:0.96, therefore the estimated number of male workers in the area under study is 2,884 and the estimated number of female workers is 2,771. The annual workload of a male worker is 824 hours, while that of a female worker is 949 hours, so a woman has to work 1.15 times more than a man on the farm.

The annual workload of agricultural activities is not very high for either male or female workers[5], but the women also have to spend a considerable amount of time in animal husbandry and household activities. Fodder was an important by-product of conventional crops. Its availability has decreased considerably after commercialisation, and women now have to spend more time collecting fodder from the forest. Commercialisation has increased the workload of women not only in farm activities but also in off-farm activities. Therefore, the actual workload of women is very high.

Male and Female Workers

Seasonal Unemployment

Although men are also involved in off-farm activities, their actual annual workload is not as high as that of women. However, we cannot confirm the presence of disguised unemployment among male workers, at least not at micro-level, because the distribution of workload over the year has been quite uneven and skewed; and during the busy agricultural season it is hardly possible to displace a worker without loss in productivity. But, during the lean period (particularly from mid-November to mid-March), the level of farm activities is very low, therefore the male workers (and to some extent female workers) remain unemployed for most of the time during this period.

5 *Although it is high compared to other studies carried out in the mountain region, e.g., Saraswat and Singh (1996, 229) report the annual workload of male and female workers as 395 and 388 hours respectively in Himachal Pradesh.*

Chapter6
Socioeconomic and Environmental Implications of the Transformation

The mountain region has an acute shortage of employment opportunities, therefore the youth of this region have to migrate in large numbers in search of work. While vegetable farming for commercial purposes has impeded this process to some extent by creating more employment opportunities, particularly for men, it has also increased women's workloads, which were already considerably high. Therefore, women's involvement in other activities, such as animal husbandry, had to be reduced. Fodder is an important by-product of conventional crops, and its availability has declined drastically after commercialisation. This has also adversely affected animal husbandry and has increased dependency on the forest for fodder with adverse ecological repercussions. In this chapter an attempt has been made to look into these and related aspects of commercialisation.

I. Impact on Migration

Large-scale outmigration of youth in search of jobs is a unique feature of the Uttarakhand economy. Chand (1996, 179) identifies three stages in this migration process. The first stage was need-based migration, i.e., when youths from only those families that had insufficient land for family subsistence migrated in search of jobs. In the second stage, youths from families that had sufficient land began to migrate, leaving behind women and non-working members of the family. Remittances from migrants became the main source of subsistence for village families. Because of this, the economy of Uttarakhand is often termed a money-order economy. This second stage has also been termed as 'the stage of large-scale migration from the agricultural sector to the service sector'. The third stage of migration involved total family-based urban migration. In this stage, migrants shifted their families to urban areas with them. Bora (1996: 37) observed that the ratio of migrant male workers to the total male workforce was 49.8 per cent in his sample villages in the Pithoragarh and Tehri Districts of Uttarakhand.

The results of the present survey indicate that the commercialisation of agriculture has checked migration to a great extent. In total, 60 families were included in the survey. Of these, 45 persons had migrated in search of alternative jobs. Not all migrated out of distress and/or would have otherwise worked in agriculture. The educated ones particularly migrated for better prospects and would not have worked on farms if they had stayed behind. Therefore, for the present analysis we have considered only those migrants who are in 'menial jobs'.* Out of the 45 persons, 31 persons were engaged in 'menial services', and all were men. The effective rate of migration among male workers, considering only those in menial jobs calculated as a percentage of such migrants to total male workers of the village (including the migrants), was found to be 16.4 per cent (Table 6.1). In most cases, the migration was need-based, but, in some cases, it was also due to the demonstration effect. In a few instances, the migrants returned to their villages after a few years (See Box 5).

Table: 6.1: Outmigration from Garampani Area (Sample Survey)

1.	Total sample families	= 60
2.	Total population of the sample families (including migrants)	= 606
3.	Total population of the sample families residing in the village	= 531
4.	Total number of migrants (i) Male (ii) Female (iii) Total	 = 62 = 13 = 75
5.	Percentage of people migrated	= 12.4%
6.	Purpose of migration (i) Menial jobs (ii) Other services (iii) Business (iv) Housewife (v) Education (and children)	 = 31 = 10 = 4 = 3 = 27
7.	Total working population in the village (in sample families) (i) Male (ii) Female (iii) Total	 = 166 = 158 = 324
8.	Effective rate of migration among male workers	= 16.4%

Box 5 : Decision to Return

Dharmanand, of Falyani Village, tried his best to get a government job after his intermediate examination in 1982. He did not want to stay in the village and work as a vegetable grower. Inspired by many migrants of his acquaintance, he was enthusiastic and hopeful about his future when he left for Delhi in 1984. But things did not go according to his expectations. After many difficulties he got a job as a composer in a printing press. He was paid Rs 800 per month for working an eight-hour schedule. This was hardly adequate even for his own subsistence in Delhi. He had to share a small room with two other workers. The living conditions were quite unhygienic. He suffered from poor health. Finally, he realised that his calculations were wrong and he decided to go back to his village in 1989, after spending five years in Delhi.

Mr. Dharmanand is an enterprising farmer now. He shows great interest in new varieties of seeds and agricultural techniques. He was the first farmer in his village to adopt cauliflower and improved varieties of beans. He also experimented in cultivating cabbage.

Mr. Dharmanand is quite satisfied with his decision. Now he does not have to work under compulsion. His health has improved. He realises that if he had not taken this decision it would not have been possible to improve the standard of living of his family to its present level. *"A wrong perception about urban life and jobs is the main cause of disappointment with vegetable farming among young boys,"* he feels. *"Many of them decide to return after experiencing that life and correcting their perceptions."*

II. Impact on Animal Husbandry

Animal husbandry has been affected by commercialisation of agriculture in two ways: (i) commercialisation increased women's workload, therefore, they have less time to care for their livestock, particularly for collection of fodder; and (ii) the availability of crop residues, which have been the biggest source of fodder in Uttarakhand, has drastically declined after commercialisation (Singh and Naik 1987[6]; Palani 1966: 347; Shah 1997: 49). Due to a sharp decrease in available cattle feed, the number of cattle per family has also decreased considerably. The average number of livestock per family is 5.84 (Table 6.2). A valid inter-area comparison of livestock size is not possible because animal husbandry has been affected adversely by large-scale outmigration in those mountain areas where commercial crops are not cultivated[7] . However, the inter-temporal comparison based on information derived from oral history of the Garampani area confirms the above hypothesis. About 40-50 years ago, per household average livestock holding was about 10-12, represented by seven to eight cows, two oxen, and one to two buffaloes. After commercialisation, the number of cattle decreased by half. Compared to cows, horses (mules) have become popular as they help transport vegetables.

Table 6.2: Average Livestock Holding Per Household in Garampani Area
(Based on Sample Survey)

S.N.	Particulars of Livestock	Average head of livestock (numbers per family)	Percentage of families actually keeping livestock
1.	Cow	0.92	62
2.	Ox	1.77	82
3.	Buffalo	1.77	98
4.	Horse/Mule	0.50	48
5.	Goat	0.88	18
	Total	5.84	100

Animal husbandry and farming in hill regions are complementary and closely interlinked. Since there has been a decline in the supply of organic manure due to the reduction in livestock holding sizes, the sustainability of the transformation process itself has been called into question.

III. Impact on the Environment

The interaction between the environment and vegetable farming is very complex and requires detailed research. The present study does not intend to bring out all of its aspects; however, two quick comments can be made on the basis of our observations.

[6] *According to Singh and Naik (1987, 223) paddy straw accounts for 10%, wheat straw for 12%, madua (coarse millet) and jhangora for 17% and 10%, and barley straw for 2% of total dry fodder production.*

[7] *According to Shah (1997: 48) on an average each family in Khulgad, Almora district, keeps about 6.6 cattle units. Singh (1996: 115) estimates the average livestock holding size as 3 in Uttarakhand.*

First, use of chemical fertilizers, fungicides, insecticides, and so on has increased very rapidly after commercialisation. This could yield the results desired to a limited extent but posed many environmental problems. Many farmers in the Garampani area have now realised that these chemicals are not suitable for dryland farming in mountain regions and are mainly responsible for the decline in soil fertility. Some scientists also endorse their views. According to one respondent, the use of insecticides has endangered the existence of useful insects such as bees. However, the use of these chemicals is still popular because the farmer realises good returns even if only in the short run. Therefore, natural agricultural techniques should be developed and popularised.

Second, reduction in the availability of crop residues for cattle feed has led to more dependence on the forests for fodder and a concomitant decrease of livestock holdings. This is not a desirable development in the light of the contracting forest area in the Himalayan region.

Chapter 7
Problems and Prospects of Vegetable Farming in a Mountain Region

One of the main objectives of the present study is to evaluate the replicability of the transformation process and its conditions. In previous chapters, attempts have been made to highlight some positive as well as negative implications of this process. This chapter attempts to analyse the problems faced by vegetable growers in the Garampani area and their attitude towards vegetable crops after a long experience in vegetable farming. Their experiences could serve as guidelines in developing a plan of action for replication of the transformation process in a more effective and sustainable manner in other mountain areas.

Table 7.1: Average Water Requirements for Micro-irrigation during March-April

Particular	Capsicum	Tomatoes	Chillies	Total
Plants per ha	46,000	25,000	66,000	-
Water requirements per plant per time (litre)	1/4	1/4	1/4	-
Period of irrigation				
(i) days	15	12	15	-
(ii) times	22	17	22	-
Maximum daily water requirements (lit./ha)	23,000	12,500	23,000	-
Per ha total water requirements (thousand lit./ha)	253	106	363	-
Area under cultivation (ha)	190.88	135.72	29.29	255.89
Total water requirements (in 100,000 lit.)	483	144	106	733
Average Water Requirements				
(i) Per household (lit)	-	-	-	52,400
(ii) Per household per day (lit)	-	-	-	1750

Problems of Vegetable Farming

(1) Availability of Water

Water is required for plants to survive during summer just after plantation. Water is given from plant to plant in small pits. Each plant requires about 1/4 of a litre of water at a time. Under normal ground moisture levels, the average watering frequency is about 15-22 times. The estimate of average water requirements is given in Table 7.1. At the present level of commercialisation, a household requires about 1,750 litres of water per day for irrigation

Although the water requirement for irrigation is not very high, it is difficult to manage it in villages that face problems with availability of drinking water. The problem is becoming more serious because many natural sources of water have dried up because of the denudation of their recharge areas (Valdia 1996). An integrated approach covering protection of forests, afforestation of recharge areas, and proper management of available water resources, is required to solve this problem.

(2) White Grub (Kurmula)

White grubs or *Kurmula* are the larvae of beetles belonging to various species of Rutelinae, Melolonthinae, and Dynastinae sub-families (Garg 1997, 294-95). The grub feeds on newly-transplanted seedlings and roots of mature plants. The problem of the white grub is endemic and serious, causing very heavy losses in vegetable yields. Although farmers are using insecticides (mainly Thaimate 10-G) to control it in the larva stage, this has not been very successful. Light trapping may be an effective method for control in the beetle stage, but this requires community-level involvement.

Carrying Water to the Fields

(3) Diseases

Many plant disease are increasingly becoming endemic and causing heavy loss to vegetable growers Summer crops (i.e., *kharif* and *jaid* crops) are more prone to diseases. Damping off of seedlings, root rot, leave spots, and fruit rotting are very common in capsicum and tomatoes. During our field survey we found that in some villages loss caused by fruit rotting is more than 50 per cent for capsicum. Peas (a *rabi* crop) are also affected by powdery mildew and white rot. Farmers are using some common fungicides (Dithane M-45, Thiram, etc) to control these diseases, but they have not been fully contained.

Watering the Fields-Micro Irrigation

(4) *Deteriorating Soil Fertility*

Diseased Capsicum Plants

Declining crop yield, in general, is one of the common experiences shared by the farmers with the survey team. Almost all the crops are affected by this tendency but, according to the farmers, the vegetable crops are more prone to it. This tendency is not limited to the Garampani area, but it has also been experienced in other parts of Uttarakhand (Singh 1996: 115). Depletion of nutrients in the soil, impact of chemicals, climatic changes, etc may be responsible for this. Proper scientific research and an action plan are required to control this process.

(5) *Gap between Research and Extension*

Full benefits of research and development could not be derived by the farmers, either due to lack of information or due to lack of a necessary infrastructure and inputs. Some farmers said during the survey that they sent samples for soil testing to the Departments of Horticulture and Agriculture, but they had not received reports. They also thought that there was no appropriate agency to provide them with information on various scientific aspects of vegetable farming such as fertilizer mix, disease control, pest control, and varieties of seeds. Good quality seeds, fungicides, insecticides, and fertilizers are also in short supply. The government agencies have not proved efficient in providing extension services, therefore private or farmers' own organizations should be promoted for this task. These organizations should operate on business lines; more emphasis should be placed on efficiency and quality, not on subsidy. They should be given research support by the universities and research institutions on a commercial basis. This model of extension will be more effective for areas such as Garampani where a culture of farm entrepreneurship has already developed.

Fruit Rotting in Capsicum: The Most Serious Problem

(6) *Local Transportation*

Vegetable farming is closely associated with transport facilities. Being a perishable commodity, farmers have to carry the vegetables regularly to market. Many villages in the Garampani area are still more than six kilometres

from a motorable road. The hill tracks are in very bad condition. The farmers have to carry their vegetables manually or on horses, and this involves too much time, labour, and risk. A link road passing through the vegetable growing belt is required in this area.

(7) Problems in Marketing

The problems encountered by farmers in marketing vegetables during the initial phase of transformation have been discussed in detail in Chapter Three. Farmers were exploited by a non-competitive market and credit-based marketing system. Although the market has greatly developed now and many marketing options are available to farmers, problems still exist in the marketing process. The farmers who send their produce to external markets, particularly to Haldwani, have to rely completely on commission agents. No farmers' representatives are present at the market at the time of auction. During the survey, we came across certain incidences that indicated that the farmers are sometimes cheated by commission agents. A strong farmers' association is required to represent the farmers at the markets as well as in other areas. A random inspection of the market by members of this association can check such incidences.

Attitudes of Farmers towards Vegetable Farming

Before arriving at any conclusion regarding the replicability and prospects of vegetable farming, it is appropriate to examine the attitudes and opinions of farmers from the Garampani area about vegetable farming after their long experiences. Forty persons from different age groups were interviewed informally and in depth. They were asked to share their experiences and opinions about vegetable farming. On the basis of the attitudes displayed by them during the interview, they were assigned attitude points (Figure 7.1 and Table 7.2). The attitudes of respondents amongst the old and adult age groups were almost similar, but the school going, young respondents displayed quite a different attitude.

Figure 7.1: Attitude Scale used for Measurement of Attitudes of Farmers towards Vegetable Farming

+3 -----	Highly optimistic and innovative
+2 -----	Optimistic and Innovative
+1 -----	Optimistic
0 -----	Indifferent
-1 -----	Pessimistic and compromising
-2 -----	Pessimistic and withdrawing
-3 -----	Highly pessimistic and withdrawing

Respondents in the old and adult age groups had mixed attitudes: 37.5 per cent of them had developed a pessimistic attitude because of the problems they had been facing during recent years (i.e., increasing diseases, deteriorating yields, etc) but none of them (except one) was willing to withdraw from vegetable farming. Only seven (17.5% of the total) respondents were found to have innovative, information seeking, and problem solving attitudes. Out of them, a high level of motivation was found among three respondents. Most of the school going, young respondents showed a negative attitude towards vegetable farming. They wanted to look for alternative jobs, but the alternatives had not yet materialised. However, most of them realised that they would opt for vegetable farming if satisfactory options were not available.

Table 7.2: Attitudes of Farmers in Different Age-groups towards Vegetable Farming

(Number of respondents = 40)

Age Groups	Attitude Points							Number
	-3	-2	-1	0	+1	+ 2	+ 3	
Elders (60 and above)	-	1	4	-	4	2	1	12
Adult: (20-60)								
Male	-	-	4	1	3	2	2	12
Female	-	-	1	-	3	-	-	04
Young school going	2	5	2	1	2	-	-	12
Total	2	6	11	2	12	4	3	40

The Future of Vegetable Farming in Garampani Area

Vegetable growing has increased employment 2.69 times and income 2.72 times. Some farmers are dissatisfied with vegetable farming because of declining yields, but vegetable farming is still much more profitable than conventional farming, therefore they are not likely to withdraw from it. It is not surprising that most young respondents were ambitious and wanted better jobs; but in view of the shortage of employment opportunities, farmers' involvement in vegetable farming is not likely to decrease in future. It is expected that the share of vegetable crops will increase in future, provided more infrastructural facilities (particularly transport facility) are developed in the area.

However, some doubts arise about the sustainability of vegetable farming because of the increasing problems of water, pests, diseases, and declining yields. These problems, if not tackled, will render vegetable farming an unprofitable venture very soon. Therefore, a proper plan of action is needed to solve these problems. The following suggestions can be made in this respect.

1. Community-level cooperation is required to solve most of the above problems, therefore, farmers should be encouraged to engage in community-level involvement through non-government organizations at local level.
2. Trees, particularly fodder species, should be planted in village forests and recharging areas for water sources. Farm forestry is a tradition in Uttarakhand, it should be made more popular. This can solve, to a great extent, the problems of diminishing supplies of water and organic manure. The water resource available should be efficiently managed.
3. Integrated programmes for pest control, as well as for disease control, are necessary. More emphasis should be placed on non-chemical measures; use of chemicals should be minimum and efficient. Light trapping may be an effective method for controlling the white grub; an action plan with community-level involvement should be designed for this purpose. Farmers (particularly farmers with entrepreneurial attitudes) should be made aware of and trained in various methods of disease control such as seed technology, mechanical controls, crop rotation, disease resistant varieties, and chemical control. These techniques will be quickly diffused among the farmers because horizontal transfer of knowledge is found to be more effective in rural societies.

4. Consultancy services (as discussed earlier) should be promoted.
5. A link road should be constructed passing through the vegetable growing belt.

Extension of Vegetable Farming into the Mountain Region

Nature of Replication

It is evident from this case study that vegetable farming can bring about considerable improvement in the income and employment levels in mountain regions. Therefore, other mountain areas should also be encouraged to initiate similar transformation processes in their farming systems. This is not to say that other areas should also adopt the same crop mix as the one in the Garampani area. Mountain areas are extremely diversified in terms of geoclimatic conditions, therefore suitability of different crops, their varieties, and timing will also vary from place to place. This study simply suggests that the farmers should shift their decision base from 'conventions' to 'markets' as true entrepreneurs Many other crops that can fetch higher market prices and can increase farmers' incomes can be identified for the mountain region. The more varied the crop mix in mountain regions, the fewer the risks of inter-area competition, thus farmers can harness their comparative advantages.

However, certain important lessons are implied in the autonomous process of agricultural transformation in Garampani area, and these must be taken into account while replicating this process in other areas. These lessons have been listed below.

i) Agriculture and animal husbandry in mountain regions are highly interdependent. Animal husbandry is likely to be affected adversely by commercialisation due to the shortage of fodder and, consequently, it will hinder the transformation process. Therefore, adequate provision for fodder is a precondition for successful and sustainable transformation. Farm forestry and social forestry may be helpful for this purpose.
ii) Effective management and protection of natural resources (particularly forests and water) are essential for sustainable transformation.
iii) Farmers should be given proper information, particularly on fertility management, pest control, disease control, new agricultural techniques, and seed varieties.

Selection of Areas for Replication

The main motivating factor in the transformation process is the presence of a market, therefore the process is more likely to succeed in those areas in which a primary market for vegetable produce is available. Secondary or dealers' markets would develop gradually with the development of the production process, and simultaneously the transformation process would be diffused to other areas. Although cooperative marketing has not succeeded in the Garampani area, a well- managed cooperative marketing society can be a catalyst for this process.

The Process of Replication

The experiences in the Garampani area suggest that, in the process of diffusion of innovation, horizontal transfer of knowledge is more effective than vertical transfer. There are al-

ways a few enterprising farmers who seek information, identify new opportunities, and take risks to implement innovative ideas. Inspired by their success, other farmers follow suit. Therefore, to initiate the process of transformation, farmers with entrepreneurial traits (e.g., need for achievement, information seeking, innovative, risk bearers, etc) and skills (e.g., skill in identifying opportunities, communications, creative thinking, and planning, etc) should be identified and trained for the transformation. In the initial stages, the pace of transformation is likely to be slow because of sociocultural and infrastructural constraints, but soon the economic motives will induce the process and gradually it will be diffused throughout the entire society. In fact, the process is likely to be faster at present than during the period when it started in Garampani, due to a greater extent of overall commercialisation and better communication facilities.

Infrastructural Support

The following infrastructural support is essential for successful transformation.

i) Micro-irrigation facilities
ii) Transport facilities
iii) A network of government, cooperative, and private institutions to provide necessary inputs (e.g., finance, seeds, fertilizers, pest and disease control measures); consultancy; and marketing facilities.

Chapter 8
Summary of the Main Findings and Conclusions

This chapter summarises the main findings and conclusions of the study.

1. Availability of a primary market in Nainital was the main factor that motivated the enterprising farmers of Garampani to cultivate vegetable crops.

2. The transformation process started about 70 years ago in the villages adjacent to Nainital town, from where it spread to other villages. The pace of transformation was slow during the early years, but it accelerated in the last 10-15 years due to availability of external, secondary markets as a result of the development of transport and marketing networks.

3. The horizontal flow of information (i.e., from farmer-to-farmer) played a predominant role in diffusion of the transformation process over the vertical flow (i.e., from external institutions to farmers). Only a few information-seeking farmers interacted with research institutions or availed themselves of the facilities and services of government agencies.

4. Although the farmers in this region have adopted commercial crops, they have not completely abandoned conventional crops. This is mainly because of resource constraints (particularly those of labour and water) and differences in quality of land; however psychological attachment to conventional crops and lack of adequate provisions for food security were also found to be factors in the continuation of this practice. This practice has increased the biodiversity in this area and preserved the conventional genetic property. Currently, cash crops are sown on 63 per cent of the total area cultivated.

5. The inter-village and inter-household differences in the level of commercialisation are affected by the following factors.

    i) Proximity of markets
    ii) Availability of transport facilities or distance from roadside
    iii) Availability of a minimum level of water for micro-irrigation
    iv) Caste and occupational structure
    v) Consolidation of land holdings
    vi) Size of holdings
    vii) Total labour available and its composition in the family

7. Market and production functions interacted with each other and helped in the development of each other.

8. Market development has been almost an autonomous and spontaneous process, external - state and institutional - efforts have not succeeded. A local market of vegetable

dealers emerged about 30-40 years ago. It developed and gained competitiveness gradually. Until some years ago, most of the farmers had to sell their produce to one dealer under the credit-based marketing system, but this situation has now changed. With expansion in the scale and area of vegetable farming, more collection centres have developed on the road. It has further induced the farmers to produce more, thus providing economy of transportation costs and time. On the other hand, more and more farmers have started to send their produce to external markets.

9. The changes in state of competition in the market have influenced the pay-off and consequently the mix of vegetable crops to a great extent. Tomatoes have lost out in this process.

10. On the basis of comparison of relative yields and market prices, the new crop mix has increased the income of farmers by 172 per cent (2.72 times).

11. Vegetable crops are more risky, in terms of both production risk and market risks, but the income advantages of the former more than offset the risks.

12. Vegetable farming is more labour intensive than conventional farming. The new crop mix has increased employment 2.69 times.

13. The high intensity of labour for the new crop mix has diluted the conventional gender-based division of labour in this area. Men now weed, apply manure, harvest, etc and women participate in marketing activities. An analysis of conventional and modern divisions of labour shows that vegetable farming increased women's workload 1.78 times and that of men 6.22 times. The gender distribution of workloads in agricultural activities is more equitable now, but the total workloads of women are still considerably high because they have also to spend a considerable amount of time in animal husbandry and household activities.

14. To a great extent, vegetable-farming has checked the outmigration of youth in search of menial occupations. The effective rate of migration among male workers is about 16 per cent.

15. Vegetable crops have increased the income levels of farmers, but there are also some unpleasant implications to this process. Fodder is an important by-product of conventional crops, and its availability has declined drastically after commercialisation. Consequently, dependency on the forests for fodder has increased, and this is not a good development from the ecological point of view. The number of cattle (particularly cows) has also decreased after commercialisation of agriculture, leading to a decline in production of milk and organic manure. This situation has raised doubts about the sustainability of the transformation process itself.

16. The following are the main problems impeding the progress of transformation and also affecting the sustainability of vegetable farming in this region.

i) Decrease in water supplies due to drying-up of water sources
ii) Increasing problems with white grubs (*Kurmula*)
iii) Increase in crop diseases
iv) Decline in crop yields
v) Shortage of necessary inputs and lack of information
vi) Problems of local transport

17. The future of vegetable farming depends upon how effectively the above problems are adressed. The following actions need to be taken immediately.

i) Promotion of community-level organizations of farmers (through NGOs)
ii) Afforestation and water management
iii) Promotion of farm-forestry to ensure supplies of fodder
iv) Light trapping of *Kurmula* beetles (the programme should be organized at community level)
v) Training for farmers on seed technology, pest control, and disease control measures
vi) Promotion of consultancy services (research institutions, private agencies, and NGOs can be employed in this task)
vii) Construction of a link road passing through the vegetable growing belt.

18. The experiences of the Garampani area indicate that the commercialisation of agriculture, particularly vegetable farming, could be helpful in ensuring the economic sustainability of agriculture in mountain regions, provided an equitable balance is maintained between agriculture, animal husbandry, and ecological resources. Agronomical research should be addressed towards identifying different crops, varieties, and timings suitable for different localities, and farm economists should ensure their economic viability and market prospects.

19. For initial replication of the transformation process, only the areas in proximity to primary markets (towns) should be selected. The process will diffuse and the dealers' market will develop gradually, following the Garampani model. However, the pace of transformation can be kept high through external support.

20. Since only the farmers with entrepreneurial attitudes and skills are likely to accept the changes and to implement them effectively, they should be identified and motivated. Horizontal transfer of knowledge is found to be effective among farmers and the process is likely to diffuse throughout the whole of society gradually.

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Annex 1
Tools and Techniques for Data Collection and Analyses

Survey-1

The first questionnaire was designed to procure primary information regarding the timing, stimuli, pace, social resistance, and present state of agricultural transformation. This involved an exploratory research design and unstructured interview technique to procure information. Twenty socially active and knowledgeable farmers were interviewed in this survey.

Survey-2

The second questionnaire was designed to get information about the cropping patterns and their determinants in the sample villages. Twenty-four educated and experienced farmers (two from each sample village) were interviewed in this survey.

Survey-3

The third questionnaire was designed to study the cost, yield, and returns from different crops. The respondents and the sample size were the same as in Survey-2. A respondent was asked to take one of his fields with average productivity as a reference field and to estimate the inputs and outputs in reference to all the important crops, one by one.

Survey-4

The fourth questionnaire was designed to study the level of commercialisation (i.e., the percentage of area under commercial crops) and its determinants, marketing practices, and impact of commercialisation on migration and animal husbandry at household level. The sample size for this survey was 60 (5 from each sample village). The households were selected randomly and information was collected from the head or the most active member of the family.

Survey-5

The purpose of this survey was to examine the attitudes of different segments of the farmer population towards vegetable farming. The survey was based on unstructured interviews and no questionnaires were prepared for this purpose. A total of 40 respondents were interviewed (12 elders, 12 male adults, 4 female adults, 12 young, school-going boys). They were asked to share their opinions on the merits, demerits, and the future of vegetable farming.

Survey-6

This survey included the vegetable dealers A total of '10 vegetable dealers working in Garampani and other collection centres were interviewed. The survey involved an unstructured interview and no questionnaire was prepared for this purpose. The respondents were asked mainly the following questions.

i) How long have you been working as a vegetable dealer ?
ii) What is the average volume (value) of vegetables purchased annually?
iii) Where do you supply the vegetables ?
iv) What is the state of external competition ?
v) What are the main problems in vegetable marketing ?

Survey-7

The following officials were interviewed to get information on the different technical aspects and the role of their institutions in promotion of vegetable farming.

i) Senior Scientist, G.B. Pant University Research Centre, Majhera
ii) The Director, a plant breeder, a pathologist, and an entomologist at Vivekanand Lab (ICAR), Almora
iii) Assistant Registrar in the Office of the Additional Registrar of Cooperatives, Uttarakhand, Almora
iv) Officer In-charge of Vegetable Extension in the Directorate of Horticulture, Hills, Chaubatia
v) Deputy Director, Horticulture and District Horticulture Officer, Nainital
vi) Administrator, *Mandi* Society, Haldwani
The surveys were conducted from March 1997 to July 1997.

Analyses of Data

The information collected was analysed from different points of view as given below.

1. Information obtained through Surveys-1, 5, 6, and 7 was qualitative in nature and has been used to form the opinions and suggestions expressed in this report.

2. Survey-2 was designed to study the crop mix in the area under study and the factors determining the crop patterns and level of commercialisation. The information obtained through this survey has been reviewed in Chapter: 4.

3. Very useful data were collected and analysed through Survey-3.

    i) All the figures of costs and revenues were expressed by the respondents in terms of a reference field—the area of which was measured in *nali*. These figures were converted into hectares using the following relationship:1 hectare = 49.42 *nali* (i.e. 20 x 2.471)

ii) Cost sheets were prepared for all the crops showing their per hectare cultivation cost and input and labour components. The cost sheets were prepared for all the villages in a columnar form.

iii) Although it is expected that the yield of a particular crop in different villages may vary due to fertility and climatic differences, the input and labour costs are not expected to vary in a significant manner. The questionnaire demands a high degree of cooperation and intelligence in estimation from the respondents so the possibilities of bias and error due to different reasons cannot be ruled out. Therefore, before estimating the fair average cost, the figures that significantly differed in the group were ignored as biased. A figure was considered biased if it did not fall within the following limits:

$$Limits = \overline{X} \pm t_{0.05,\,n-} \; \sigma / \sqrt{n - 1}$$

iv) Having eliminated the biased responses, the fair average cost of each crop was estimated. The findings have been discussed in Chapter 6.

v) The revenue and other relevant figures were also analysed in the same manner. The detailed methodology and results have been discussed in subsequent chapters

4. The information collected through Survey-4, was used to study the factors influencing the level of commercialisation, and impact of commercialisation on migration and animal husbandry. Multiple Regression Models were used for this purpose. The detailed methodology has been discussed in the chapters concerned.

Annex 2
Questionnaires Used in the Survey*

Questionnaire 1 : Study of the Transformation Process
Research Method : Unstructured Interview
Respondents : Socially Active, Educated and Experienced Villagers

1. Name of the Respondent .....
2. Village .....
3. Age of Respondent .....
4. Occupation of the Respondent .....
5. Educational Status .....
6. Which are the different commercial crops cultivated in your village ? .....
7. When was the cultivation of commercial crops started in your village? [approximate duration] .....
8. Which commercial crop was adopted first? .....
9. Which commercial crops were adopted subsequently (give chronological details as far as possible) .....
10. Whether any commercial crop was discontinued after some time? If yes, why? .....
11. Whether your village was the first to adopt commercial crops in this area? If other villages had previously adopted them, name of the villages .....
12. After how many years did your village adopt the commercial crop compared to their being adopted by other villages in the area .....
13. Who was the first farmer adopting commercial crops in your village? Give possible details about him .....
14. Whether other farmers adopted them immediately or whether these crops expanded gradually in the village? .....
15. If these expanded gradually, which segment of farmers was prompt in adopting them ?.....
16. Whether any group [e.g. male/female, age group etc] opposed the commercial crops during the initial years? Which group supported these crops ? .....
17. How and why did the cultivation of commercial crops start in Garampani area [as per your information and opinion]? .....
18. What are the reasons for the popularity of vegetable crops in Garampani area in comparison to other mountain areas? .....
19. What was the role of government and other institutions in popularising commercial crops .....

* Only light editing has been carried out.

20. What are the benefits derived by farmers in this area through adopting commercial crops and how has it affected their living standards? .....
21. If there is any demerit in commercial crops please explain ?.....
22. What difficulties were encountered by farmers in adopting commercial crops ? .....
23. What was the marketing arrangement during the initial period and how has it been changed over time? .....
24. Whether the farmers in your village continued with the same crops for a long time or whether they are adopting new crops — which are the crops adopted recently? .....
25. Whether any farmer in your village takes more interest in adopting new crops? If yes, give all details possible.....
26. Whether any farmer in your village takes more interest in adopting new agricultural techniques? If yes, give all details possible. .....
27. In your opinion, what steps should be taken to promote commercial crops in this area? .....

Part C : Crop Structure of the Village

Group	Crop	% of land under cultivation	Main/ Subsidiary Crop	Commercial crop/ conventional crop	Name of joint crops	Duration[1]
(1) *Rabi* (Sown in winter)	1. Wheat					
	2. Barley					
	3. Peas					
	4. Masoor					
	5. Mustard					
	6. Spinach					
(2) *Kharif* (Early summer)	1. Paddy					
	2. Capsicum					
	3. Chillies					
	4. Tomatoes					
	5. Beans					
3. *Jaid* (Late Summer) sown in the rainy season)	1. *Madua*					
	2. Soyabean					
	3. Cauliflower					
	4. *Urd*					
	5. *Gahat*					
	6. *Ghangora*					
	7. Potatoes					
	9. Peas					

[1] *Duration for which the crop is being cultivated in the village*

Questionnaire 2 : Study of the Crop Structure
Research Method : Structured Interview
Respondents : Young Educated Farmers, Male/Female

Part A : Particulars of the Respondent

1. Name of the Respondent -
2. Address -
3. Age -
4. Educational Qualification
5. Occupation (besides agriculture, if any)

Part B : Particulars of the Village

1. Name of the village -
2. Distance of the village from the motor road? -
3. Nearest market from the village and its distance? -
4. Number of families in the village? -
5. Distribution of the families according to their caste [percentage]?
   - i) *Brahmin* (purohit) -
   - ii) *Brahmin* [farmers] -
   - iii) *Rajput* -
   - iv) Scheduled Castes -
   - v) Scheduled Tribes -
6. Population of the village [estimated]? -
7. Altitude [estimated]? -
8. Whether irrigation facilities are available or not? -
9. Percentage of irrigated land? -

Questionnaire 3 : Analysis of Cost and Yield
Research Method : Structured Interview
Respondents : Farmer Family, Male and Female Both

Part A : Particulars of the Respondent :

1. Name of the Respondent -
2. Address -
3. Age -
4. Educational Qualification -
5. Occupation (besides agriculture, if any) -

Part B : Particulars of the Reference Field

1. Area of the reference field? -
2. Irrigated/non-irrigated? -
3. Main crops grown in reference field? -
   (a) Rabi crops -
   (b) Kharif crops -
   (c) Jaid crops -
4. Category of the reference field according to its productivity? :
   (a) Very good -
   (b) Good -
   (c) Average -
   (d) Bad -

Part C : Particulars of the Reference Crop

[Please use separate sheets for different reference crops. Choose only main crops for the reference]

1. Name of the reference crop? -
2. Name of the joint crops? -
3. Sowing time? -
4. Harvesting time from - to -?

Part D : Inputs

S.No.	Input	Source	Quantity	Rate	Total Cost
1.	Seed/Plants?				
2.	Organic manure?				
3.	Chemical Fertilizers :?				
	(a) Urea?				
	(b) DAP? (Diammorium Phosphate)				
	(c) NPK? (Nitrogen, Phosphorus, and Potasium)				
	(d) Any other?				
4.	Fungicides/Insecticides				
5.	Any other				

Part E : Labour Requirements?

S.No.	Activities	Total labour hours/days				Cost
		Male	Female	Ploughman	Children	
1.	Ploughing?					
	First					
	Second					
	Third					
	Other					
	(e.g. Danela)					
2.	Sowing/Planting?					
3.	Micro-irrigation?					
4.	Weeding?					
	First					
	Second					
	Third					
	Fourth					
	Fifth					
	Sixth					
	any other					
5.	Manuring?					
6.	Spraying of Fungicides/ Insecticides?					
7.	Harvesting/ Collection?					
8.	Processing?					
9.	Any other?					

Wage rates and working hours :

(a) Male worker? - -
(b) Female worker? - -
(c) Ploughman? - -
(d) Children? - -

Part F : Yield Estimates

1. Expected yield of the reference crop?
   (a) under normal conditions -
   (b) under most favourable conditions -
   (c) under most adverse conditions -
2. Expected yield of the joint crops?
   (a) -
   (b) -
   (c) -

Part G : Marketing Costs

S.No.	Particular	Cost under different market options				
		I option	II option	III option	IV option	V option
		Rs	Rs	Rs	Rs	Rs

1. Processing cost?
2. Packing cost?
   Material?
   Labour?
3. Freight?
5. Fare?
6. *Mandi* (market)
   charges?
7. Any other?

Part H : Value of the Output

1. Purchase price (in the case of cereals)? -
2. Selling price (in the case of commercial crops)?

S. No.	Market option	On the basis of last year's experience		
		Minimum	Maximum	Average
1.	Local Market			
2.	Haldwani *Mandi*			
3.				
4.				
5.				

3. Value of the joint crops?
   (a) -
   (b) -
   (c) -

Questionnaire 4 : Study of *Commercialisation* at Household Level
Research Method : Structured Interview
Respondents : Head/Most Active Member of the Family

1. Name of the Respondent? -
2. Village? -
3. Particulars of the Family?
   i) Total members? -
   ii) Members residing in village? -
   iii) Members residing in village in working age group (14-60)?
   (a) male -
   (b) female -
   iv) Particulars of migrant members :

S.No.	Age	Education	Occupation	Duration of migration

4. The educational level of the most educated member of the family who is engaged in agriculture? -
5. Educational qualifications of the head of the family? -
6. Other occupations of the family members residing in the village besides agriculture, if any ?-
7. Total land holding?
8. Cultivated area?
   own -
   hired -
9. Whether the land is in consolidated form? -
10. What is the average distance of the water source from the fields? -
11. Number of cattle?
    (a) cow -
    (b) ox -
    (c) buffalo -
    (d) horse -
    (e) goat -

12. Total area cultivated with different crops during this year? -

(A) *Rabi* crops
   i) Wheat -
   ii) Pea -
   iii) Others -

(B) *Kharif* crops
   i) Paddy -
   ii) Capsicum -
   iii) Tomato -
   iv) Chilli -
   v) Others -

(C) *Jaid* crops

i) *Madua* -
ii) Soyabean -
iii) Cauliflower -
iv) Beans -
v) Others -

ICIMOD

ICIMOD is the first international centre in the field of mountain development. Founded out of widespread recognition of environmental degradation of mountain habitats and the increasing poverty of mountain communities, ICIMOD is concerned with the search for more effective development responses to promote the sustained well being of mountain people.

The Centre was established in 1983 and commenced professional activities in 1984. Though international in its concerns, ICIMOD focusses on the specific, complex, and practical problems of the Hindu Kush-Himalayan Region which covers all or part of eight Sovereign States.

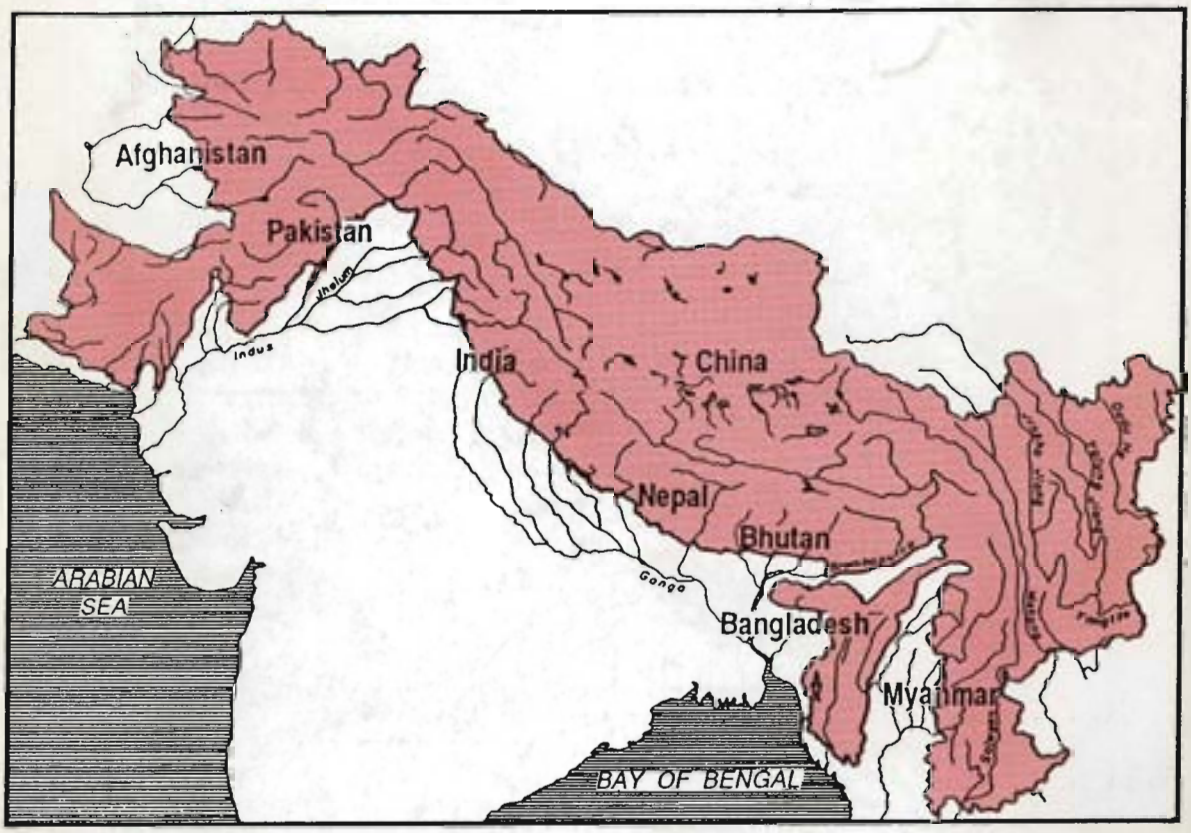
ICIMOD serves as a multidisciplinary documentation centre on integrated mountain development; a focal point for the mobilisation, conduct, and coordination of applied and problem-solving research activities; a focal point for training on integrated mountain development, with special emphasis on the assessment of training needs and the development of relevant training materials based directly on field case studies; and a consultative centre providing expert services on mountain development and resource management.

Mountain Enterprises and Infrastructure Division

Mountain Enterprises and Infrastructure constitutes one of the thematic research and development programmes at ICIMOD. The main goals of the programme include i) gainful enterprise development and income generation; ii) harnessing mountain specific advantages; iii) infrastructural development (social and physical); iv) sustainable energy resources for mountain development; and v) capacity building in integrated mountain development planning.

Participating Countries of the Hindu Kush-Himalayan Region

- Afghanistan
- Bhutan
- India
- Nepal
- Bangladesh
- China
- Myanmar
- Pakistan



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