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.