Three

Study Methodology and Socioeconomic Profile of Farm Households

Broadly, the farming systems in Sikkim can be classified into three main categories. The farming system in the northern district is dominated by large cardamoms, whereas in the east, west, and south, it is dominated by maize-potatoes at higher elevations and paddy, maize, ginger, and mandarin oranges at lower elevations. All the farming systems are, however, in the process of transition and have attained different levels of development. For example, while farming systems dominated by large cardamoms are market-oriented and relatively more developed, those dominated by maize-potatoes and rice-maize are mainly subsistence-oriented, although farming of high-value cash crops, such as ginger, is increasing.

Study Area and Sample Size

A multi-stage, stratified sampling technique was followed to select sample farmers in the study areas. A direct and indirect assessment of the existing agriculture was made through reconnaissance field visits to all the four districts of the state. Based on this exercise, the northern and southern districts were selected purposively for the study. The *Bhutia* farmers in Kabi *panchayat*, located at 28km away from Gangtok, were selected in order to study a large cardamom-dominated farming system, and the *Sherpa* farmers in Jaubari panchayat, 10km from Namachi, were selected to represent the maize-potato dominated subsistence farming system. The total number of households in these two *panchayat*(s) and their distribution according to land ownership, are provided in Table 3.1.

The climates of both *panchayat*(s) are temperate. The main weather parameters of the two selected *panchayat*(s) are presented in Table 3.2.

Table 3.1: Distribution of Households According to Their Land Ownership Status in the Selected *Panchayat*(s)

Size class (ha)	Category	Cardamom-dominated system (Kabi)		Maize-potato dominated system (Damthang)		Total of both systems	
		Number	%	Number	%	Number	%
Up to 2	Small	178	76.07	154	76.62	332	76.32
Above 2	Large	56	23.93	47	23.38	103	23.68
Total		234	100	201	100	435	100

Source : Participatory Rural Appraisal (PRA), 1996

Table 3.2 Weather Parameters of the Two Farming Systems

Parameters	Cardamom-dominated system	Maize-potato dominated system
Ethnicity	*Bhutia*	*Sherpa*
Altitude (m)	1,200-2,000	1000-2000
Rainfall (mm)	3,000-4,000	1500-2200
Ambient air temperature (°C)		
- Minimum	3-14	1-10
- Maximum	15-30	12-27
Average	10-22	6-19
Soil temperature (°C)	10-24	9-20
Relative humidity (%)	70-98	80-97
Snowfall (frequency)	-	Occasionally

Source: Field observations over the years

A sample of 90 households — 50 from the maize-potato dominated system and 40 from the large cardamom-dominated system — were selected following a proportional allocation method for the study (see Table 3.3). Since a preponderant majority of the households is small, owning less than two hectares of land, the households were classified into two categories: those owning up to two hectares (small farmers) and those owning above two hectares (large farmers).

Table 3.3 Sample Size from the Two Systems Selected

Category	Cardamom- dominated system (Kabi)		Maize-potato dominated system (Damthang)		Total sample size	
	Number	%	Number	%	Number	%
Small	30	75	38	76	68	76
Large	10	25	12	24	22	24
Total	40	100	50	100	90	100

Source: Computed from the above table

Data Collection and Analysis

In order to accomplish the objectives of the study, a combination of Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA), and Formal Survey Methods was employed. This was done by staying with the farmers for about 10 to 15 days in each of the two *panchayat*(s). Data were collected using a well structured, pre-tested questionnaire (see Annex III) on various aspects of the household economy such as the demographic features, literacy, occupational structure, cropping patterns, input use, crop yields, consumption patterns, and so on.

The model presented in Figure 3.1. was used as a basis for determining the scale of empirical work. While analysing the livelihood options, the socioeconomic aspects of the sample households were used as important factors, along with the physical and institutional infrastructures that shape the nature of livelihood options being practised

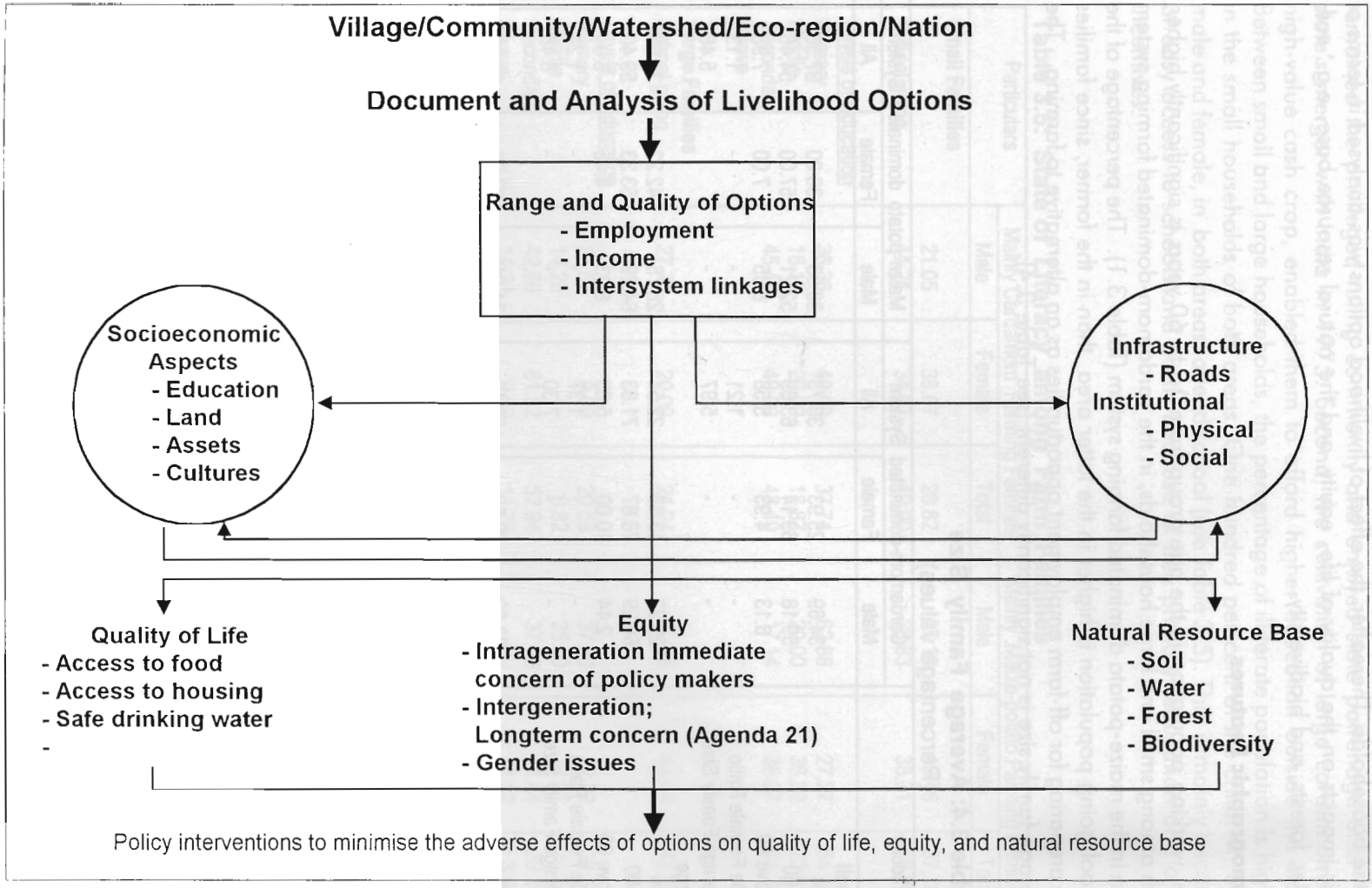

Figure 3.1: Framework for Operationalising the Concept of Sustainability

by the households. Thereafter, the effect of livelihood options was analysed in terms of their impacts on the quality of life, equity, and the natural resource base, e.g., soil, water, forests, and biodiversity.

Demographic Features

The working population in the age group from 15 to 60 years is significantly higher, both among small and large households, in the cardamom-dominated farming system than in the maize-potato dominated farming system (Table 3.1). The percentage of the school-going population is higher in the latter area than in the former, since families are preparing for off-farm employment opportunities as an alternative to farming. The average family size is not significantly different (see Table 3.4).

Table 3.4: Average Family Size
(Percentage values)

Particular	Cardamom-dominated System			Maize-potato dominated System		
	Male	Female	All	Male	Female	All
Small						
0-14	34.69	25.93	30.73	38.93	36.00	37.56
15-60	59.18	69.14	63.69	52.21	57.00	54.46
Above 60	6.13	4.93	5.58	8.85	7.00	7.98
Male Female Ratio	-	-	1.21	-	-	1.13
Average Family Size	-	-	5.97	-		5.46
Large						
0-14	29.27	13.33	22.54	26.78	42.22	33.66
15-60	68.29	76.67	71.83	64.29	53.33	59.40
Above 60	2.44	10.00	5.63	8.93	4.45	6.94
Male Female Ratio	-	-	1.37	-	-	1.24
Average Family Size	-	-	7.30	-	-	8.48
All						
0-14	33.09	22.52	28.40	34.91	37.93	36.31
15-60	61.87	71.17	66.00	56.21	55.86	56.05
Above 60	5.04	5.77	5.60	8.81	6.21	7.64
Male Female Ratio	-	-	1.25	-	-	1.17
Average Family Size	-	-	6.30	-	-	6.15

Source: Field Survey 1996

Education and Gender

The extent of human resource development in terms of literacy is significantly higher in the large cardamom-dominated area than in the maize-potato dominated area. The most glaring contrast is discernible in the female literacy rate which, though lower than the state average of 37.74, is more than double (26.66%) in the former area than in the latter area (11.83%). Also, the percentage of the population attaining education beyond the secondary level is higher in the cardamom-dominated area than in the maize-potato dominated area. These differences could be attributed to two reasons: first, the cardamom-dominated area is inhabited by the *Bhutia*(s) who

remained the privileged ruling community and enjoyed state patronage until the state's merger with India in 1975. Second, the cultivation of large cardamoms, a high-value cash crop, enabled them to afford higher education outside the state. Between small and large households, the percentage of illiterate population is higher in the small households of both areas. One hundred per cent of the children, both male and female, in both areas, attend school (see Table 3.5). This is mainly because of easy access to schools and partly because of free primary education and other incentives.

Table 3.5: State of Literacy among Farm Families

Particulars	Mainly Cardamom Farming Families			Mainly Maize-potato Farming Families		
	Male	Female	Total	Male	Female	Total
Small Families						
	21.05	38.67	28.82	27.18	49.46	37.76
School going	44.21	34.67	40.00	38.83	38.71	38.78
Levels of Education						
Primary	36.36	40.00	37.74	62.86	27.27	54.35
Middle	18.18	20.00	18.87	20.00	36.36	23.91
Secondary	45.46	40.00	43.40	17.14	36.37	21.74
Above	-	-	-	-	-	-
Large Families						
School going	27.78	20.00	24.24	40.38	44.44	42.27
Levels of Education						
Primary	28.57	9.09	20.59	37.50	22.22	33.33
Middle	14.29	-	8.82	25.00	22.22	24.24
Secondary	42.86	81.82	52.94	37.50	44.44	39.39
Above	14.29	9.09	11.76	-	11.12	3.04
All Families						
School going	39.69	30.48	35.59	39.35	40.58	39.93
Levels of Education						
Primary	33.33	29.03	31.76	52.54	25.00	45.56
Middle	16.67	12.90	15.29	22.03	30.00	24.05
Secondary	44.44	54.84	48.24	25.43	40.00	29.11
Above	5.56	3.23	4.71	-	5.00	1.28

Source: Field Survey 1996

The *Bhutia*(s) all over the state are the most progressive community. Their population is concentrated mainly in the northern district which is famous for growing large cardamoms. Owing to the cultivation of cardamoms, they are highly educated and hence occupy the top echelons of the state bureaucracy and other technical posts. There are also some *Bhutia*(s) in the all-India civil service and they occupy high posts in other states and in the central government departments. All this can be attributed mainly to large cardamom farming.

Household Assets

The assets' inventory of sample households in terms of residential buildings, cattle sheds, farm implements, and so on is provided in Table 3.6. The amount of assets per household and per capita was nearly two-and-a-half times more in the cardamom dominated area than in the maize-potato dominated area. In the composition and relative importance of different assets in both areas, residential buildings accounted for more than three-fourths of the total assets. Between the two areas, the share of residential buildings is, however, higher in the cardamom-dominated area than in the maize-potato dominated area. Animals constituted the next important asset in both areas, even though animals are more important in the latter area. The most important difference is, however, in the percentage of non-farm assets such as television, vehicles, and other durable household goods; the share of these assets is around ten per cent in the cardamom-dominated area compared to around five per cent in the maize-potato dominated area.

Livestock Holding Patterns

The livestock holdings of the sample households are shown in Table 3.7. It shows that cattle, goats, pigs, and poultry are important animals. Almost all households keep poultry which, besides enriching their diet, also enable them to meet emergency cash requirements. The cattle reared are local breeds which yield less milk. There is no significant difference in the number of animals owned by the small and large households in the maize-potato dominated farming system. On the other hand, in the cardamom-dominated system, the number of animals owned by large farmers was significantly higher than the number of animals owned by small farmers. This difference in livestock numbers is related to free access to fodder from the forests in the former area. In the latter area, access to fodder from forests was denied in 1980. The community responded to this cessation of access to forest fodder in two ways. First, by adjusting the number of livestock according to the availability of fodder on their farm and on the community support land, and second, by replacing cattle with goats and pigs. The number of animals kept by large farmers who have enough land to ensure year-round fodder supplies was higher than the number kept by small farmers.

Land-Use Patterns

Land-use patterns in the study areas have been shown in Table 3.8. Agricultural land, including the land under large cardamom farming, accounts for more than two-fifths of the farm land in the maize-potato dominated farming system in contrast to nearly four-fifths in the large cardamom-dominated farming system. There are fewer grasslands and pastures in the latter area due to the fact that large areas are under cardamoms. It may be recalled that since cardamoms can be grown on marginal lands, farmers have devoted all their available land to this crop. Land under cardamoms in the maize-potato dominated farming system is much less due to the unsuitability of land for growing this crop because of lack of forest/tree cover and moisture stress. The main

Table 3.6: Inventory of Assets (US$)

Particular	Cardamom Farmers						Maize-potato Farmers					
	Small Farmer		Large Farmer		All Households		Small Farmer		Large farmer		All Households	
	PH	PC	PH	PC	PH	PC	PH	PC	PH	PC	PH	PC
Residential Building	2487 (87.85)	417	4714 (71.94)	664	3044 (80.92)	487	1042 (78.95)	189	2000 (75.98)	238	1268 (77.82)	205
Cattlesheds	28 (0.99)	5	56 (0.86)	8	35 (0.93)	6	25 (1.92)	5	71 (2.71)	8	36 (2.22)	6 -
Traditional Implements	42 (1.47)	7	55 (0.85)	8	45 (1.20)	7	39 (2.97)	7	50 (1.88)	6	42 (2.56)	7
Dairy Animals	101 (3.58)	17	210 (3.20)	29	128 (3.41)	20	101 (7.64)	18	143 (5.43)	17	111 (6.80)	18
Draught Animals	35 (1.23)	6	62 (0.95)	9	42 (1.11)	7	22 (1.69)	4	63 (2.40)	8	32 (1.96)	5
Other Animals	51 (1.80)	8	119 (1.82)	17	68 (1.81)	11	43 (3.25)	8	108 (4.12)	13	58 (3.58)	9
Non-Farm Assets	87 (3.08)	14	1335 (20.38	188	399 (10.62	64	47 (3.58)	9	197 7.48)	23	82 (5.06)	13
Total Assets	2831 (100.00)	474	6552 (100.00)	923	3761 (100.00)	602	1319 (100.00)	240	2632 (100.00)	313	1629	263

Source: Field Survey 1996

Note: PH=Per Household, PC=Per Capita

Table 3.7: Inventory of Livestock Holdings in the Two Farming Systems

Livestock	Cardamom-dominated System			Maize-potato dominated System		
	Small Farmer	Large Farmer	All	Small Farmer	Large Farmer	All
1. Milch Cows						
Local	0.67	1.90	0.98	0.74	0.50	0.68
Improved	0.23	0.60	0.33	0.12	0.25	0.15
2. Non-Milch Cows						
Local	0.20	0.30	0.23	0.56	0.58	0.57
Improved	0.07	0.20	0.10	0.12	0.25	0.16
3. Young stock	0.73	1.5	0.13	0.72	1.33	0.86
4. Bullocks	0.40	1.00	0.55	0.36	0.83	0.47
5. Goats	1.50	3.00	1.88	1.05	1.75	1.22
6. Pigs	0.47	0.70	0.53	0.38	0.92	0.51
7. Poultry	4.23	5.6	4.58	4.76	6.83	5.25
Total Livestock, Including Poultry	8.50	14.8	10.11	8.81	13.24	9.87
Average Milk Yield (per cow lt/per day)						
Local	1.90	1.92	1.91	1.90	2.75	2.04
Improved	4.71	4.00	4.38	3.60	4.17	3.81
No. of Eggs Per annum/HH	124	128	125	88	118	95

Source: Field Survey 1996

Table 3.8 Comparative Land-Use Patterns (per cent)

Paticulars	Cardamom Farmers			Maize-potato Farmers		
	Small*	Large*	All	Small*	Large *	All
Land owned	100.00	100.00	100.00	100.00	100.00	100.00
	(47.70)	(53.20)	(100.90)	(46.64)	(50.20)	(96.84)
Agricultural land	91.48	69.73	80.01	56.90	30.28	43.10
Grassland	7.93	20.86	14.43	32.59	36.45	34.59
Forests	-	-	-	7.16	26.49	17.18
Land not fit for cultivation	0.59	9.41	5.55	3.34	6.77	5.12
Average area of land owned (ha)	1.59	5.32	2.02	1.19	4.18	1.90
Average area of operated land (ha)	1.45	3.71	2.23	0.68	1.27	0.82
Per capita land owned (ha)	0.27	0.75	0.40	0.22	0.49	0.31
Per capita land operated (ha)	0.24	0.52	0.32	0.12	0.15	0.13
Number of fragments	2.33	4.70	2.93	1.10	1.42	1.18

Source: Field Survey 1996
Note: Figures in parentheses indicate the total area of land owned.
** Farmers*

cardamom area is largely inhabited by the *Bhutia*(s), the erstwhile rulers of the state who have larger landholdings than the farmers in the other area who are Nepalese in origin and were not allowed to own land until recently. The *Bhutia* land is also protected by law, because an outsider cannot buy and settle there. Tribally-owned land can only be purchased by tribals; and the land ceiling laws have still not been implemented in the state.

Cropping Patterns

Table 3.9 shows the cropping patterns of the two farming systems. In the maize-potato dominated farming system, maize (*Zea mays*) and potatoes (*Solanum tuberosum*) account for more than 55 per cent followed by large cardamoms (*Amomum subulatum*) which account for about 32 per cent. See Figure 3.2 for the monthly cropping sequence in the two farming systems. *Pahaleo, Seto*, and *Kalo* are the main local maize varieties grown. *Kufri Jyoti, Kufri Sindurey, Kufri Dewa,* and 'Red Imperial' are the important varieties of potato. For the last five years, large cardamom farming has increased rapidly. '*Ramsey*', '*Sawney*', '*Golsey*', ' *Bharlang*', '*Madhusey*', and '*Ramla*' are the main cardamom varieties (Subba 1984, Chapter33). '*Ramsey*' is more popular in the maize-potato farming area, because it requires less water than '*Golsey*'. Peas (*Pisum sativum*), ginger (*Zingiber officinale*), and pulses (*Phaseolus* spp) are the other important cash crops. Among the different categories of farmer, small farmers devote more land to maize and potatoes than large farmers, who devote more land to large cardamoms. The state government's programme of providing free ginger seeds has helped this crop spread rapidly as a year-round crop. Nevertheless, while allocating areas to different crops, farmers take care to grow cereals on relatively flat lands and cardamoms on steeper, marginal, and fragile lands so as to minimise soil erosion and landslides.

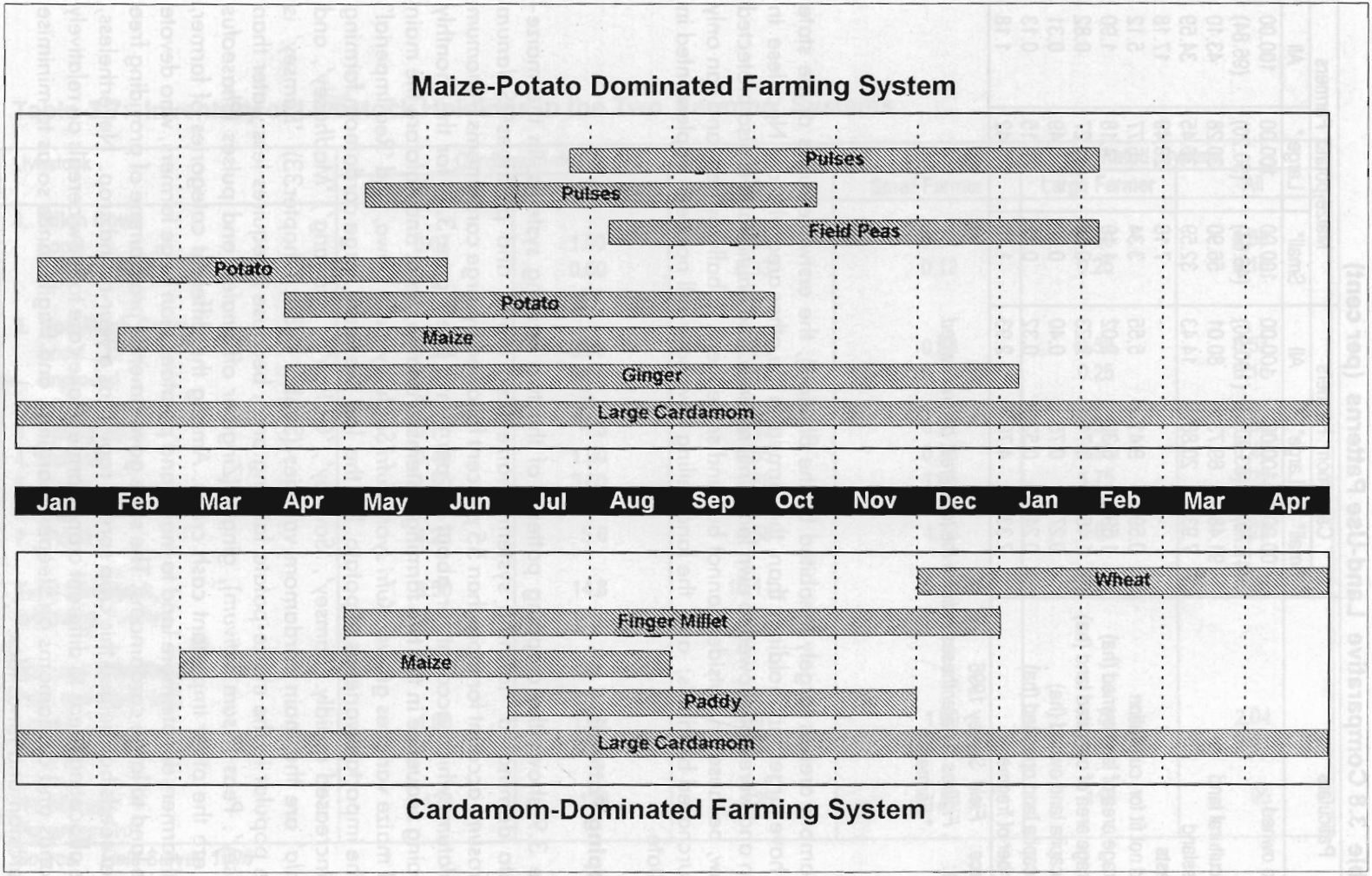

Figure 3.2: Cropping Sequence in Two Farming Systems

Table 3.9: Comparative Cropping Patterns of the Two Farming Systems (per cent)

Crops	Cardamom Farmers			Maize-potato Farmers		
	Small	Large	All	Small	Large	All
Maize	14.43	8.80	11.99	44.19	30.41	39.40
Paddy	15.59	17.10	16.24	-	-	-
Wheat	5.22	2.20	3.92	-	-	-
Finger millet	10.82	11.48	11.12	-	-	-
Potatoes	1.12	-	0.63	17.92	14.58	16.76
Peas	-	-	-	9.70	6.61	8.63
Ginger	0.15	1.03	0.53	2.25	1.77	2.08
Pulses	-	-	-	1.36	2.47	1.75
Large cardamons	52.67	55.39	55.57	24.55	44.15	31.38
Cropping intensity	123	105	101	143.92	134.10	140.30
Cropping intensity excluding Cardamom	163	130	148	155	175	160

Source: Field Survey 1996

In the cardamom farming area, the crop covers over 56 per cent of the farmland. Among the different categories of farmer, while large households devote larger areas to cardamoms, small households use more land for raising crops, not because of survival considerations, as is the common belief, but because they do not have enough land suitable for growing cardamoms at higher elevations. The cropping intensity, largely, is higher in the maize-potato farming area than in the large cardamom farming area. The farmers have tried to cope with the increasing population pressure and the sub-division of landholdings by intensifying cultivation and growing more than one crop. Nonetheless, there is still scope for increasing the area under double cropping.

In the maize-potato dominated farming area, the cultivation of large cardamoms began during the last two decades and became a popular practice more recently. Nearly 30 per cent of the households introduced large cardamom cultivation in the last ten years and about 36 per cent have plantations that are more than 20 years old (Table 3.10). In contrast, in the cardamom-dominated area, farmers have been growing this crop for about a century, and the average age of their plantations exceeds thirty to forty years. It was observed that the farmers in both areas have, more recently, started taking an

Table 3.10: Age of Cardamom Plantations on Sample Farms (per cent)

Age in Years	Cardamom Farmers			Maize-potato Farmers		
	Small*	Large*	All	Small	Large	All
Less than 10 years	-	-	-	41.67	-	30.30
10-15 years	-	-	-	25.00	44.44	24.24
15-20 years	-	-	-	8.33	22.52	15.15
Above 20 years	100.00	100.00	100.00	25.00	33.34	36.31
Per cent of HHs Growing Cardamons	100.00	100.00	100.00	38.46	25.00	23.53

Source: Field Survey 1996

interest in maintaining the productivity of crops, by filling gaps and planting new trees to replace aging ones and so on. The limited farming of cardamoms in the past was because their cultivation was monoplised by a few *Kazis* (big landlords).

Crop Yields

The yields of different crops have been given in Table 3.11. No systematic pattern is evident in the yield levels of small and large households. For instance, contrary to the stylised, inverse farm size-productivity relationship, the yields in the cardamom dominated area are marginally higher in the case of large farmers than in the case of small farmers. However, in the maize-potato dominated farming system, the yields of cash crops, notably, potatoes, ginger, and cardamoms are higher on small farms. It, however, should be kept in mind that the inverse farm size-productivity relationship may not generally hold true in mountain agriculture for two reasons. First, the fertility of land in these areas is a direct function of the elevation of the land, and it depends where the bulk of the land in a particular category is located. Second, in areas where a high-value cash crop is grown, the land under cereals may be of poor quality, resulting in lower yields.

Input Use

The use of chemical fertilizers is negligible. In terms of households, while six per cent of the sample households used chemical fertilizers in the maize-potato dominated area, more than three-fourths did so in the large cardamom-dominated area, and not for cardamoms, but for other crops. Again, in comparison to the reported state average of 52.40 per cent (Table 2.12 in Annex to Chapter Two) of the total cultivated area of maize, wheat, and paddy under high-yielding varieties, not a single hectare of land under these crops on sample farms in both the farming systems had high-yielding varieties. The use of farmyard manure (FYM) was, however, much higher in the former area (6.6 tonnes) than in the latter (3.13 tonnes), which could partly be attributed to the practice of grazing animals. The use of other inputs (e.g., labour) was significantly higher in the

Table 3.11: Comparative Crop Yields of Farmers (tonnes/hectare)

Crops	Cardamom Farmers			Maize-potato Farmers		
	Small*	Large*	All	Small*	Large*	All
Maize	1.19	1.12	1.19	1.10	1.34	1.17
Paddy	1.30	1.59	1.43	-	-	-
Wheat	1.2	1.19	1.20	-	-	-
Finger millet	0.53	0.34	0.46	-	-	-
Potatoes	1.87	-	1.87	3.62	3.16	3.49
Peas	-	-	-	0.74	1.07	0.83
Ginger	3.28	4.5	3.02	5.62	5.11	5.48
Pulses	-	-	-	0.43	0.60	0.45
Large cardamom	0.35	0.39	0.37	0.26	0.25	0.26

Source: Field Survey 1996
** Farmer*

maize-potato dominated area (see Table 3.12). The factor responsible for the low use of modern inputs (cited by farmers) was mainly the lack of timely availability (see Table 3.13).

Table 3.12: Comparative Input Use by Farmers

Particulars	Unit	Cardamom Farmers			Maize-potato Farmers		
		Small*	Large*	All HH	Small*	Large*	All HH
FYM	T/ha	5.16	4.0	4.7	6.2	7.9	6.6
Chemical fertilizers (N)	Kg/ha	4	13	7	1.72	Nil	1.23
Households using chemical fertilizers	%	73.33	90	77.50	7.69	Nil	5.88
High-yielding varieties	% HH	Nil	Nil	Nil	Nil	Nil	Nil
Labour in crop production	Days/ha	75	61	69	85	103	89
Labour in large cardamom production	Days/ha	50	62	56	97	75	86
Seeds							
- Maize	Kg/ha	15.82	19.44	16.96	17	21	18
- Wheat	Kg/ha	21.43	32.22	24.05	-	-	-
- Paddy	Kg/ha	29.01	38.14	33.17	-	-	-
- Finger millet	Kg/ha	8.02	10.42	9.10	-	-	-
- Potatoes	T/ha	-	-	-	1.9	1.6	1.7
- Ginger	T/ha	-	-	-	1.4	1.7	1.5
- Peas	Kg/ha	-	-	-	1.2	1.0	1.1

Source : Field Survey 1996
Note: HH = households; FYM = farm yard manure.
** Farmers*

Table 3.13: Reasons against Using Chemical Fertilizers (% of households)

	Cardamom Farmers						Maize-potato Farmers					
	Small		Large		All		Small		Large		All	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Harmful to soil	3	50.00	1	100	4	57.14	7	58.33	26	70.27	33	67.35
Not available in time	-	-	-	-	-	-	3	25.00	4	10.81	7	14.29
Enough FYM	3	50.00	-	-	3	42.86	1	8.33	5	13.51	6	12.24
Lack of Purchasing power	-	-	-	-	-	-	1	8.34	2	5.11	3	6.12
Total	6	100	1	100	7	100	12	100	37	100	49	100

Source: Field Survey 1996