

PROSPECTS OF HORTICULTURAL DEVELOPMENT

Rasuwa lies to the north of Kathmandu and borders Tibet. In spite of its remoteness, it is linked to Kathmandu, a major market, by roads. Apple, potato, and vegetable production has been increasing gradually due to government efforts, although there are many constraints to further expansion of fruit and potato production in Rasuwa.

Comparative Advantages

Land Availability and Climatic Conditions

Almost 98 per cent of the land area is located in the temperate and alpine zones suitable for growing apples, pears, plums, peaches, and walnuts. Off-season vegetable crops can also be grown commercially. Hailstorms rarely occur in Rasuwa, therefore, this area is suitable for high quality apple and vegetable production.

Only 2.8 per cent of the land area lies in the mid-hills where cereal crops are dominant. The remaining cultivated land can be brought under fruit, vegetable/(fresh), and vegetable seed production.

Increased Production Per Unit Area

The principal horticultural crops yield higher returns per unit area than cereal crops. The farmers should be convinced of the benefits in terms of both price and market. A comparison of the returns of different crops grown in Rasuwa is given in Table 4. Apples and potatoes yield 13 and 3.5 times more than millet.

Table 4: Benefits (Gross) of Different Crops Per Hectare in Rasuwa

	Crops	Yield MT/ha	Total income Rs/ha ¹
xx	Apple	7.46	74600.00
x	Potato	6.48	19440.00
xx	Walnut	2.75	68750.00
xx	Pear	13.50	67500.00
x	Paddy	1.95	9750.00
x	Wheat	1.10	5863.00
x	Maize	1.52	4936.20
x	Millet	1.12	5623.80

x Adapted from Table 2, the data on area and production were collected by the District Agricultural Development Office, Rasuwa for 1989/90.

xx Adapted from Table 3 for 1989/90.

¹ Prices for Dhunche taken during mid-production season.

Creation of Job Opportunities

Rasuwa was one of the food deficit districts in Nepal and there were few available jobs. However, with the cultivation of fruits and vegetables (requiring intensive labour during both production and marketing) and also use of different tools and baskets, new jobs have been created for skilled, semi-skilled, or unskilled labourers. Various industries might also be established in the area as a result of horticultural crop production.

Minimising Migration

The 1981 Census showed that Rasuwa was one of the districts in Nepal with a high rate of out-migration. However, the 1991 Census indicated that outmigration may have decreased. There are new job opportunities in the district itself. Table 4 shows that fruits and potatoes yield high returns even with low inputs.

Utilisation of Marginal Land

It can be observed from Table 1 that the land resources of Rasuwa mainly consist of marginal land where the productivity of cereal grains is low, in spite of efforts made in the last three to four decades (Table 3). With little effort, the farmers of Rasuwa can enjoy maximum returns per unit area (Table 3) by cultivating horticultural crops, thereby utilising the marginal land. The marginal land is more vulnerable to landslides and other erosion processes, but such hazards can be minimised through the cultivation of horticultural crops, i.e., apples, peaches, walnuts, and other fruits.

Environment

Environmental degradation is a debatable issue and a major development concern in Nepal. Horticultural programmes offer feasible solutions that can help reverse the present trend of degradation. Environment degradation results in landslides, floods, desertification, air and water pollution, etc. Tillage on high sloping lands for cereal crops also increases soil erosion and causes a decline in fertility.

Suitable fruit crops, if properly planted and managed, can have a strong positive effect on reducing tillage on slopes which, in turn, will reduce degradation, landslides, and pressure on forest land, while increasing soil fertility and species' diversity.

Growing High-value Crops

Rasuwa is linked to Kathmandu by a metal road (72km) and the all-weather gravel Trishuli - Sordang road (105km). However, transportation within the district is difficult. High value crops can be cultivated in favourable pocket areas. These advantages have not been properly harnessed. Vegetables from Kathmandu and Trishuli are still sold in Dhunche and other parts of the district. Therefore, according to the area, soil, and climatic conditions, high-value crops,

such as apples, walnuts, vegetable seeds, fresh vegetables, potato seeds, and tubers, should be produced under a specific programme.

In Rasuwa, apples, pears, plums, peaches, walnuts, and citrus fruits can be grown under favourable climatic conditions, but only high-value crops that can be transported easily or can withstand the long period required for transportation should be considered. Prioritisation of the crops should be considered as follows (Frontispiece).

The areas above 1,800 metres in the temperate zone should be brought under commercial apple cultivation. Rasuwa can easily capture Kathmandu's fresh apple market. Another suitable crop is walnut. This crop also has a very good market in Kathmandu. Walnuts can be transported even a few months after harvest, either the whole nut or only the kernels. Peaches can be grown in warm, temperate areas. This fruit is very perishable in nature, therefore it cannot be transported over long distances but it can be used in distilleries. Rasuwa is a food deficit district, but most of the villagers ferment millet or maize to make liquor. Peaches can be used instead of cereal grains for distillation purposes.

The advantage of Rasuwa's proximity to the Kathmandu market should be exploited by using the upper parts of the district for commercial potato production. Potatoes are cultivated from *Phalgun* (February-March) to *Srawan-Bhadra* (August-September) which is off-season in Kathmandu and elsewhere. However, brown rot disease is prevalent as a result of selling all the produce during harvest and bringing in seeds from disease infected areas. Wart disease, however, has not been reported in Rasuwa, although it is prevalent in the Nuwakot district. Therefore, a special programme for potato seed production at higher altitudes in the district can be designed. In this way, seeds required in the district, as well as in neighbouring districts, can be supplied and occurrence of diseases will be minimised.

Another important crop programme which should be implemented in Rasuwa is vegetable seed production. Nepal is currently importing vegetable seeds, e.g., cabbages, cauliflower, carrots, etc from abroad. Dolpa, Humla, and Jumla are also producing cauliflower seeds, especially Snowball, but the cost is higher. Rasuwa can easily grow carrots and Snowball cauliflower seeds. This innovative strategy will certainly benefit the farmers of the district as well as the national economy.

Rasuwa farmers can easily use their apple orchards for growing off-season vegetables, vegetable seeds, and potatoes, but care must be taken to avoid soil erosion.

Demand for Fruits and Vegetables

The consumption of vegetables and fruits in Rasuwa is low. Horticultural products should reach the demand areas, particularly the Kathmandu Valley. Apples and walnuts from Jumla and Mustang seldom reach Kathmandu, but it is an accessible market for horticultural produce from Rasuwa.

A significant number of tourists visit Rasuwa. Therefore, any increase in the production of apples, potatoes, and other vegetables can be absorbed easily by domestic (local population and tourists) consumers as well as by the Trishuli and Kathmandu markets. The requirements of the processing and distillery industries can also be met easily.

Rasuwa has surplus fruit, potato, and vegetable production, however, this district has been rated as a food deficit district (Table 5). This indicates the need to change the food habits of Rasuwa's inhabitants.

Table 5: Fruit, Potato, and Vegetable Production in Rasuwa (1990/91)

Crops	Area (ha)	Production (MT)	Per Capita Production (kg)	National Per Capita Production (kg)	Surplus (+) deficit (-)
Fruits	532.38	4223.56	114.87	24.27	+
Vegetables	225	3682	100.14	50.90	+
Potatoes	2316	16730	455.01	30.35	+

Source: Achievement Reports of the Agricultural Development Office, Rasuwa, the Fruit Development Division, and the Preliminary 1991 Census Report of CBS.

National per capita consumption of fruits, vegetables, and potatoes at the end of the Seventh Five-year Plan (1989/90) was 22.79kg, 53.73kg, and 34.93kg respectively. Taking into account the population of Rasuwa according to the 1991 Census, the computed demand of Rasuwa District comes to 837.94MT - fruits, 1975.54MT - vegetables, and 1,286.30MT - potatoes (Table 6).

Table 6: Demand for Fruits, Vegetables, and Potatoes in Rasuwa District

Crops	Production (MT)	District Demand (MT)	Surplus (MT)	Demand of the Kathmandu Valley and Bidur municipalities (MT)
Fruits	4223.56	837.94	3398.62	13934.96
Vegetables	3682.00	1975.54	1706.46	32853.26
Potato	16730.0	1286.30	15443.70	21357.98

Source: Computed by the author from district production and population data.

The surplus fruits, vegetables, and potatoes can be marketed easily in the Kathmandu Valley and in Bidur. The total demand in the towns of the Kathmandu Valley and Bidur is in excess of the current surplus in Rasuwa.

Cropping System

The farmers of Rasuwa follow a monocropping system. Due to the cold climate, crop rotation is practised (maize or millet or maize-millet or potato), in about 97 per cent of the areas. Some of the farmers grow buckwheat or wheat. They can harvest only one crop in a year. However, at lower altitudes, paddy-potato, or paddy-wheat, or maize-potato are the dominant cropping patterns.

Some of the apple growers follow a multiple cropping system, i.e., apple orchards are intercropped with *kodo* (finger millet) or maize. Recently, farmers have started to intercrop cauliflowers and radishes in apple orchards.

The following areas in the district have been identified as potential areas for horticultural crop cultivation.

Areas	Crops	Growing Season
1. Yarsa, Gatlang, Langtang, Chilime, Ramche, Dhunche, Haku, Syaphru, Thuman, Bridim	Potatoes	February - August
2. Laharepauwa (lower part) Bhorle, Dhaibung, Saramthali, Dandagaun, Thulogaun	Potatoes	December - March
3. Bharkhu & Goljung (in Syaphru VDC), Dandagaun, Dhunche, Bhorle	Cauliflowers and other vegetables	March/April July/August December
4. Bridim, Gatlang, Bharkhu, Yapche, Ramche, Dhunche, Thuman, Syaphrubesi, Chilime	Apples (main), Walnuts	April - August/October
5. Lower part of Dhunche & Ramche, Laharepauwa, Lower parts of Bharkhu, Syaphrubesi	Peaches	April - July

At higher altitudes, two or two and a half crops can be grown in areas where a single crop is grown per year, by intercropping potatoes or vegetables in commercial apple orchards or other fruit orchards. Maize or finger millet can also be intercropped in orchards. However, care must be taken to reduce soil erosion and increase production by practising minimum tillage, using more organic manure, terracing, planting permanent crops on the bunds, etc.

Small Farmers and Rural Development

There are a number of rural development programmes which have implications for horticultural development in Rasuwa. The major programmes are as follows.

Small Farmers' Development Programme

According to the 1991 Census, there were 7,204 households in Rasuwa. The total cultivated land area was 8,993ha. The average cultivated land area per household was 1.24ha. The household size was 5.1. This clearly indicates that the farmers of Rasuwa are poor and primarily small landholders.

The Government has introduced the Small Farmers' Development Programmes (SFDP) in five places in Rasuwa. The SFDP is supposed to disburse loans to farmers in the district in consultation with the Agricultural Development Office (ADO). However, there is a problem in disbursing loans to those engaged in the horticultural sector. The total loan investment for the last five years through the Agricultural Development Bank (ADB/N), including SFDP, was only Rs 1,924,000, which is a very small amount.

The low disbursement of loans in the horticultural sector is mainly due to the long gestation period. SFDP should be more involved in encouraging the cultivation of potential crops in the area, e.g., apples and potatoes.

Loans should be of a specific nature. The interest imposed should be very nominal and the process of sanctioning loans should be simplified. The small farmers of these areas are not educated, therefore the simplest possible procedures should be followed.

Rasuwa-Nuwakot Integrated Rural Development Project

The Rasuwa-Nuwakot Integrated Rural Development Project (IRDP) was started in 1976/77 in order to develop hill agriculture. This project was implemented by HMG with World Bank assistance. The main objectives of the first phase were to increase physical facilities, construct roads and bridges, develop irrigation facilities, and support different agricultural extension services. This project has extended support to the horticultural farm in Rasuwa and the Agricultural Development Offices by building facilities, imparting training to permanent staff, and providing temporary staff. However, this project has failed to identify the actual potentials of Rasuwa District in the horticultural sector. The manpower supplied to ADOs includes subject matter specialists, i.e., assistant agronomists and assistant extension officers. The allocated budget also does not clearly specify the actual budget for horticultural development in Rasuwa, excluding the support services provided to the horticultural farm. A separate unit for horticultural extension services integrated with other sectors such as education, health, livestock, etc will certainly prove to be most effective for rural development. The IRDP should be a two-way bridge between local level agents (governmental and non-governmental) and concerned line agencies and departments to ensure better coordination.

Household Investment

The farmers of Rasuwa have invested very little in fruit cultivation. However, considerable sums are invested in potato and vegetable cultivation. The overall investments required for orchards and for potato and vegetable cultivation are Rs 25,178, Rs 38,045 and Rs 10,538 per hectare respectively. The costs are very high in comparison to the present investments made by farmers (Tables 7-11). The investment costs were calculated on the basis of present prices and discussions with concerned personnel in Rasuwa.

The present income of the farmers is not sufficient to enable investment in fruit and vegetable cultivation. The ADB/N or other agencies should provide the necessary credit for horticultural development. The ADB/N sanctions loans up to 70 per cent of the total scheme for horticultural development. This may not be sufficient for the rural sector. Rasuwa's farmers give top priority to their household needs. Household investments are limited to human labour and farmyard manure.

Costs of purchased inputs, such as planting materials, fertilisers, and chemicals for plant protection, need to be subsidised as an incentive to the farmers if they choose to cultivate fruits requiring a long gestation period. Other costs can be met by granting loans from credit institutions. These loans should be subsidised also, i.e., at least to the extent of 50 per cent of the interest rate.

**Table 7: Household Investment for Potato Cultivation
under Present Conditions in Rasuwa**

Items	Quantity	Total Cost
1. Variable Costs		
Planting materials		
Seeds	800 kg/ha	Rs 8000.00
Compost	2000 kg/ha	200.00
Labour	270 mdays/ha	10800.00
	Total	19000.00
2. Fixed Costs		
Land revenue	-	15.00
Farm equipment	-	145.00
	Total	160.00
	Total (1+2)	19000.00 +160.00
	Total investment	Rs 19160.00
Household investment		
Compost		200.00
Labour		10200.00
		11000.00

Source: Field Survey

Table 8: Production Cost of Potato Cultivation Using Improved Methods

Items	Quantity	Total Cost
1. Variable Costs		
Potato seeds	1,200kg/ha	12000.00
Labour *	290m days/ha	11600.00
Ploughing	60 days/ha	4800.00
Manure	2,000kg/ha	200.00
Fertilisers (80.60.80)	200kg	1400.00
Chemicals for plant protection		200.00
	Total	30200.00
	Interest 15%	4530.00
	Total	34730.00
2. Fixed Cost		
Land revenue		15.00
Farm equipment		300.00
Sprayers		3000.00
	Total	3315.00
	Total Cost (1+2)	38045.00

Source: Field Survey

* Labour refers to field preparation, applying manure, digging, manuring, soiling, weeding, plant protection measures, harvesting, etc.
m days = man days

Table 9: Total Cost of Vegetable (Cauliflower) Production in Rasuwa

Items	Unit	Quantity	Rate (Rs)	Total Cost (Rs)
1. Variable Costs				
Ploughing	m days	20	40.00	800.00
Labour*	m days	160	40.00	6400.00
Seeds/seedlings	gm	500	200.00	100.00
Manure	mt	5	700	500.00
Fertilisers	kg			
Complexal		100	630	630.00
Muriate of potash		40	321.0	128.40
Chemicals for plant protection		-	-	-
				8558.40
Interest on variable cost - 18%				1540.44
Total				10098.84
2. Fixed Costs				
Land revenue	ha	1	40	40.00
Equipment (spades, ploughs, etc.)				400.00
Maintenance cost of equipment				
Total				440.00
Total (1+2)				10538.84

* Labour includes field preparation, manure/fertiliser application, sowing/transplanting, weeding/intercropping, irrigation, plant protection, and harvesting.

Table 10: Average Production Cost of Fruit/Ha in Rasuwa (Apples)

Items	Unit	Quantity	Rate (Rs)	Total (Rs)
1. Variable Costs				
Labour				
Digging pits	m days	60	40	2400.00
Planting	m days	15		600.00
Pruning	m days	75		3000.00
Manure Application	m days	20		800.00
Fertiliser Application	m days	5		200.00
Spraying	m days	5		200.00
Harvesting	m days	50		2000.00
Manure	MT	5	100	500.00
Fertilisers				
Complexal	kg	800	6.30	5040.00
Muriate of potash	kg	150	3.21	481.50
Chemicals	kg			200.00
Dithane M-45 & others				
Equipment Maintenance (sprayers, secateurs, spades, etc)				200.00
Plants				1950.00
			Total	17571.50
Interest on variable cost - 16%	no	300	6.5	3162.86
			Total	20734.36
2. Fixed Costs				
Land revenue				40.00
Equipment				4000.00
			Total	4040.00
Depreciation cost of fixed cost				404.00
			Total	4444.00
			Grand Total	25178.36

Source: Field Survey

Note:

- The farmers of Rasuwa generally do not prune apple plants.
- Very few orchards are pruned.
- Chemical fertilisers are not used except in mixed cropping (vegetables + apples).
- Spraying is not carried out for pest and disease control.
- Computation of apple production cost is indicative of average conditions because planting and harvesting operations cannot be carried out simultaneously.
- Manure and fertiliser doses are different for one-year old plants than for ten-year old plants, therefore, computation was based on the average plant age.
- Equipment once purchased can be used for about five years on an average.

Table 11: Production Cost of Maize in Rasuwa District

Items	Unit	Quantity	Rate (Rs)	Total (Rs) 1 ha
1. Variable Costs				
Labour				
Ploughing	m days	20	40	800.00
Labourers*	m days	100	40	4000.00
Seed	kg	25	40	1000.00
Manure	MT	2		400.00
Fertilisers	-	-		-
Plant Protection	-	-		-
			Total	6200.00
2. Fixed Costs				
Land revenue				40.00
Maintenance of farm equipment				100.00
Farm equipment				4000.00
				5040.00
			Total (1+2)	11240.00

Source: Field Survey

Labour includes field preparation, manuring, sowing, weeding, harvesting, etc. m days = man days