CHAPTER V

PRIVATE PROFITABILITY

In this chapter the discussion is first on the use of the different inputs. The market prices that were prevalent during the period of the study have been used to value the inputs and the outputs. Attempt has been made to analyse the economic returns by modern varieties (MV) and traditional varieties (TV). This chapter ultimately tries to meet the objectives of understanding the production and technological options of growing rice in the different agro-ecological zones and the profitability of rice production. Private profitability refers to observed revenues and costs reflecting actual market prices received or paid by the farmers, merchants, or processors in the agricultural system. The private profitability calculations show the competitiveness of the agricultural systems, given current technologies, output value, input costs, and policy transfers (Monke and Pearson, 1989).

5.1 Determining private prices

A very convenient way of starting the discussion on the efficiency of the commodity system is to examine the private and the social costs (Seini, 2004). Private prices are the actual prices of all inputs and outputs used in production. These prices were derived from farm surveys and group discussions. Private or market prices of tradables were collected from the farmers during the time of interview and cross checked with the Commission Agents (CAs), that deal with fertilizers and for seed with the Druk Seed Corporation and for the output visits to the markets were made. Domestic factor prices such as labour cost and land rent were collected from the survey as well as through personal communication with government organizations.

5.2 Analysis tools for private profitability

Initially data was analyzed using a pre-developed spreadsheet applications and budget for rice was carried out for every zone for comparison among the different zones. From the budget table returns to scare factors like land and labour and the cost of cultivation were calculated.

a. Gross Returns per hectare = Quantity produced per hectare X Market price
b. Returns to land = Gross Returns – (Material cost + Draught power cost + Labour cost)
c. Returns to labour = (NRLL – OCL)/TLI

Where: NRLL = Net Returns to Land and Labour

OCL = Opportunity Cost of Land

TLI = Total Labour Input

and:

NRLL = GR-(MC+CI)

GR = Gross Returns

MC = Material Cost

CI = Capital Input

d. Cost of cultivation (Nu/Kg) = (TNC- Value of by-products)/QMP

Where:

TNC = Total net cost (excluding opportunity cost of land)

QMP = Quantity of Main Product

The different returns to the scare factors of production, gives a clear picture as to which zone is the most attractive in terms of paddy production. However, that is only from the private profitability point of view.

5.3 Input

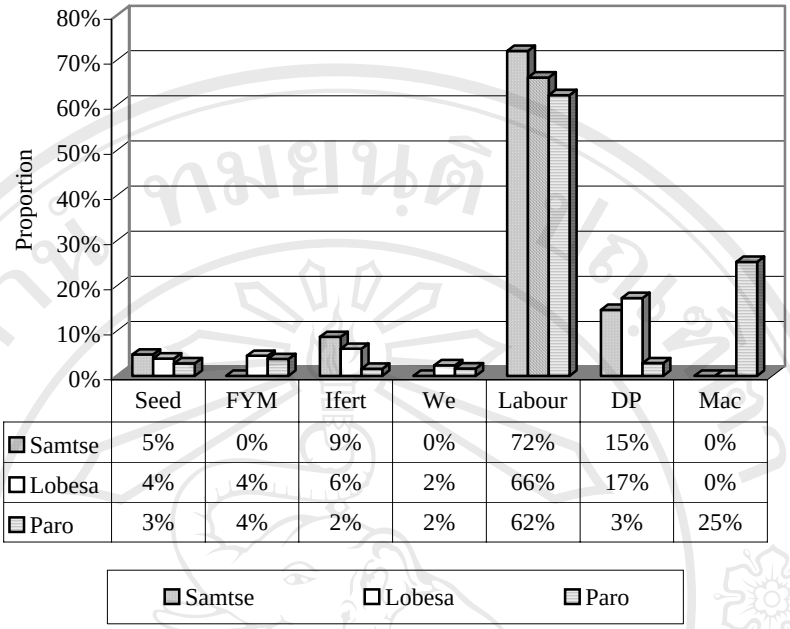
Results from the survey have shown that rice production in all the three locations was labour intensive and only a few purchased inputs were used to grow the crop. The most popular inorganic fertilizers used were urea and suphala and its usage differed among the different locations. Urea is mostly used as a top dressing while suphala is used as a basal dose. The use of weedicide is becoming more popular in those areas where weeds in paddy fields are a major problem. The inorganic fertilizers and weedicides are imported from India and Druk Seed Corporation (DSC) is the agency responsible for its distribution across the country through the Commission Agents appointed by the districts. Labour requirement was met through household members, exchange and hired labour. The peak labour requirement periods are during paddy transplantation, weeding and harvesting. Table 5.1 shows the quantity of the inputs used and the value of those inputs by different locations.

Table 5.1. Input quantity and costs per hectare of paddy

Inputs	Unit	Samtse		Lobesa		Paro	
		Qty/ha	Value (Nu/ha)	Qty/ha	Value (Nu/ha)	Qty/ha	Value (Nu/ha)
Seed	Kg	57	969	82	1,394	58	978
FYM	Kg	0	0	6,440	1,610	5,300	1,328
Urea	Kg	110	614	138	770	52	290
Suphala	Kg	130	1,157	158	1,406	31	276
Weedicide	Kg	0		38	845	26	578
Labour	Days	185	14,800	200	24,000	148	22,200
Draught power	Ox pair days	15	3,000	25	6,250	4	1,000
Machine	Machine days	0	0	0	0	9	9,000
TOTAL			20,540		36,275		35,650

Source: Survey, 2004.
1US$ = Nu 44.5 as of December 2004

Breaking the inputs into different cost components gives a clearer picture of the present situation of the rice systems of the western region of the country. Figure 5.1 shows the proportion of the different costs involved in the production of paddy in one hectare by different locations.



	Seed	FYM	Ifert	We	Labour	DP	Mac
Samtse	5%	0%	9%	0%	72%	15%	0%
Lobesa	4%	4%	6%	2%	66%	17%	0%
Paro	3%	4%	2%	2%	62%	3%	25%

FYM = Farm yard manure; Ifert = Inorganic fertilizers; We = Weedicide; DP = Draught power; Mac = Machine use

Figure 5.1. Proportion of cost in paddy cultivation by different study locations

5.3.1 Material costs

The material costs involved in paddy production are seeds, farm yard manure (FYM), inorganic fertilizers, weedicide and pesticides. However, only a few farmers reported to the use of pesticides during the time of the survey and that too at a very low rate. Moreover, they do not use pesticides every year and is used only and when they face some serious pest and disease problems. Therefore, the cost of pesticide use has not been reflected in the analysis here. Out of the total costs involved in a hectare of paddy production, material costs alone contributed to approximately 14 percent in Samtse and about 17 percent each for Lobesa and Paro.

The seed rate for a hectare of paddy seemed uniform for Samtse and Paro but differed greatly for that of Lobesa. This was due to the fact that most of the farmers used dry bed for raising their nursery and therefore required more seed and also that farmers did not want to take any chances of not having enough paddy seedlings at the

time of paddy transplanting. The proportion of seed cost to the over all material cost however, was highest for Samtse with 35 percent followed by Lobesa with 23 per cent. In Paro, it accounted for 20 percent of the total material cost. The reason for the high proportion of seed cost can be traced back to the fact that seeds and inorganic fertilizers were the only inputs used.

Most paddy fertilization was based on cattle manure mixed with varying proportions of crop residues or leaf litter from the forest to form compost. This use of farmyard manure varied widely from one place to another or among households mainly because of household size, the number and types of animals owned and the distance of the fields from the house. In Samtse, the more common practice was tethering of cattle in the fields. As a result the cost of farmyard manure for Samtse has not been reflected in the analysis. Farmers in Lobesa and Paro do apply FYM and valuing its cost at Nu 0.25 per kilogram, the cost of fertilization with FYM was rather high. It accounted for 38 percent of the total material cost in Paro and 27 percent in the case of Lobesa. It was high for Paro because the farmers reported using lower dosage of inorganic fertilizers and higher quantity of farmyard manure

The farmers to supplement the farmyard manure also did apply inorganic fertilizers like urea and suphala to further improve soil fertility. The dosage used by the farmers varied among the different locations. The use of inorganic fertilizers was highest in Lobesa followed by Samtse. Farmers reported of difficulties in tilling the land due to repeated use of inorganic fertilizers, and that was also one of the reasons for the high use of farmyard manure. The proportion of the costs of inorganic fertilizers to the total material costs was 64 percent in Samtse, 36 percent in Lobesa and 12 percent in Paro. The proportion was high for Samtse, because, unlike the other two locations, the seeds and chemical fertilizers were the only material costs reported.

Weed in paddy fields is a major problem in the mid and high altitude zones. The most serious weed is *Potamogeton distinctus,* locally known as *Shochum*. It is abundantly found in flooded conditions at altitudes of 1200-2500 masl (Ghimiray, 2000). Farmers used butachlor in transplanted rice to get rid of the weed, especially

in Lobesa and Paro. Farmers in Samtse did not report to any use of weedicide. The cost of using weedicide or butachlor accounted to 14 percent of the total material cost in Lobesa and to 12 percent in Paro.

5.3.2 Draught power cost

A vast majority of the farmers in Samtse and Lobesa used draught oxen power to cultivate their land. Most farmers have their draught oxen, although significant proportion have to hire in at least one ox and, in some cases all their draught oxen requirement. Though the use of power tillers are more common in Paro for land preparation, they also used draught oxen to plough the corners of the field left untouched by power tillers and for fields that have steep terraces. The availability of draught oxen at one time was not a major constraint in Lobesa and Paro. For farmers who did not own sufficient draught cattle, the system of exchange coupled with the availability of draught cattle for hire usually meant that any potential problems could be solved. The situation is not the same any more. With the advent of mechanization, wealthier farmers have sold their bullocks thereby creating a shortage of draught oxen in the areas. The exchange system as well as hiring of draught oxen still however do exist, but with more difficulties. The rate of exchange in all the three locations are in the ratio of one is to two (1:2). One ox-pair day is equivalent to four labour-days. The cost of draught animals to the overall cost accounted for 15 percent in Samtse, 17 percent in Lobesa and three percent in Paro.

Despite the high level of subsidy given for the purchase of power tillers and threshers, and the efforts of the Agricultural Machinery Centre (AMC), the rate of adoption of these machines had been slow. Paro has the highest rate of adoption as the district benefits from close proximity to AMC for repairs and maintenance. In Paro where machines are now used in farming, the use of power tillers for land reparation and other labour saving devices like threshers amounted to 31 percent of the total cost involved. The trend is picking up in Lobesa but in Samtse none of the farmers reported to owning and use of power tillers and threshers. With increased income from the sale of cash crops like mandarin, areca nut and ginger, many farmers

however have put up requisitions for power tillers and it is expected to ease the problem of farm labour shortages.

5.3.3 Labour cost

The average number of labour-days required for a hectare of paddy cultivation ranged from 148 to 200. It was highest for Lobesa with 200 labour days per hectare, followed by Samtse with 185 and the lowest for Paro with 148 labour days per hectare. The system of exchange labour is still followed in all the three locations though hiring of labour do exist but at a lower scale. The total labour cost was high in all the three locations. In Samtse the daily wage for a hired labour irrespective of gender was reported to be Nu.80 per day, while in Lobesa it was Nu.120 per day and was the highest in Paro with Nu.150 per day. Looking in to the proportion of labour cost to the overall costs, it was highest in Samtse (77 percent), followed by Lobesa (66 percent) and only 62 percent for Paro. The proportion of labour cost was lower in Paro because of the lesser number of labour-days required which can be further attributed to the use of machines in the area. Despite the less number of labour-days employed in Paro, the high wage rate of Nu.150 was the main cause of high proportion of labour cost to the overall cost.

5.3.3.1 Labour input by activities

Transplanting of paddy, weeding and harvesting are the most labour intensive activities. To further elaborate on the use of labour as an input, the proportion of labour input by different activities involved is as shown in Figure 6.

In all the three locations, the proportion of labour requirement for transplanting of paddy was almost the same with about 15 per cent each of the total labour required. The proportion of labour required for weeding was the highest in Paro. As discussed earlier, weed is a major problem in the mid and high altitudes and farmers in Paro prefer hand weeding rather than using too much weedicide. Hand weeding of the weeds in the paddy fields is carried out as many as three times in a

season, resulting in to high labour input. On the other hand farmers in Lobesa used a higher rate of weedicide as compared to Paro and therefore, the proportion of labour required for weeding was lower.

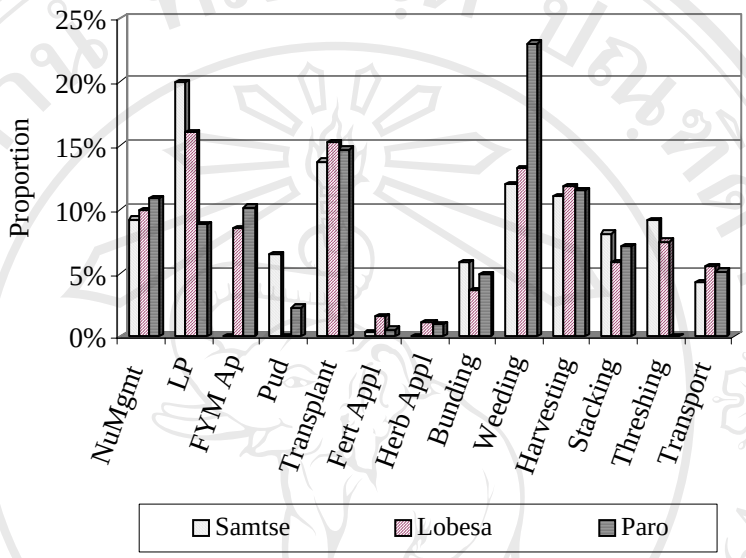


Figure 5.2. Proportion of labour input by activities in paddy production

The proportion of labour requirement for land preparation was highest in Samtse followed by Lobesa. It was low for Paro because of the use of farm machineries like power tillers. Farmers reported shortage of labour during transplanting, weeding and harvesting seasons in all the three locations and those are the times when households have to hire labour.

5.3.3.2 Gender division of labour in rice farming

The different role and responsibilities of men and women in rice-farming systems are partly due to the type of activities to be carried out. Looking in to the labour requirement, women also do play an important role in terms of paddy cultivation. Their roles differed according to the physical strength required to carry out the activities and by locations. The involvement of women in rice farming varied from region to region. Figure 5.3 shows the average proportion of labour contribution by gender towards paddy cultivation in Samtse (Sibsoo and Chengmari).

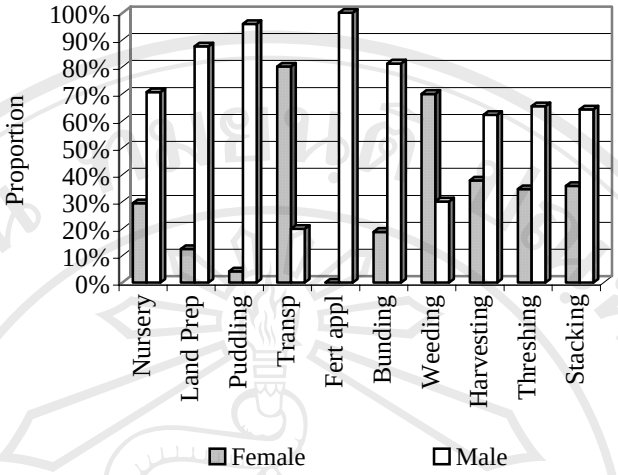


Figure 5.3. Proportion of labour input by gender in paddy production, Samtse

Men are more involved in almost all the activities of paddy cultivation in Samtse except for transplanting of paddy and weeding. The scenario in Lobesa and Paro was much different from that of Samtse. In these two areas, women contributed more labour in paddy cultivation then men (Figure 5.4 and 5.5).

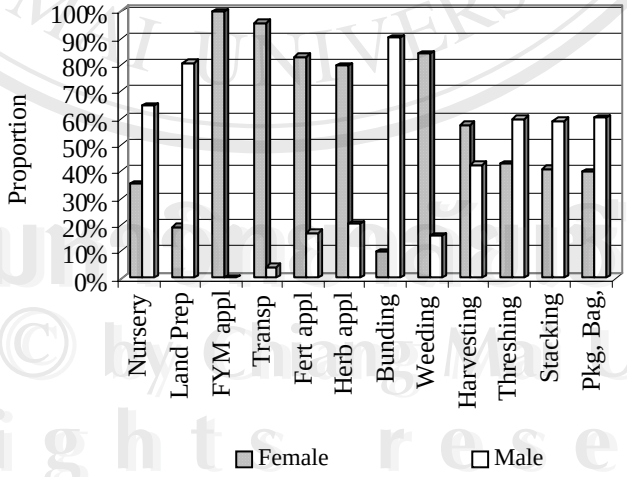


Figure 5.4. Proportion of labour input by gender in paddy production, Lobesa

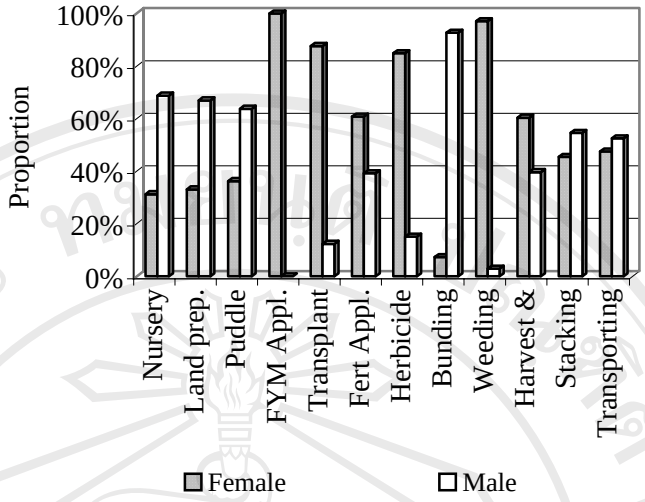


Figure 5.5. Proportion of labour input by gender in paddy production, Paro

From the two figures above it is clear that women participate in most of the activities and their contribution is the highest in carrying and spreading of farm yard manure, weeding, transplanting of paddy and in some cases harvesting. Men are more involved in activities like land preparation, ploughing, puddling, bunding and bund maintenance. The contribution of male in those activities that are more carried out by women is not very significant (e.g. FYM application is fully carried out by women in Lobesa and Paro, 97 percent of the weeding in Paro is carried out by women, 97 percent of paddy transplantation in Lobesa is carried out by women). On the other hand there have been and are complaints of labour shortages especially during the transplanting, weeding and the harvesting season.

5.4 Yield

The average yield of paddy was lowest in Samtse and highest in Lobesa. The average yield of paddy was 2.23 tons/ha in Samtse, 5.16 tons/ha in Lobesa and 5.02 tons/ha in Paro. Yield was lowest in Samtse because of crop damage by wild elephants, lack of proper irrigation facilities and the repeated use of seeds of traditional varieties. Some of the farmers in Samtse reported yield loss as high as 60 percent due to crop predation by wild elephants. Moreover, unlike Lobesa and Paro, BR-153 was the only modern variety being grown by the farmers in Samtse. On the

other hand, farmers in Paro and Lobesa cultivated modern as well as traditional varieties. Yield of traditional varieties was lower as compared to that of the modern varieties, yet farmers still cultivated traditional varieties due to a number of reasons. Based on the survey, yield of traditional paddy varieties in Samtse was about 2130 kg/ha while modern varieties yielded about 3285 kg/ha, thereby making the yield of modern varieties 54 percent higher than the traditional varieties. Yield of modern varieties in Lobesa was approximately five per cent higher than the local varieties. Despite the higher yield that can be obtained through modern varieties, farmers still continued to cultivate traditional varieties. The reasons are that traditional varieties can be grown under diverse environment, are preferred for making "*zow*" or puffed rice, are favoured for its eating quality and commands a premium price in the local markets, for religious rituals, as gifts and in some cases a sign of social status.

Domestically produced milled rice is often sold during the weekends at the "Sunday" market. The farmers from Paro sell the output either at the weekend market in Paro while the farmers from Lobesa either do sell it in Thimphu, Wangdue or Punakha weekend markets. The normal price for the local rice in these markets is Nu.25/kg. Farmers in Sibsoo and Chengmari sell at the weekend market in Samtse at about Nu.20 per kilogram. Price is lower in this area as farmers have to compete with the Indian farmers and traders who also set up stalls to sell rice during the weekends. At times farmers also do sell rice from the farm itself that is when consumers mostly in the form of government officials visit the villages on tour.

5.5 Economics of rice production

A crop budget (Annex Table 1) was constructed for the three different locations to see the private profitability or the financial benefits of rice cultivation. The results are as shown in Table 5.2. Assuming that the milling recovery is 60 percent and that a further 10 percent is paid as milling cost the average yield of milled rice was highest in Lobesa and lowest in Samtse. There was not much yield difference between Lobesa and Paro. The low yield in Samtse could be attributed to the destruction of crops by wild elephants, unavailability of modern varieties and

shortage of proper irrigation facilities. The variability of yield was high among the farmers in all three locations. The reason could be due to the fact that the analysis did not take into account the yield of the traditional varieties and modern varieties separately.

Analysis to returns to land and labour are useful parameters. Both are relevant for farmers in all the three locations because both arable land and labour are the scarcest resources in the country.

Table 5.2. Cost and returns for milled rice

	Unit	Samtse	Lobesa	Paro
Yield (Milled Rice)	Kg/ha	1,144	2,582	2,509
Gross Returns	Nu/ha	23,400	65,120	63,365
Returns to land	Nu/ha	2,861	28,834	27,755
Returns to labour	Nu/labourday	55.5	227.1	278.8
Cost of production	Nu/kg	17.50	13.83	13.94

1US$=Nu 44.5 as of December, 2004

Current returns to land and labour were satisfactory in Lobesa and Paro representing the dry sub-tropical zone and the warm temperate zone respectively. It was highest in Lobesa with Nu. 28,834 per hectare while it was lowest in Samtse with only Nu.2,861 per hectare. The high returns to land in Lobesa and Paro are primarily a reflection of higher prices for the output, higher yield achieved from the cultivation of modern varieties, proper irrigation facilities and favourable soil conditions in these zones as compared to that of Samtse. Though return to land was positive in Samtse, the return to labour (Nu.55.46 per day) was much lower than the prevailing wage rate (Nu.80 per day). This again could be due to the low level of yield in the area and the lower price of the output as compared to the other two locations.

The cost of production of milled rice was highest in Samtse (Nu.17.5/kg) while the production cost differences between Lobesa and Paro was negligible with

approximately Nu.14/kg. Though the total costs involved were not very high for Samtse, yet the production cost remained high because of the lower yield.

5.5.1 Modern versus traditional varieties

An attempt was made to see the differences in returns and the production cost by modern and traditional varieties. Modern varieties here refer to the improved and higher yielding varieties that were released by research for adoption by the farmers while the traditional varieties are the local land races that farmers have been growing for ages. When the analysis was carried out separately for modern and traditional varieties, the scenario was different. Besides the difference in yield per unit area, the use of inorganic fertilizers was low for traditional varieties while it was higher for the modern varieties. Table 5.3 shows average use of inorganic fertilizers for the two different varieties.

Table 5.3. Quantity of inorganic fertilizer and weedicide used by varieties and by location

Inputs	Unit	Samtse		Lobesa	
		MV	TV	MV	TV
Urea	Kg/ha	120	80	155	80
Suphala	Kg/ha	140	90	167	129
Weedicide	Kg/ha	--	--	39	34

Note: MV=Modern Varieties and TV=Traditional Varieties

Source: Field Survey, 2004

The use of inorganic fertilizers in traditional varieties as compared to the modern varieties was 53 and 54 percent lower in Samtse and Lobesa respectively. No analysis was carried out for Paro because at the time of the survey, only the details of cultivating modern varieties were gathered. This however was not done on purpose and it just happened by chance.

Assuming that the total labour requirement is the same for both traditional and modern varieties, the analysis of returns and production cost are as given in Table 5.4. In Samtse a huge difference between the yield of traditional and modern varieties was observed. Modern varieties yielded almost 54 percent higher than the traditional varieties. However, there was not much difference in the yield of the two varieties in Lobesa and the yield of modern varieties was approximately five percent higher than the traditional varieties.

Returns to land from the cultivation of modern varieties was as high as 232 per cent for Samtse but only eight percent for Lobesa. In Samtse, the returns to labour was observed to be lower than the wage rate from the cultivation of traditional varieties but 63 percent higher than the wage rate with the adoption of modern varieties.

Table 5.4. Cost and returns for milled rice by varieties and location

		Samtse		Lobesa	
	Unit	MV	TV	MV	TV
Yield	Kg/ha	1,642	1,064	2,622	2,502
Gross Returns	Nu/ha	33,360	21,800	66,120	63,120
Total Cost	Nu/ha	20,674	20,006	36,461	35,704
Returns to land	Nu/ha	12,686	1,794	29,659	27,416
Returns to labour	Nu/labourday	109	50	231	220
Cost of production	Nu/kg	12.30	18.31	13.90	14.27

Even by cultivating traditional varieties, the returns to labour in Lobesa was higher than the wage rate and the adoption of modern varieties has not made much difference in the returns to labour. This could be attributed to the minimal difference between the yields of the two varieties and also that there was not much difference in the cost of adopting modern varieties. The only difference in costs was that of the

inorganic fertilizers. This is because farmers use more inorganic fertilizers in the modern varieties.

The cost of growing modern variety was lower in Samtse when compared to that of Lobesa. In Lobesa, there was not much difference between the cost of production between the traditional and the modern varieties. This again can be attributed to the big difference in the yield of the two varieties in Samtse while no significant differences were observed for Lobesa.

The analysis carried out in this chapter has shown that the cultivation of rice is a profitable enterprise and that adoption of modern and higher yielding varieties would offer higher profitability. Lobesa representing the dry sub-tropical region has the highest per unit returns to land, while Paro has the highest returns to labour. Returns to land was positive but rather low in the wet sub-tropical zone and the returns to labour was lower than the wage rate. Though Samtse has the highest acreage under wetland, not all are utilized for the cultivation of paddy and are often left fallow. The high returns to land and labour from the cultivation of modern varieties show the potential of the area in the cultivation of paddy. Resources, especially wet/paddy land could be maximized if proper irrigation facilities coupled with higher yielding varieties could be provided. The provision of small farm machines could also ease the drudgery on labour. If all these facilities could be provided, Samtse and the areas in the wet sub-tropical zone could emerge as the area with the maximum contribution towards achieving the goal of 60 percent self-sufficiency in rice.